

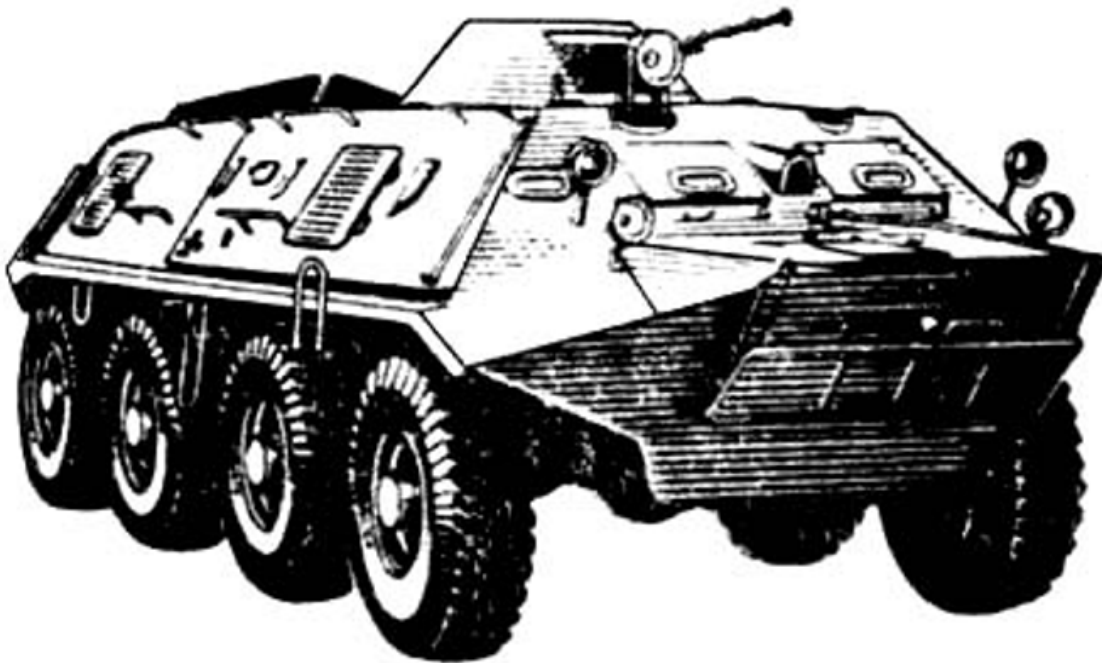
S.A. Semikov

BALLISTIC THEORY of RITZ AND PICTURE OF THE UNIVERSE

The concept of matter and light, the microworld and the Cosmos
Alternative to the theory of relativity and quantum physics
Revolution in science and technology

to the 50th anniversary of the creation of the first LASER

Third edition,
revised and supplemented



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C30 Semikov S.A. **Ritz's Ballistic Theory and the Picture of the Universe** (The concept of matter and light, the microworld and the Cosmos. An alternative to the theory of relativity and quantum physics. A revolution in science and technology). – 3rd ed., Revised. and add. - Nizhny Novgorod: LLC "Stimul-ST", 2013, - 612 p.

A century ago, on July 7, 1909, the thread of the life of the talented young scientist Walter Ritz, who managed to do a lot in science in 31 years of his life, was cut off. To this day, the Ritz combination principle is used in spectroscopy, and the Ritz variational method is used in physics, mathematics, and technology. However, his other, even more important scientific developments, are consigned to oblivion, due to their discrepancy with the dogmas of the theory of relativity and quantum physics. These are the ballistic theory and the magnetic model of the atom developed by Walter Ritz in 1908, a year before his death. The sudden tragic death of the scientist prevented him from completing and proving these fundamental concepts of light and atoms, electromagnetism and gravity. As a result, the name and theories of Ritz were soon forgotten, although it is the ballistic theory that easily, beautifully and graphically explains many of the mysteries of nature. In order to restore historical justice and recall the undeservedly forgotten scientific and life feat of Walter Ritz, this book was written, where the author popularly expounded and developed, taking into account the level of modern science, Ritz's Ballistic Theory.

Semikov S.A. **The Ballistic Theory of Ritz and Principles of the Universe** (The Conception of Matter and Light, Microcosm and Outer Space. The Alternative to the Relativity Theory and Quantum Physics. Revolution in Science and Engineering). – 3rd ed. – Nizhni Novgorod, 2013.

A century ago, on July 7, 1909, the destiny cut short the life of a young talented scientist Walther Ritz, who contributed greatly to scientific progress. Up to now the Ritz's combinative principle is used in spectroscopy, and the Ritz's variational method – in mathematics and physics. However, there exist some other, probably, more important scientific research results which have been forgotten due to their disagreement with the dogmas of the relativity theory and quantum physics. These results are the ballistic theory and the magnetic atom model developed by Walther Ritz in 1908. His sudden and tragic death in 1909 prevented the scientist from accomplishing his research and proving these fundamental concepts of light and atoms, electromagnetism and gravitation. As the result, the theories and the name of the scientist were nearly forgotten, though it is Ritz's ballistic theory that can quite easily and vividly explain many enigmas of nature. This book was written to put the historical record straight and to remind the mankind how much Walther Ritz had done for science. It is a popularly written book the author of which has set forth and evolved the Ritz's ballistic theory taking into account the present-day state of science.

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Walter Ritz (02.22.1878 - 07.07.1909)

FROM THE AUTHOR

*Dedicated to the blessed memory of
Walter Ritz, the hero of science, consigned
to oblivion.*

A century ago, in 1908-1909, a bold and universal scientific doctrine was born called the Ritz Ballistic Theory (BTR). It included the original ideas of the Swiss physicist Walter Ritz about the nature of light and electricity, mass and time, magnetism and gravity, about the structure of the atom and the electron. These ideas make it possible to easily and visually explain the redshift in the spectra of galaxies and other mysteries of space, to understand the structure of atoms, nuclei, elementary particles and the nature of their interactions. But, despite this, or rather, precisely because of this, the supporters of the theory of relativity and quantum mechanics keep silent about the successes of the ballistic theory. After all, the BTR, being an all-encompassing classical theory, leaves no stone unturned from the current absurd physics and cosmology.

In order to remove the age-old conspiracy of silence surrounding the BTR, this book was published, timed to coincide with the centenary of the birth of ballistic theory and the centenary of the death of Walter Ritz. The scientist died in 1909, at the age of 31, shortly after the publication of his revolutionary theory. Let's hope that thanks to this book, the year of Ritz's memory will be remembered for a long time by physicists. The book, if possible, will reveal the true meaning of Ritz's theory, tell about his views on the structure of the atom, electricity and light, tell about the nature of time and gravity, about the structure of the microworld and space, about the eternal life and youth of the Universe; will show the close connection of Ritz's ideas with the thoughts of other prominent scientists: Democritus, Copernicus, Galileo, Newton, Lomonosov, Mendeleev, Tsiolkovsky, Belopolsky, Tesla.

The conspiracy of silence around the ballistic theory is already indicated by the fact that not only about it, but also about Ritz himself, few have heard, even among physicists, and I, like many other supporters of the BTR, had to discover the foundations of the ballistic theory on my own. Only later, during a detailed analysis of the literature, I was surprised to discover that such ideas had been put forward a century ago. Having studied the original works of Ritz, he truly discovered the BTR, and was so fascinated by its depth and significance that he prepared a Russian translation of Ritz's main work and popularly expounded its essence, first on the website www.Ritz-BTR.narod.ru, in magazines and reports, and now in the book. The book also contains many new, author's, ideas that develop and strengthen Ritz's theory already on the basis of modern scientific data. From the standpoint of the BTR, we will cover physics, chemistry, astronomy and cosmology with a single glance. Here the reader has a rare opportunity to get acquainted with the hidden information of the distant past and look into the future.

In contrast to the abstract theory of relativity and quantum mechanics, which are inaccessible to understanding, Ritz's theory, relying on classical, mechanical concepts, images and models, explains all phenomena easily and visually. Therefore, the book is available to both schoolchildren and students. It can be read both as an exciting novel about the drama of great ideas and destinies, and as a textbook on the BTR. Having mastered the book, not only will he learn a lot about the structure of our world, the Universe, but will be able to draw important conclusions or even discoveries himself, solving problematic issues of physics and astronomy, over which scientists, who did not know or do not recognize the BTR, are struggling to this day. In the book, the reader will also find a lot of unusual things, take a fresh look at the phenomena of nature.

The theory of relativity and quantum mechanics have been criticized by many. But for a long time, this criticism was chaotic: the authors of different concepts did not help, but rather interfered with each other. I would like to hope that the BTR, due to its versatility, will allow them to unite their efforts on a common classical basis, bring order and clarity to the diversity of theories prevailing here, the chaos of ideas, and direct the efforts of the authors along the same channel. The BTR can serve as a kind of electroshock to defibrillate the heart of science, restarting it, eliminating the erratic contraction of the muscles of theories and schools, forcing them to work in concert, in time. A similar method of synchronization of oscillation modes is also in the physics of lasers, where randomly tossing harmonics, due to the matching mechanism, fall into phase, giving out a powerful laser pulse. The same powerful synchronizing and harmonizing impulse for development can give the BTR to science.

The book is divided into five parts:

- Part 1** reveals the basics of Ritz's Ballistic Theory and its essence, electrodynamics and optics.
- Part 2** shows the effectiveness of the application of the ballistic principle and BTR in space.
- Part 3** is devoted to Ritz's ideas about the structure of the microworld, atom, electron and other particles.
- Part 4** outlines Ritz's views on the theory of radiation with an appendix his ideas to solid state physics, chemistry and thermodynamics.
- Part 5** opens up prospects and possible ways, vectors of development of the BTR, its practical applications.

If the first pair (Part 1-Part 2) is devoted to criticism of the theory of relativity with an exposition of the alternative Ritz's concept, then the second pair (Part 3-Part 4) criticizes the quantum theory, again with an exposition of the alternative, Ritz theory of the atom and the electron. Part 5 gives the quintessence of the first

four, helping to unite and comprehend them in a single way, to understand and apply the information given in them, introduces the methods of scientific research and its specifics. In many ways, these sections are independent, and the book can be read from anywhere, but to fully understand Ritz's concept, it is better to study the book sequentially.

The calculations presented in the book are extremely simplified, condensed and do not go beyond the framework of the university course in physics and mathematics. All calculations and formulas of the book are given in the international system of units of SI. The use of the CGS system in many physics courses introduces a lot of confusion and masks the defects of Maxwell's electrodynamics. Vector quantities are highlighted in bold where relevant. Often we will use fractional exponentiation instead of the root sign. So, instead of the square root of a we will write $a^{1/2}$, instead of the cubic root - $a^{1/3}$. It is also useful to remember the power series expansion of the function $(1 \pm x)^m = 1 \pm mx + m(m-1)x^2/2! \pm m(m-1)(m-2)x^3/3! + \dots$, Where $2! = 1 \cdot 2$; $3! = 1 \cdot 2 \cdot 3$; $4! = 1 \cdot 2 \cdot 3 \cdot 4$, etc.

I would like to express my gratitude to all colleagues in the defense of the BTR, especially V.I. Sekerin for his book, published in 1988, which became the first swallow of the spring of the BTR; Professor V.V. Cheshev for his support, translations of articles by Ritz and Freundlich, and sent copies of Ritz's book; C.P. Maslikov for his infectious enthusiasm, bold thoughts and comparisons. The merit of Professor R.S. Fritzius as the publisher of Ritz's work in English (including on the website [Shade Tree Physics](#)) and a popularizer who developed and actively defended Ritz's ideas in the United States. I also thank K.A. Khaidarova, A.V. Byalko and professors of the Faculty of Radiophysics of the Nizhny Novgorod State University named after N.I. Lobachevsky: N.S. Stepanova, M.I. Bakunova, V.B. Hildenburg, for a discussion of the BTR and constructive criticism. Relatives, especially my father, A.G. Semikov, who offered a lot of ideas and facts useful in terms of scientific understanding of symbolism, heritage of ancestors, Russian fairy tales and, most importantly, the Thunder Temple - the general sacred object of the ancient Rus, the key to understanding many aspects of the universe. Many thanks to my mother, M.V. Semikova, for her constant support and assistance in organizational matters, to Sister Maria - for her help in translating articles and historical research during a trip to Göttingen in 2009, where Ritz lived, worked and died. I would like to express special gratitude to the "Engineer" magazine and its employees, especially to the editor-in-chief K.M. Emelyanova, for the fact that they exist, for their support and quick publication of articles [112-132], which formed the basis of this book. Finally, thanks to all those who stood in the way of the BTR and in every possible way obstructed research in this direction and the advancement of the BTR. Only they made it possible to fully understand the importance of this topic, to realize the existing unwritten ban on it, stirring up interest in it and spurring on the work.

With special warmth I would like to note the efficient, high-quality work of the director and employees of the Press-Kontur printing house S.V. Kravchenko, N.V. Vorontsov and V. Kuznetsov, who prepared the original layout and gave life

to the first edition of the book in record time, thanks to which it came out exactly on the 100th anniversary of the memory of Ritz, July 7, 2009.

The second edition of the book offered to the reader's attention differs from the first in a number of additions and clarifications. Errors and misprints have been corrected in the book, figures have been added and revised, and some paragraphs have been expanded. The four main parts of the book are provided with lists of key ideas, summarizing the content of each part. The list of applications has been supplemented with two new tables of experiments on testing BTR, as well as a name and subject index, for the convenience of working with the book. In addition, the second edition is provided with an annotation and author's commentary in English (thanks to my sister), which makes the contents of the book open to the whole world.

This book is not the property of one person or publisher: it and the ideas presented in it belong to all of Humanity. It is a product of the thought of many people, although Ritz's foundational contribution is certainly the most significant. Therefore, the author did not register copyrights restricting the dissemination of information, and is ready in every possible way to promote the early publication of the book by any publishers. The use of fragments, with a link to the original source, is encouraged. You can download the book in electronic form for non-commercial use free of charge at www.Ritz-BTR.narod.ru. In this case, we recommend that you print it out and read it in a hard copy, which, according to the observations of psychologists, contributes to a better assimilation of information, allows you to make notes and quickly find what you need. I would like to hope that the book will become your good friend and mentor for many years to come. The publication of the book took a lot of work and was carried out at the expense of the author with the participation of relatives and friends, to whom I am immensely grateful for their patience, understanding and support.

So, we open the BTR - and good luck!

S. Semikov

INTRODUCTION

Our only chance to fix everything is to return to the past, at the moment when all this happened, and this terrible alternative reality arose.

From the movie "Back to the Future"

Everyone who joins the insane (in the words of the creators themselves) ideas of the theory of relativity and quantum physics feels the same confusion of mind that befell Alphonse the Wise in the 13th century from his acquaintance with the intricate geocentric system of the world of Aristotle-Ptolemy. Countless epicycles, cumbersome mathematical calculations made the monarch exclaim: "If the Creator, creating the world, asked me for advice, I would tell him how to make the Universe easier." Three hundred years after Alphonse, Copernicus showed that the world is really simple.

Similarly, even now there are many people who experience confusion or even disgust when studying modern non-classical physics, Einstein's quantorelativistic model of the universe, which is as confusing, obscure and unnatural as Aristotle's.

It seems that such a subconscious aversion to cumbersome and confusing theories is a characteristic indicator of their falsity. Indeed, even a century after the creation of non-classical physics, when, it would seem, the time of doubts should have passed, many criticize it or simply do not accept and do not understand. Only specialists (and not all) believe in the theory of relativity and quantum mechanics (and not all), and not because everything became clear and convincing to them, but because they got used to, got used to the strangeness of theories and gave up, so as not to complicate your life. Scientists themselves say this: "Quantum mechanics cannot be understood, you can only get used to it."

Such a long-term rejection of the theory of relativity and quantum mechanics suggests that they could be as erroneous as Ptolemy's geocentric system, which placed the Earth at the center of the world. The system of the world of Ptolemy existed for thousands of years, but collapsed at once with the arrival of the heliocentric system of Copernicus, who, according to the precepts of the ancestors, gave the central place to the Sun. We will return to this analogy with the greatest scientific revolution begun 500 years ago, due to the similarity of situations. Like Ptolemy's system, the theory of relativity and quantum mechanics have been applied for a long time, without raising doubts among scientists-"theologians", whose well-being directly depended on the ability to sell and praise their dubious scientific "commodity". And just as the geocentric system was based on the authority of Aristotle and Ptolemy, so modern abstract physics is based on the authority of Einstein and Bohr. Perhaps, following the engines of the theories of Ptolemy and Aristotle, in the coming years, the ugly towers of the theory of relativity and quantum mechanics, heaped up by merchants from science, will collapse in the coming years. But for this, a new, visual and natural theory must appear, which will revolutionize science, overturning all our ideas about the world.

It is very possible that this theory will be the Ritz Ballistic Theory (BTR), built in 1908, also remembered by the Tunguska bolide. Over the hundred years that

have passed since the creation of the ballistic theory, a mass of data has accumulated that is inexplicable from the standpoint of modern physics, but quite understandable from the standpoint of BTR. These are the results of laboratory experiments and mysterious cosmic phenomena. They all contribute bit by bit to the treasury of Ritz's theory. Therefore, in the coming years, we can expect that the mass of contradictions in non-classical science will exceed the critical one, and a powerful information explosion will burst out, which will sweep away the abstract theoretical physics of the 20th century. Then the dark age of Aristotelian scholasticism and mysticism will finally be replaced by an era of prosperity, scientific revival, a return to the classics, to the science of ancestors. And the new rapid development will help raise science to an unprecedented level.

It is precisely the novelty, opening horizons, and not just one explanation of already known facts with relativistic and quantum effects, that Ritz's theory is interesting. To master its essence, we will have to travel back in time to the past century, to the beginning of the 20th century, to that crossroads point where this alternative reality arose in the dispute between the BTR and SRT and the development of science went along the wrong path of the theory of relativity and quantum mechanics, instead of the BTR path. Only by going back in time, to the place of the fork, one can understand the reasons for choosing the absurd path in order to get out of the dead end into which the mystery of quantorelativism has led the science, and to correct the historical injustice. Then, applying this retrospective view, we will review all subsequent events and discoveries from the standpoint of the BTR.

PART 1. RITZ AND HIS BALLISTIC THEORY

First of all, from all kinds of things that we see, it is necessary to flow and fly, scattering, calves, which hit in the eyes, causing them to see ... Thin like a hymen, separating from the surface of bodies, They soar in the air, flying in all directions... In exact order, always preserving their appearance and shape ...Sunlight, like heat, belongs to these objects, Since they are composed of small initial particles ...And finally, because their rare tissue when flying Without difficulty to pass through any obstacle capable ... So, from all things in an incessant stream All things flow, spreading everywhere, in all directions; This current goes without stopping and without rest.
Titus Lucretius Carus, "On the nature of things", 1st century. BC. [77]

Characterizing the state of modern physics and the history of its development, the following well-known poem by A. Pope (1688-1744) and J. Squire (1884-1958) is often cited

The world was shrouded in earthly pitch darkness.
Let there be light! And then Newton appeared!
But Satan did not wait long for revenge:
Einstein came, and everything became as before.

The first two lines are by Alexander Pope, who wrote the epitaph to Newton's death. It was Newton who, in his "Elements", built a new, non-Aristotelian physics almost from scratch. He also shed light on the phenomena of optics and put forward a corpuscular hypothesis that light propagates in the form of a stream of particles-corpuscles emitted by luminous bodies. Also, Newton tried to combine this theory of light outflow with the wave nature of light.

Ballistic theory, as Ritz notes, is in many ways a development of Newton's ideas, which in turn go back to even more ancient ideas of the first atomists - Leucippus, Democritus, Epicurus and Lucretius. These scientists of antiquity discovered not only the atomic structure of matter, but also built an atomistic theory of light, surprisingly similar to the ballistic one.

For a century now, Einstein's theory of relativity and Maxwell's electrodynamics have existed, muddying our ideas about the world, returning science to dark Aristotelian physics and replacing Newton's visual models, which was aptly characterized by John Squire, who supplemented Pope's verse two centuries later. These theories, built largely speculatively, without sufficient experimental foundations, until recently seemed unshakable. Ritz was the first to dare to question these dogmas. He saw that the cause of the crisis that broke out in physics at the beginning of the 20th century. was not in classical mechanics, but in Maxwell's electrodynamics, the natural consequence of which, according to Einstein, was the theory of relativity. Therefore, the SRT was relatively easy to accept, in contrast to the BTR. And only one Ritz threw an open challenge to all modern physics and accomplished a scientific feat, creating a ballistic theory. Because of his seditious ideas, Ritz did not find support in the scientific community and soon died. After his death, no one dared to raise the fallen banner of the BTR, a theory that crossed the road to Maxwell's electrodynamics, but gave all the phenomena of optics and electrodynamics a simple, visual explanation in

the spirit of classical Newtonian mechanics. About the fate and forgotten ideas of Ritz, this courageous thinker, universal scientist, a man of amazing spiritual qualities [50], famous for his discoveries not only in the field of electrodynamics, spectroscopy, atomic physics, strength of materials, wave theory, but also in mathematics, experimental IR spectroscopy -range, we will tell you. It is Ritz's theory that, I think, will shed light again on many questions of the physics of the Universe, restoring order in it. Then, perhaps, the name of Ritz will complete the intertemporal poem formed from century to century.

§ 1.1. *Walter Ritz, his life and death*

Promoting acquaintance with scientific works of rare beauty, we strive not only to attract once again the attention of physicists and mathematicians to the work of the most refined mind, but we are also convinced that by facilitating the dissemination of new and bold ideas, we favor the progress of Science.

From the preface to the posthumous collection of works by Walter Ritz [9]

As noted by the researchers, biographical information about Ritz (Fig. 1), despite his significant contribution to science, is extremely scarce. They have to be collected bit by bit from different sources. Ritz's personality and his theory seem to be surrounded by a conspiracy of silence. Even among those interested in the history of science, you rarely meet people familiar with the biography of Walter Ritz, and even more so with his works. Here is the scant information that is given in the biographical reference book of Khramov [156]:

“RITZ Walter (22.II 1878 - 7.VII 1909) - Swiss theoretical physicist and mathematician. Born in Sion. Graduated from Zurich University (1900). He worked in Göttingen, Bonn, Paris, Zurich, Tübingen.

His works in physics are devoted to spectroscopy, the theory of thermal radiation, and electrodynamics. In 1908 he discovered the law according to which the wavenumber of any spectral line is equal to the difference of two terms from the set of terms inherent in a given element.



Fig. 1. Walter Ritz (1878-1909).

The formula describing any spectral line of an element was given in 1890 by I. Rydberg. Hence the name "Rydberg - Ritz principle", or "combination principle"

of Rydberg - Ritz". In mathematics, the "Ritz method" is known - a method for solving variational problems (1908) "

Even in the Great Soviet Encyclopedia, which includes all the more or less significant scientists, engineers, etc., one cannot find articles about Ritz. There is only a brief mention of the Ritz-Galerkin method (remember, Ritz was also an excellent mathematician). Such a stubborn reluctance to talk about Ritz seems all the more strange since it was he who discovered the most important law of atomic physics and spectroscopy - the combination principle, as well as his mathematical works: the variational method for solving boundary value problems (Ritz's method) developed by him is still widely used today. No wonder H. Lorentz, A. Poincaré, D. Hilbert, G. Minkovsky, A. Kleiner, highly appreciated "the exceptional talent of Ritz, bordering on genius" [6, 50]. But many more of Ritz's works and amazing scientific predictions are simply forgotten. To some extent, this book fills this gap and restores historical justice in recognizing the merits of Ritz.

Perhaps the first step in this direction was taken in 1995 by an outstanding Belarusian scientist - academician M.A. El'yashevich (the author of the famous monograph on atomic spectra) and his colleagues, L.M. Tomil'chik and N.G. Kembrovskaya. In the article "Walter Ritz as a theoretical physicist and his research on the theory of atomic spectra" [50], these authors revealed the true meaning of Ritz's work and the details of his dramatic biography.

Ritz was born in 1878 in the Swiss city of Sion (German name - Sitten, Sitten), in the family of the famous landscape painter Raphael Ritz. Apparently, this, coupled with family traditions (Ritz had relatives of engineers), predetermined his choice of the path of an engineer and the visual, model-geometric, engineering style of his scientific works, as Poincaré put it. In 1897, Ritz entered the Zurich Polytechnic (Federal Polytechnic School) and fell into the same group with A. Einstein [50, 107]. And here lies the first riddle ...

In numerous biographies of Einstein, of which dozens have been written, not a word is said about Ritz, who studied with him, although others from among his eight classmates are repeatedly mentioned. Only in the book of K. Zelig [58, p. 123], the phrase of G. Minkowski (professor of mathematics at the Zurich Polytechnic University), said on a completely different occasion, accidentally: "... At one time Louis Kollros seemed to me, and perhaps to other colleagues, the most gifted in the field of mathematics of all the students of his course, and it means a lot. For it was this small course of the Faculty of VI-A that gave the prominent researchers: Albert Einstein, Walter Ritz and Marcel Grossmann. " Ritz and Einstein not only studied together, but also argued in print media, and also co-authored an article. And yet Einstein's biographers are stubbornly silent about Ritz.

After completing his studies in Zurich in 1901, Ritz moved to study in Göttingen. In 1902 he graduated with honors from the University of Göttingen and went on an internship to work in the laboratories of Göttingen, Bonn, Paris, Zurich, Tübingen. There Ritz studied with such famous physicists and mathematicians as W. Voigt, E. Ricke, M. Abraham, T. de Koudre, F. Klein, D. Hilbert, G. Minkowski, discusses burning scientific problems with G. Kaiser, K.

Runge, P. Weiss, M. Born, A. Poincaré. On his educational and internship trips, Ritz, together with P. Ehrenfest visited in Leiden and H.A. Lorentz, having attended the course of his lectures. Ritz worked at the Kaiser Institute in Bonn (1903), in the laboratory of E. Cotton in Paris (1903-1904). At this time, Ritz began to publish articles on spectroscopy, trying in parallel to build a model of the atom. But at this time, his illness suddenly exacerbates, the nature of which is very mysterious. Some argue that it was pneumonia, others - tuberculosis, others - pleurisy, fourth - lung cancer. For about three years, Ritz is forced to interrupt work in order to improve his health. In 1907, Ritz returned to duty, as if feeling how little time was allotted for him to complete and publish his works, and began to work feverishly for F. Paschen in Tübingen. And in the spring of 1908, Ritz moved to live and work in Göttingen, where he took up the post of professor at the world famous University of Göttingen, where he had previously studied.

It was in 1908 that numerous works of the scientist were published, which formed the basis of his ballistic theory and the magnetic model of the atom, which revealed the nature of atomic spectra. These fundamental works, carried out in 1908-1909, were Ritz's swan song, because immediately after that, in 1909, the scientist tragically dies at the age of 31. Ritz died in the Göttingen hospital from a hemorrhage. Had Walter Ritz lived for at least another five years, we might have already learned the nature of gravity, mastered the galactic expanses, flying at superluminal speeds and drawing energy from the very depths of matter. Ritz himself understood the meaning of his unfinished works, it was not in vain that on the day of his death, lying in the hospital, he said the following words: "Take good care of me, sister, it is so necessary that I live a few more years for Science" [50]. But an evil fate untimely cut off the thread of the life of this remarkable scientist, and on July 7, 1909 he was gone ...

And the next morning, July 8, 1909, the lucky star of another, then almost unknown Swiss scientist, a modest employee of the patent office Albert Einstein, rose. It was on this day, when the sky itself was still mourning the death of Ritz, and even the festive procession in honor of the 350th anniversary of the University of Geneva resembled a funeral, that Einstein's scientific merits were officially recognized [58, p. 92]. Immediately after that, in the fall of 1909, he would leave the patent office and enter official science, and the theory of relativity would begin its triumphant march around the world, which had not stopped for a hundred years.

No one can tell for sure the nature of Ritz's illness and how he got sick. Some associate his illness with an accident in the mountains of Montpellier [6] (a similar incident in the mountains of Switzerland took place at the same time with Einstein [58, p. 15]). Others believe that Ritz was poisoned, attributing his death to illness. Ritz may have died, but he was probably helped to die, as evidenced by the accusatory statements of his friend L. Nelson [6]. There were undoubtedly people who were extremely uncomfortable with Ritz and his newly emerging theory. He himself mentioned this more than once, noting that many call his ballistic theory monstrous, since it poses a serious threat to Maxwell's theory and the theory of relativity published in 1905 [6]. After all, everything that seemed so complicated and strange, Ritz naturally and naturally explained from the classical point of

view. It was not for nothing that Ehrenfest wrote: "His death first of all caused in me the feeling that everything is simple, how everything is completely resolved" [50]. And, for sure, the simple rule "No man - no problem" worked here, because with the death of Ritz, his theory, despite all its merits and grandiose prospects, was rejected and forgotten.

In relation to the life and death of Ritz, there is still a lot of strange, mysterious and there is enough room for conjecture, which is caused, among other things, by the lack of biographical information about him. Perhaps one day some Sherlock Holmes (he often remembered the case of poisoning in Montpellier) will solve all these riddles and reveal why Ritz died so suddenly and strangely, why he was so hastily forgotten, hiding the fact of his studies and communication with Einstein. Perhaps the key to this mystery is the suicide of P. Ehrenfest, who talked a lot with Ritz and often accompanied him on trips (for example, Ehrenfest defended Ritz's theory after his death [171]). Einstein hinted that the reason for Ehrenfest's suicide was a conflict of conscience with scientific interests, a conflict of old and new theories [73, p. 281]. Considering this and the fact that Ehrenfest was the closest friend and colleague of Einstein and A.F. Joffe, who visited the Ritz just before his death [50], it can be assumed that the situation of "Mozart and Salieri" was repeated. Evidence of this could be considered the transfer of Ritz's professorial place to Einstein during his illness and death [6, 161], as well as Einstein's hint to his family and friends in February-April 1909 that something was going to happen soon, and then in the fall of this year, professorship is provided for him [58, p. 90], which really came true. Finally, Einstein's close friendship with pharmacologists, forensic experts, and specialists in criminal law and his unwillingness to eat outside the home are mysterious [58].

Ritz's sudden death did not allow him to fully develop and substantiate his scientific concept. Therefore, many sections of this book represent not so much the ideas of Ritz himself, but their development and popular presentation by the author. Ritz, of course, could not talk about nuclear physics, the structure of elementary particles, about redshift, relic radiation, quasars, supernovae and other mysteries of space - in his time all these phenomena were unknown or not studied. However, Ritz always worked at the forefront of science, immediately perceived and incorporated the latest scientific facts and experimental results into his concept. Therefore, in spite of the fact that Ritz lived and worked a century ago and, at the same time, for a very short time, from 1902 to 1909 (with a three-year break due to illness [50]), he managed to lay a solid foundation, the skeleton of the Ballistic theory and set a clear vector of development physicists, having invested much more in the BTR than he could have imagined. So, the authorship of the ideas presented in the book can well be attributed to Ritz. It seems that he would reason like this if he had stayed alive and had all the knowledge brought by the subsequent age-old development of science. Ritz's life was a supernova explosion that in a short moment emitted an unprecedented power, a mountain of light, which only a century later fully reached us. It was a super-bright beacon of knowledge, which, shining on others, burned out by itself. Feeling the closeness of death and knowing that he would not be able to take advantage of the results of his labors and achieve recognition, Ritz still spent the rest of his energy and

time not on rest, treatment and serene enjoyment of the last days of his life, but on bringing to humanity the great that he managed to know. That is why, despite his poor health, it was in the last 1908-1909, life saw a pronounced peak of Ritz's scientific activity [50]. He saw a negative trend in the development of physics, knew that much could still be corrected, and, fearing to be late, he gave his best, finally undermining his health and paying with his life for the publication of new luminous ideas [6]. So Ritz almost followed the path of Copernicus, who died immediately after the publication of his revolutionary book.

Fighting to his last breath, **Ritz always found a third, non-standard and simple way. This is his ballistic theory and the magnetic model of the atom.** Most physicists, faced with the dilemma of choosing between the theory of relativity and the theory of the ether, or between the quantum and planetary models of the atom, preferred to give up classical physics without a fight, not noticing that it allows other options for development and ways out of the impasse, including those proposed by Ritz. Ritz's theory remains largely unfinished: the true fighter and martyr of science, Ritz died untimely at the age of 31, fighting for an idea and barely starting to publish his revolutionary works. The ideas of Ritz, this knight of science, have remained unrecognized and forgotten for a century. However, the "scientists" who imposed on us the medieval mysticism of the theory of relativity and quantum mechanics, have forgotten that you can kill a person, but not an idea. So, when the forces of darkness destroyed other like Ritz, true fighters-revolutionaries - Giordano Bruno and Che Guevara (Fig. 2) - their ideas not only survived, but also won.



Fig. 2. Three great revolutionary fighters.

§ 1.2. Fundamentals of Ritz's Ballistic Theory

There was a great need for an intermediate link that was invented to explain the reason for the equality of action and reaction. I pointed out in the introduction that radiant energy, born and radiated at the speed of light, would in itself constitute such an intermediate link. Thus, we return to the emission theory in its new form and to the use of Poincaré's example, which is that the recoil of an artillery gun and the force perceived by a body emitting a wave of radiant energy in a certain direction are absolutely analogous.

Walter Ritz, "Critical Analysis of General Electrodynamics" [8]

While very few people know about Walter Ritz, they usually know even less about his ballistic theory. Therefore, we will briefly tell you what the Ritz

Ballistic Theory (BTR) is. After that, let's move on to a detailed analysis of its findings.

So, Ritz's Ballistic Theory is a universal classical theory that, on the basis of uniform visual mechanical representations, provides a consistent description of the phenomena of the microworld and the Cosmos, light and atoms, electromagnetism and gravity, the nature of mass, matter and time. This theory constitutes an alternative and serious opposition to the theory of relativity and quantum mechanics. Walter Ritz was not only the one who laid the foundation of the theory, and the foundation was solid, which stood for all hundred years, despite the intrigues of the opponents of the BTR, but also erected the main part of the building of the theory, established its main principles. Only an early death did not allow Ritz to complete the theory: to protect the building with a roof, to decorate and put into operation, in other words, to bring the theory to life.

The essence of the theory is that all interactions and phenomena of nature - light, electricity, magnetism, gravity are reduced, ultimately, to purely mechanical motion, collision, merging and decay of particles in empty space, which does not have properties and does not affect what is happening. Thus, the BTR is a theory that continues the program started by Leucippus and Democritus in the form of an atomistic theory developed by Newton, Lomonosov and won at the end of the 19th century.

In the future, however, scientists began to move further and further from these atomistic concepts, which had proved their effectiveness and naturalness. Scientists, as in the time of Aristotle, again began to endow space with properties. First, in electrodynamics and the special theory of relativity (SRT), where space was identified with an electromagnetic field, on the assumption that it is the change in the state of space by charges that gives rise to electromagnetic effects and waves. Then in the theory of gravity, in the general theory of relativity, where the visible manifestations of gravitation were explained by the change in properties, the curvature of space under the influence of masses. And now the followers of energetism (the eternal opponents of atomism § 5.14) are no longer afraid and consider the particles themselves just a visible manifestation of certain properties of space - its energetic excitations and vibrations. But, as is clear to any sane person, all this is from the evil one. It is noteworthy that the foundations of all these three geometrodynamical theories were laid by Einstein in his special and general theory of relativity and in his unfinished unified field theory [146].

The essence of the BTR is to deny space in all contrived physical properties, recognizing only one natural thing - to be a receptacle for particles. Meaning is only the absolute, independent of anything and influencing nothing, three-dimensional Euclidean space, which possesses only these invariable geometric properties. Indeed, what physical properties can an absolute emptiness have? Newton, for example, compared the absolute space he introduced with an empty theatrical stage - this is only a place of action that does not in any way affect the events unfolding there. Thus, the BTR returns us to the former visual mechanistic and atomistic concepts. As for endowing space with physical properties, this is as illiterate as giving its own properties to axes and a coordinate system, as if it is

they that generate all those curves, lines, geometric objects that are built in it. The main problem of modern abstract physics is precisely in endowing purely mathematical objects, such as space and field, with physical properties.

The main provisions of the BTR are as follows:

1. **Electric, magnetic and gravitational influences are of a mechanical nature and are carried by particles emitted by elementary charges at the speed of light c , which is why all electromagnetic and relativistic effects are classically interpreted;**
2. **Light is a stream of these noninteracting particles of the same type, periodically distributed in space and scattering from the source in a straight line at the speed of light. The motion of these particles obeys the laws of classical mechanics, including the law of addition of the speed of particles (and the light carried by them) with the speed of their source;**
3. **Elementary particles and atoms have a complex crystal structure, being formed from periodically located particles of the same type (electrons - carriers of elementary charge, magnetic moment and mass). Due to this, all the laws of the microworld, quantum laws and radiation spectra are explained in a natural way, within the framework of classical mechanics and electrodynamics.**

These are the three whales that underlie Ritz's ballistic theory, which includes his own magnetic model of the atom, and from which all the remarkable consequences of the BTR follow. All these provisions in one form or another can be found in the works of Ritz on electrodynamics and the theory of atomic spectra, published a century ago.

So, the essence of the BTR is simple and boils down to the fact that it extends the principles of mechanics (moreover, Newtonian mechanics, without the paradoxical consequences of SRT, such as changing the scale of times, distances and masses) to the area of optical, electrical, atomic and any other phenomena. Light in an armored personnel carrier is represented as a stream of particles emitted by luminous bodies. The light source, like a turret machine gun, shoots

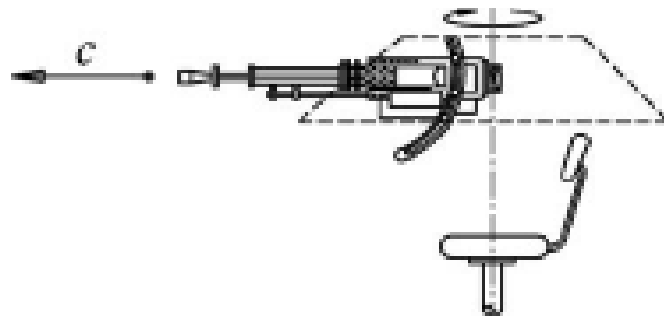


Fig. 3. A turret (in a rotating turret) machine gun depicts a light source that shoots light particles in all directions at the speed of light c .

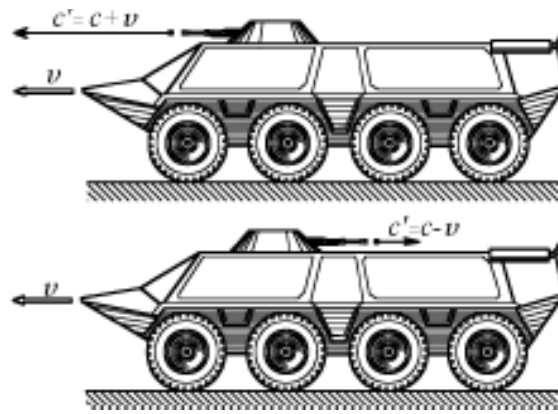


Fig. 4. Machine-gun fire from a rolling armored car simulates the propagation of light particles from a moving source, the velocity v of which is summed up with the velocity c of the "firing" of particles-bullets.

these particles in all directions at a constant speed equal to the speed of light c (Fig. 3). If the light source moves (a machine gun fires from an armored car rolling along the road), then the speed of the particle-bullets is geometrically added to the speed of the source (armored car) according to the classical law of adding velocities (Fig. 4). From the comparison of light with shells fired by a mobile weapon, the name "ballistic theory" was born. It is not without reason that light sources in BTR have long been compared with a fragmentation bomb (P. Ehrenfest), an artillery gun (W. Ritz, A. Poincaré), a machine gun (J. Fox, S. Maslikov) or an automatic machine gun.

As Ritz himself noted, his theory is partly a return to the corpuscular theory of the outflow of light, proposed back in the 17th century. Newton and 2 millennia before him - Democritus, Epicurus and Lucretius (Part 1, epigraph). Let us recall that Newton represented light in the form of a stream of particles emitted by luminous bodies [89]. Therefore, Ritz's theory is sometimes called not "ballistic", but "theory of outflow", and he himself called it "emission". But, as we will show below, Ritz's luminiferous particles are fundamentally different from Newtonian light corpuscles and similar light quanta, Einstein's photons, and closer to the particles of Democritus and Epicurus. According to Ritz, these particles are carriers of not just light, but in general the electromagnetic effect, of which light will be a particular manifestation. Due to this, the ballistic theory harmoniously, without paradoxes, combines optics and electrodynamics and explains the wave properties of light - interference and diffraction.

In addition to electrodynamics, ballistic theory affects cosmology, the structure of the atom and elementary particles, in fact, rebuilding all current physics and astrophysics. Many scientists criticize attempts at a global restructuring of science and ridicule enthusiasts who aim at the entire building of physics at once, because they consider the falsity of the entire physical picture of the world to be too unlikely and believe that physics should develop only along the path of gradual restructuring and generalization of laws. However, if the assumptions underlying the modern paradigm are wrong, this should inevitably entail a revision of all physics. Indeed, in science, one thing clings to another, and with the fragility of

one link, the whole chain breaks. Therefore, if you remove just one brick from the foundation of quantorelativistic physics, its entire building will collapse, which in fact turns out to be a house of cards.

The theory of relativity and quantum mechanics have infected the entire fabric of science with the virus of irrationalism. And, just as during deep infection with viruses it is necessary to reinstall the operating system of a computer, so a radical revolutionary revision of the whole science is also necessary - a case too neglected here. The inevitability of such fundamental, revolutionary changes in the scientific picture of the world was substantiated by the famous American historian of science T. Kuhn. He showed that quite often the old paradigm is completely discarded with the arrival of a new, more perfect scientific concept, saving practically nothing from it, since all facts are rethought practically from scratch.

It is hardly worth counting on the unconditional justice of the modern picture of the world. Imagine a scientist from the 17th century, abandoned in Ancient Greece or the Middle Ages. Would he take much from the old naive, but generally accepted Aristotelian worldview? Likewise, a scientist of the 20th century, who found himself in the 17th century, would have to redraw the whole science to its foundations. Finally, a scientist abandoned from the distant future would hardly have retained at least something of the fundamental physics and cosmology of the 20th century, but would have radically rebuilt them in accordance with the better developed and proven science of the future. An example of such a revolution in science, a radical revision of the model of the world, is the change in the geocentric system of the world by Ptolemy, who considered the Earth as the center of the world, the heliocentric system of Copernicus (it is not for nothing that Copernicus's book bore the revolutionary title "De revolutionibus" - "On conversions"). Changes in ideas about the cosmos required the abandonment of both the previous laws of mechanics of Aristotle, and of all of Aristotelian physics. Likewise, Ritz's theory leads to the rejection of Einstein's mechanics, the laws of Bohr and Heisenberg, Maxwell's electrodynamics and the revision of all astronomy and cosmology. Unwinding with the help of Ritz's theory a tangled tangle of facts and contradictions, you will have to revise many branches of physics, as well as discover a lot of new things.

Scientists professing generally accepted scientific beliefs with all their might resist such revolutions, reducing all their knowledge and skills to the level of illiteracy and absurdity. On this occasion, K.E. Tsiolkovsky, whom we will often quote, wrote: "Let's take an example, a new spelling. Everyone considered himself educated and literate, while others, ordinary people, were illiterate. The innovation did the opposite. Isn't it a shame, especially for inert people and old people! Refuting some false discovery is even more painful. Suppose experiment rejected the hypothesis of relativity (Einstein). How many works were used by scientists to assimilate it, how many students puzzled over it - and suddenly it turned out to be nonsense. And humiliating and as if the treasure was lost. How much pride there was before others who were not familiar with the doctrine - and everything collapsed ... Old hypotheses are constantly rejected, and science is improving. And scientists always prevent this most of all, because they most of all suffer and suffer from this alteration" [159, p. 80].

It is interesting that in the USSR, the country where the Great October Revolution broke out (which just led to the spelling reform), where scientific revolutions should be extolled, and non-materialistic concepts, such as the theory of relativity with quantum mechanics, should be rejected, these two theories were raised to the rank of dogma, and any attempts to revise them and objective criticism were suppressed in every possible way. A special decree was even passed prohibiting criticism of the theory of relativity and quantum mechanics in print. At the same time, the opinion of both non-specialists, non-physicists and the most sensible scientists who criticized the theory of relativity was completely ignored. Only at the turn of the 90s, with the collapse of the USSR, works criticizing the theory of relativity began to appear in print. Therefore, it was only in 1995 that the first Russian article devoted to Walter Ritz and his spectroscopic studies was finally published in the journal *Uspekhi Fizicheskikh Nauk* [50]. This article, apparently, was prepared by M. Elyashevich for many years, but could not be published, despite the fact that he was an academician. This author was going to publish a separate article on Ritz's ballistic theory, but did not have time, since he died the next year after publication. In the same period, the first books in defense of the BTR appeared [22, 44, 111]. The first of these books in support of ballistic theory belongs to the pen of Vladimir Ilyich Sekerin, the namesake of another famous revolutionary and defender of materialism, who launched the revolutionary machine a century ago and published *Materialism and Empirio-Criticism* in the same 1908-1909 as Ritz's theory. It was through the efforts of V.I. Sekerin in the 80s, the revolutionary movement of the BTR began in the USSR (Fig. 5).



Fig. 5. Vladimir Ilyich makes a speech, defending the BTR.

Of course, initially, Ritz's ballistic theory meant only his emission electrodynamics. However, Ritz's electrodynamics is closely connected with the structure of matter, atoms, electrons, with the problem of black body radiation and with the phenomena of space, it is not for nothing that these topics are touched upon in Ritz's articles. Therefore **by Ritz's Ballistic Theory, we here mean not only its emission electrodynamics and optics with a magnetic model of the atom, but also in general a classical, mechanical, visual approach, applicable to all phenomena without exception and reducing all of them to motion, collision, decay and combination of particles in an empty Euclidean space without properties.** This is a truly atomic, materialistic theory. The very word "ballistic" implies the classical basis of this theory, which reduces everything to

mechanics - free movement and collision of particles, similar to projectiles (after all, it was ballistics - the science of the movement of bullets and projectiles - that was taken as the basis of mechanics by Galileo and Newton).

Ritz's ballistic theory is the most universal scientific concept, applicable to the description of the Cosmos, the Universe, galaxies and the microworld. And at the same time, this is the most revolutionary theory since the time of Copernicus, and therefore the accidentally arisen abbreviation of the BTR and the analogy in the form of an armored car are quite symbolic, even for those who are superficially familiar with the history of the October Revolution, in which an armored car and a salvo from the cruiser Aurora became its hallmark and are associated with revolutionary transformations.

§ 1.3. Ritz Electrodynamics

Experience has shown that the impacts (electromagnetic) are not instantaneous, and he also did not reveal even a trace of the environment in empty space free of matter. Therefore, I thought that I could give the law of propagation of these influences a very simple kinematic interpretation, borrowed from the theory of light outflow and satisfying the principle of relativity of motion. Fictitious particles are constantly emitted in all directions by electrical charges. They continue to spread indefinitely along straight lines at a constant speed, even when moving through weighty bodies. The impact on the charge depends only on the location, speed and other parameters of these particles in its immediate vicinity.

Walter Ritz, "A Critical Analysis of General Electrodynamics" [8]

One of the main, but rarely mentioned merits of Ritz is the creation by him of a new emission electrodynamics, an alternative to Maxwell's electrodynamics. Ritz outlined his theory of electromagnetism in 1908 in a large article "Critical Analysis of General Electrodynamics" [8]. In this case, only PART ONE of the work, where the shortcomings of Maxwell-Lorentz electrodynamics were examined, was purely critical. But PART TWO was already constructive criticism, since it was there that Ritz outlined the foundations of his alternative theory, simultaneously examining its applications to optics, gravity, the nature of mass, and explaining many relativistic effects.

What prompted Ritz to build a new electrodynamics, if, according to the conviction of his contemporaries, as well as ours, the Maxwell-Lorentz electrodynamics gave a completely adequate and accurate description of the phenomena? The main flaw in Maxwell's theory was in its foundation - the ether hypothesis, which by 1908 had already been convincingly refuted by the experiments of Michelson-Morley, Trouton-Noble and the phenomenon of stellar aberration. And since there is no ether, then the Maxwellian electrodynamics based on it was also worthless. In addition, Ritz pointed out a number of discrepancies in Maxwell's theory when explaining the phenomena of radiation and propagation of light. Finally, Maxwell's equations are unconvincing just because they admit physically impossible solutions. All this, coupled with the growing problems of interpreting experimental material on the basis of Maxwell's theory, led to the only possible, according to Ritz, conclusion: Maxwellian electrodynamics is fundamentally wrong.

However, most scientists were so hypnotized by the previous successes of Maxwell's theory, by the elegance of its formulas, enslaved by the habit of it, that they preferred to keep the theory, and eliminate the inconsistencies that had arisen by means of a large number of artificial assumptions-props. Lorentz and Fitzgerald followed this path. Their idea was developed by Poincaré and Einstein, who proposed an even more radical solution - to preserve Maxwell's electrodynamics at the cost of abandoning the classical mechanics we are used to, replacing it with relativistic mechanics, which runs counter to all our experience and common sense. This is how the Special Theory of Relativity (SRT) arose. It is very strange that the scientific and world community, which hostilely accepts everything new, relatively easily accepted the theory of relativity. It is possible that such is the nature of a person who bows to the incomprehensible, accepts the incredible on faith, but meets with hostility everything reasonable, rational, if it is noticeably different from the old.

Ritz did not share the general enthusiasm for SRT and believed that it is possible to introduce fundamental ideas that so radically change our ideas about the world and run counter to all our experience, only after a thorough theoretical and experimental analysis of the theory, when all other, less cardinal methods have been exhausted. resolving the problems that have arisen. It was this method that Ritz proposed in the theory he developed. Indeed, the essence of the contradictions that led to the crisis in physics and the creation of the theory of relativity was as follows: Maxwell's electrodynamics did not agree with classical mechanics. Scientifically speaking, Maxwell's equations are not covariant with respect to Galileo's transformations (which, by the way, is not entirely true, § 1.11). Therefore, either Maxwellian electrodynamics is false, or classical mechanics is erroneous. Einstein saw the way out in the rejection of classical mechanics with the usual kinematics, and in the acceptance of relativistic mechanics of the theory of relativity. That is, an unnatural mechanics was built artificially, which made it possible to fit Maxwell's equations to reality.

Ritz, on the other hand, offered a more natural, but at the same time more revolutionary way out. If Maxwell's electrodynamics, which by 1905 was only 15 years old, contradicted classical mechanics, proven for centuries, is it not easier to assume that electrodynamics is precisely wrong? It should be changed! This conclusion also suggested itself because Maxwell built his theory purely speculatively: he arbitrarily introduced abstract concepts of fields and operated with them exclusively analytically. No wonder scientists complained that Maxwell's treatise on electrodynamics was completely incomprehensible. In addition, after all, the contradictions with Michelson's experiment were revealed precisely in Maxwellian electrodynamics, and not at all in mechanics. Therefore, Ritz came to the conclusion that it is much more natural to reject Maxwellian electrodynamics and keep classical mechanics. Then, in PART TWO of his work, Ritz developed a new electrodynamics, which was not only built much more consistently, logically and reasonably than Maxwell's, but also easily solved all problems, including the experiments of Michelson and Trouton-Noble.

An equally simple solution was obtained by relativistic effects discovered by that time - a change in the mass of an electron, a secular shift of the perihelion of

Mercury. But, most importantly, Ritz's theory finally gave a visual, mechanical description of the phenomena of optics and electrodynamics, explained their nature, showed how the movement of charges leads to the appearance of a magnetic field. In other words, this theory had a huge advantage over Maxwell's theory, because if the former answered only the question of HOW do phenomena occur in each case, then Ritz's theory also answered the main question of science - WHY do they proceed this way and not otherwise? their deepest mechanisms, beginnings. It was the beginning of things and phenomena that the most progressive scientists, such as Democritus, Newton, Lomonosov, Mendeleev, Tsiolkovsky, were always looking for. In the knowledge of the beginnings of things, the causes of phenomena, they saw the meaning of science.

Rejecting Maxwell's electrodynamics, Ritz, in fact, returned to the old pre-Maxwellian versions of electrodynamics built by Ampere, Weber and Gauss. These versions of electrodynamics did not need the concept of a field, so this approach was called fieldless, and the theories themselves were also called theories of long-range action, since they denied the role of space between charges. Empty space did not affect the interaction in any way: only the positions and velocities of the charges in this space were important. The charges seemed to interact at a distance, without the mediation of an intermediate medium - ether, field or space itself. However, such options for electrodynamics were rejected, and precisely because scientists could not come to terms with interactions instantly transmitted without any material intermediary. So the theory of short-range action was adopted - the gradual transfer of influence by the space itself, by the field - the approach developed by Faraday and Maxwell. But Ritz showed that the mediator is actually possible in the previous versions of electrodynamics, where the interaction is also not transmitted instantaneously. But this mediator is not at all a ghostly, weightless, immaterial field or space between charges, but just the very particles that, according to Ritz's theory, are emitted by charges at the speed of light.

This is the essence and main difference of Ritz's electrodynamics. To build an BTR with all the ensuing far-reaching conclusions, just one assumption is enough. Here is his condensed formulation from the work of Ritz [8]:

Any elementary charge continuously emits in all directions the smallest homogeneous particles, scattering from the charge at the speed of light and subsequently interacting neither with each other, nor with the charge that emitted them, while freely (without reducing the speed and flux density) passing through any bodies.

Ritz's electrodynamics, which explains all the known laws of electrodynamics, follows from this simple, crystal clear and in no way contradicting hypothesis, one has only to apply the laws of classical mechanics to it. Ritz used classical mechanics as the basis of his electrodynamics. No wonder he said that his emission electrodynamics is a kind of mechanical theory of electricity. It is this mechanical approach that was established in science in the 19th century. and likening the whole world to a mechanical watch, it seems the most natural and reasonable.

All the mistakes of modern theoretical physics stem from the inability to understand this mechanism, from the desire to replace the real device with a set of formulas, as Aristotle and Ptolemy did in the geocentric system of the world. After all, the theorist is guided by considerations of algebraic beauty and simplicity. But nature is alien to the algebraic, mathematical beauty, to which Aristotle and Einstein so strived, who led science to a dead end. Nature is deeply indifferent to how difficult it is for us to calculate its behavior. Like an ingenious engineer, Nature is guided by the principle of physical beauty and grace: strives to standardize and reduce the number of parts and principles of the mechanism. This is what the **Occam's principle** - **"Do not multiply entities beyond what is necessary"** - **to minimize the number of objects and hypotheses, preferring simpler, natural explanations to complex and mystical ones.** Only a clear, simple, beautiful mechanism of the universe is reliable, stable and durable.

And therefore, at all times, it was engineers and mechanics such as Archimedes, Democritus, Da Vinci, Galileo, Newton, Ritz, Tsiolkovsky who understood the structure of nature better than others and looked far into the future. Scientists from among the quantorelativists, rejecting classical mechanics as the basis of nature, deny, in fact, the materiality of the world, leading humanity into the darkness of medieval mysticism and as if wishing to ground it forever, to protect it from the forbidden knowledge of the cosmos, as opponents of Copernicus' teachings tried to do.

§ 1.4. The nature of electrical repulsion and Coulomb's law

Electric charges are constantly emitted in all directions by particles scattering at a constant speed along straight lines. The impact on the charge depends only on the location and speed of these particles near it ... We can say that this will be a kind of mechanical theory of electricity.

Walter Ritz, "Critical Analysis of General Electrodynamics" [8]

Before moving on to Ritz's electrodynamics - the theory of the interaction of mobile charges and currents, let us first consider the interaction of motionless ones, in other words, electrostatics. As the Coulomb's law known to everyone from school says, two like-named charged point bodies repel with a force F proportional to the magnitude of their charges q_1, q_2 and inversely proportional to the square of the distance R between them $F \sim q_1 q_2 / R^2$. How does the BTR explain Coulomb's law?

According to Ritz, the repulsive force consists of the elementary forces of interaction between the elementary charges of two bodies. Indeed, it is known that the charge of any body consists of the standard charges of electrons and protons of the nuclei that form a given body, therefore the charge changes discretely, in jumps. So, let's consider, for a start, the interaction of two elementary charges (electrons). According to Ritz's hypothesis, an electron emits in all directions homogeneous particles, scattering at the speed of light c and having a standard mass m , which means that they carry a standard momentum $p = mc$. Getting into another electron, these particles transfer their momentum to it, which causes the Coulomb repulsion of the charges. Just as bullets fired from a

Kalashnikov assault rifle with a speed v hit a tin can and make it fly off in the direction of impact, transferring their momentum Mv , so particles, hitting an electron, cause repulsion, imparting their momentum $p = mc$ to the electron. The huge speed of particles, even with their negligible mass m , makes this momentum $p = mc$ tangible. This exchange of charges, exchange of "shots" and creates repulsion of charges with force F , acting along the "line of fire".

If an electron gets n particles per second, it is imparted every second an impulse nmc - this is the Coulomb force F of repulsion of electrons. After all, force, by definition, is the impulse imparted to the body per unit of time. Thus, according to Ritz, the Coulomb repulsive force has a purely mechanical, kinetic nature. No wonder Ritz argued that the BTR is, in fact, a mechanical theory of electricity, according to which the speed of the ejection of particles by an electron purely mechanically sets the light speed of propagation of electrical interaction, and hence the speed of light, electromagnetic waves.

Ritz showed that each elementary charge (electron) emits the same number of particles N every second. Like a machine gun firing bullets, an electron throws out microparticles in all directions with the speed of light c and frequency N . However, only a small fraction of them n reach another electron located at a distance R . This fraction is easy to find, considering the electron to be a ball of known radius r . Since the electron emits N particles every second, the same number of particles must cross the surface $4\pi R^2$ of the sphere surrounding the electron per second. Since the particles scatter in all directions uniformly, another electron located at a distance R and having a cross section of πr^2 receives a fraction of particles that is $\pi r^2 / 4\pi R^2$ from their total flux N . In other words, $n = N\pi r^2 / 4\pi R^2 = Nr^2 / 4R^2$. Thus, the Coulomb repulsive force of two electrons located at a distance R can be found in the Ritz model as $F = nmc = Nr^2 mc / 4R^2$ (Fig. 6)

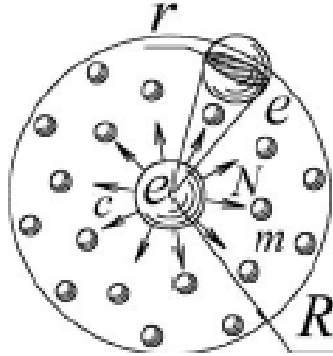


Fig. 6. The particles emitted by electrons produce by their impacts an electric repulsion with a Coulomb force $F \sim 1/R^2$.

Thus, we obtained a mechanical expression for Coulomb's law: the repulsive force acting between two elementary charges is inversely proportional to the square of the distance R between them. If the charges are not elementary, but contain the first - q_1 electrons, the second - q_2 electrons, then the resulting interaction force will be the sum of the elementary forces of interaction of individual charges in all possible combinations. Each of the q_1 electrons will interact with each of the q_2 electrons. That is, in total there will be $q_1 q_2$ of the same elementary repulsive forces $Nr^2 mc / 4R^2$, giving the total force $F =$

$q_1 q_2 N r^2 m c / 4 R^2 = A q_1 q_2 / R^2$, where $A = N r^2 m c / 4$ is some constant, and q_1 and q_2 are the charges of bodies, measured in units of charge electron. That is, we received a complete formulation of the Coulomb law: $F = q_1 q_2 e^2 / 4 \pi \epsilon_0 R^2$, where e is the electron charge, ϵ_0 is the electric constant. Hence, we find $A = N r^2 m c / 4 = e^2 / 4 \pi \epsilon_0$, or $\pi N r^2 m = e^2 / c \epsilon_0$. This gives a connection between the fundamental constants e , c , ϵ_0 . We also find the number of particles emitted by the electron per unit time $N = e^2 / \pi r^2 m c \epsilon_0$. In addition, if we assume that the electron radius is equal to the classical one $r = e^2 / 4 \pi \epsilon_0 M c^2$, where M is the electron mass, then we get an interesting relation $r / c = (4 M / m) / N$, the meaning of which will be revealed in the next section.

So, Ritz not only revealed the mechanism of electricity, electrical interaction, but also gave it a visual mechanical interpretation: the repulsion of one charge by another arises in the same way as the repulsion of a target by a hail of bullets from a machine gun. The BTR explains the transport of impact from charge to charge and this effect itself. Each bullet fired from a machine gun carries a standard mc impulse, which, when it hits, is transmitted to the target. The repulsion force consists of individual impacts of particle-bullets, drumming on charges, like real bullets on a target or hail, snow pellets and raindrops - on an umbrella. This is what the true theory of electricity should be - a visual one that reveals the secret springs of electrical action. And current electrodynamics only states the presence of an electric effect, not explaining its essence, but referring to an invented electric field with its very vague nature. Such an explanation of one incomprehensible phenomenon to another dubious and mystical, of course, cannot be considered scientific. Maxwell's electrodynamics resembles the mythical explanations of electricity and thunderstorms by the ancient Greeks, who believed that lightning was thrown by the thunderer Zeus - a supernatural being and even more mysterious, incomprehensible than the lightning itself. But in the ancient world there were also materialist scientists - atomists Democritus and Lucretius, who taught that a thunderstorm is a natural phenomenon, and connected lightning with electricity and the rapid movement of the smallest particles, anticipating the discovery of electrons [77] (§ 4.17). Materialistic science must reduce all phenomena to natural, known or intuitive. This is exactly what Ritz's theory did for electricity.

The current state of electrodynamics most of all resembles the state of thermodynamics and chemistry before the creation of the molecular kinetic theory. Then in thermodynamics, chemistry, all phenomena were also explained by means of abstract substances, such as caloric, phlogiston, and various alchemical highly scientific terms (why not ether or the electromagnetic field of modern electrodynamics ?!). Only with the advent of the molecular-kinetic theory did it become clear that heat is not some kind of abstract substance, but just a random, chaotic movement of atoms and molecules; the gas pressure on the piston is just countless impacts of molecules against the wall; transformations of substances are not at all fabulous alchemical transformations, but mechanical connection and separation of atoms in molecules. Therefore, the molecular kinetic theory is often called the mechanical theory of heat. Likewise, Ritz called his electrodynamics the mechanical theory of electricity. Any physical theory must

reduce phenomena to mechanical motion and interaction of bodies, particles, must be atomistic. For there is mysticism, and there is atomism. Where particles disappear, atomistics disappears - elements of mysticism, supernatural, non-materialistic, irrational and transcendental, inevitably appear, even if all this is clothed in scientific mathematical formulations (§ 5.14)

Ritz's theory was precisely atomistic. If the molecular-kinetic theory showed that the force of gas pressure on the piston is made up of individual impacts of gas molecules against the wall, then Ritz's theory said that the force of electric repulsion of charges is actually made up of individual hits of particles emitted by charges. It is not surprising, therefore, that the first atomist Democritus adhered to the same views on the nature of light, electromagnetism, as Ritz did. It is not for nothing that J. Thomson, who discovered the atom of electricity (electron) and proposed the first structural model of an atom with electrons (§ 3.1), supported the ballistic theory [6, 93]. If thermodynamics no longer interpreted heat as an abstract substance of caloric, but as the movement of atoms and molecules, then Ritz also considered the electric field not as a state of space or abstract ether (as in Maxwell's theory), but only as a field of velocities and concentrations of moving particles emitted by charges and filling all the surrounding space. In Ritz's theory, field interaction is described as a bullet: the field, that is, the degree of impact on a single target charge, is determined at a given point by the density of fire - the flow of particle-bullets ejected by machine-gun charges (Fig. 6). That is, the field is given by the dislocation of the charges-guns, this field artillery, and is expressed in terms of the number of particles-bullets per unit area of the front per unit of time.

It remains to understand what kind of particles are these - these atoms, quanta of electric impact, emitted and absorbed by charges? Many of those who studied Ritz's theory mistakenly considered them to be photons. At the same time, they forgot that photons are incompatible with BTR. In addition, photons, as their name implies, are quanta of light. Whereas Ritz particles are quanta of electrical action that exist even in the absence of light sources and do not necessarily create light. Since the word quantum has discredited itself, it is better to call these particles, nevertheless, not quanta, but atoms of electric impact. After all, "atom" means "indivisible" - it is precisely an elementary, indivisible unit of matter, influence, charge (for example, an electron is called an "atom of electricity"). The Ritz particles are, in all likelihood, the smallest among the known elementary particles, having a standard mass much less than the mass of an electron. It is still difficult to talk about their other properties. These particles have neither charge nor magnetic moment. In relation to them, it is generally impossible to talk about these characteristics, since it is these particles that create electrical and magnetic effects. In the same way, in thermodynamics, one cannot talk about the temperature and pressure of one atom - these are characteristics of a large ensemble of atoms, moreover, these are characteristics of the processes of motion of particles, and not of the particles themselves. Likewise, an electric charge, an electric impact is, in reality, a phenomenon caused by the movement of a huge collection of particles.

In order not to repeat from time to time "particles emitted by charges", for definiteness, let us give these elementary particles a name, as is customary in physics. Unfortunately, Ritz himself, due to sudden death, did not have time to give them a name. Therefore, in order to honor his memory, we will call these atoms, quanta of electric impact rheons (from the Greek rheos - "flow", "flow"), in view of their outflow from charged bodies and the fact that Ritz called his concept the theory of outflow, emission [92, 93]. And we will denote rheons in the drawings by the Latin "R", which again reminds of the discoverer of these particles - Walter Ritz. From the ancient Greek "rheos" and the ancient Indian "rayas" (stream, run), the Russian words "flutter" (stream, fly), "rhea" (a bar for a sail that catches streams of wind), "swarm" (a collection of flying bodies), "swarm" (a bunch of flying bodies), English "rain" (rain). Therefore, the well-known comparison of light-carrying particles (rheons) with raindrops flying in space and drumming on the umbrella-charge like a swarm of pellets, hail is very successful [40]. If we are looking for electrical analogies, then it is worth noting that the name of the rheostat device (variable resistance to current) also comes from the word "rheos", and the Latin name for a ship's yacht gave us the concept of an antenna that emits and catches streams of rheons in the form of radio waves (§ 1.11). And the English word "ray" (ray, flash, radiation), apparently, historically arose due to the representation of all radiation as streams of particles from sources. It is no coincidence that Democritus and Lucretius spoke about the emission of luminiferous particles by bodies that float in space (Part 1, epigraph). It also says that these particles must have scanty sizes, and therefore it is easy to penetrate through any obstacles, rushing at great speeds. And the most amazing thing is that Democritus and Lucretius explained the electric, magnetic effects and light precisely by the impacts of these particles, having surprisingly guessed the common nature of these phenomena [77].

By the way, as it turned out, back in 1991 V.S. Okolotin in his article ["Corpuscular concept of field interactions"](#), supporting and developing emission electrodynamics, also proposed to name the Ritz particles in honor of their author "ritzons" (which is consonant with "rheons"), meaning by them elementary particles that form an electron and are much smaller in size ... Likewise, Ritz believed that rheons have an insignificant (point) size, even in comparison with an electron. Therefore, they can be considered as material points with zero dimensions. Thanks to this, the rheons move in space freely, without collisions and interactions with each other: their flows intersect and pass one through the other without deflection and scattering of particles - the probability of collision of rheons is so negligible due to the small size. This means that if two charges emitting streams of rheons act on the third, then due to the independence of these streams, the joint action of the charges is equal to the sum of the actions of the charges taken separately. This is how Ritz's theory explains the principle of superposition - the principle of superposition of fields. At the same time, due to its small size, the probability of collision of rheons with particles of matter is extremely small. Therefore, as Ritz noted, even after passing through sufficiently thick layers of matter, the rheon flux weakens very insignificantly. Rheons must have tremendous penetrating power and have gigantic path lengths in the

substance, piercing it like bullets through. That is, the effective cross section for collisions with electrons is also very small, possibly much less than the square of the classical radius of an electron. It is no coincidence that Ritz called the electron a "charged point" (which can reflect not only the small size of the electron, but also its ability to emit rheons: "point", "current", "source" - these are all related words). The huge path lengths are associated with the fact that rheons practically do not interact with each other and with matter, which is natural, given that they themselves perform the functions of carriers of interactions (§ 3.16).

Even Democritus and Lucretius considered natural free flight through matter of particles-rheons of light, electric and magnetic outflows, knowing that bodies are not solid, but are formed from atoms, between which there is a void that makes up the bulk of the substance. After millennia, science recognized the atoms of Democritus, which for centuries had been rejected because of their invisibility and smallness. Atoms manifested themselves only indirectly, and Lucretius cited a number of observations confirming their reality. And now scientists do not want to recognize rheons - luminiferous particles, also predicted by Democritus and having even smaller sizes. But again, these particles indirectly betray their presence. The very fact of the propagation of light, electromagnetic influences in a vacuum, with a finite speed, requires the presence of particles that carry an impulse from charge to charge. The effect of electron jitter from the impact of rheons is also known (responsible for the uncertainty of the position and energy of the electron, § 4.13), similar to the Brownian motion of particles from the impact of atoms. But it was the analysis of Brownian motion that became the decisive proof of the reality of atoms. It is no coincidence that the idea of Democritus and Lucretius that electromagnetic forces are caused by the pressure of a stream of microparticles exuded by an electron (charged amber) and magnets was supported and developed by such prominent atomists, researchers of electromagnetism as W. Gilbert, P. Gassendi, R. Boyle, and Newton [78, 106].

So, just as a fireworks charge explodes with a sparkling ball or a sparkler fires in sheaves of sparks, so electrons explode in cascades of rheons, rushing between two fires. This flow of sparks, the rheon wind, generates pressure, the Coulomb effect of one charge on another, like an ordinary wind (a stream of atoms) presses on the wall (Fig. 7). It is interesting that already in the works of B. Franklin, who discovered the nature of electricity and predicted electrons, this idea of flows of certain atmospheres from all-pervading particles, like the wind, emanating from charges and pressing on other charges, is slipping. So, the first electric motor he created (Franklin's charged wheel, § 3.19) rotates according to the same reactive principle as Heron's fire turbine or fireworks wheel of fire, and Franklin called electricity nothing but "electric fire", following the example of the ancients (§ 4.17)

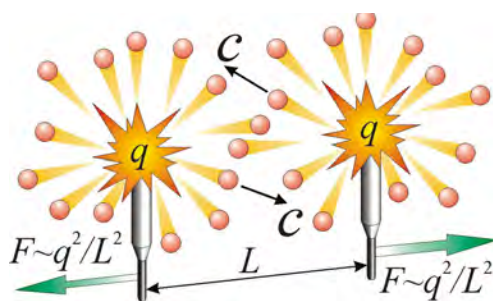


Fig. 7. According to Ritz, charges are similar to sparklers and interact by means of particles emitted by electrons at the speed of light.

As if sensing the fire, explosive, ballistic nature of the electric charge, it was called charge in both Russian and English (charge) languages. Indeed, according to Ritz, an electric charge is like a bomb, a charge of shot, shrapnel, scattering in the explosion of hundreds of small fragments at great speed. Likewise, **an electric charge throws out in all directions rapid rheon fragments, which, like a hail of pellets from a gun or bullets from a Kalashnikov assault rifle, drum at the target - at other charges.** Amazingly, even the device for measuring the charge was called a ballistic galvanometer, where a ballistic constant is introduced to calibrate the charge. This device is described in detail in the most popular electricity course by S. Kalashnikov [60] (the parallel with the name of the inventor AK is another example of shooting coincidences, § 5.16).

It is possible that the ballistic, shooting model of light and electrical interaction was inspired by the legend of Wilhelm Tell, a well-aimed arrow from a bow, to Ritz himself. According to legend, this Swiss mountaineer and fighter for the freedom of his homeland had, on the orders of the cruel governor of Gesler, to shoot down an apple from the head of his little son, Walter Tell, with an arrow from a bow (or crossbow). This legend, on which the children of Switzerland were brought up, may have prompted Walter Ritz to compare a crossbow and an arrow shot by it, piercing and throwing an apple, with an electron charge that repels another electron by means of the rheon shells fired and absorbed by them. Probably, the same legend inspired the young Ritz, this son of Switzerland and a descendant of the freedom-loving highlanders, to courageously fight against falsehood in science. The reader will encounter many more such coincidences, at first glance accidental. They should not be surprised, because everything in our world is interconnected: people and things do not get names by chance, but according to certain laws. Already from the analysis of words and language, you can learn a lot about the essential structure of the world (§ 5.16). So, the above **ballistic model, which likens charges to firing points, is the essence, the basis of Ritz's Ballistic Theory.**

§ 1.5. Emission of rheons and decay-evaporation of an electron

The electron is as inexhaustible as the atom, nature is infinite.

V.I. Lenin, "Materialism and Empirio-Criticism", 1908

Ritz proposed his hypothesis about the emission of rheons by elementary charges only as a way to give our imagination a visual image, an idea of the nature of electricity. Indeed, in his time such a hypothesis sounded very bold and

unusual, especially since no one observed rheons and their emission by charges was only an assumption, albeit quite natural (in contrast to an abstract electric field with its incomprehensible nature and properties). Therefore, we will consider the Ritz hypothesis about rheons from the standpoint of modern experimental data and the theory of the structure of matter.

First, the question arises: why charges always emit rheons with the same speed c , which sets the constant speed of light? The speed of emission of rheons is unchanged, probably for the same reason as the speed of the shells fired by the cannon is constant (without this, it would be impossible to aim at a target, for which three shots are enough due to the amendments). It's all about the standard mass of the projectile and the charge of gunpowder, which, when burned, gives the projectile standard energy and speed. But rheons also have a standard mass, since they are elementary, and, therefore, ideally similar particles. They, in turn, are "fired", imparting constant energy and speed c , other elementary particles - charged (in a different sense than a gun) electrons. The speed and energy of alpha particles emitted by nuclei of the same type are also the same.

Thus, from the standpoint of nuclear physics, the emission of rheon by an electron is a process of decay of an electron, and, according to the laws of mechanics (the law of conservation of momentum and energy), rheons should be emitted with the same speed equal to the speed of light c . It is this speed of emission of rheons from an electron that determines the speed of propagation of electromagnetic influences and, in particular, light. After all, it is the electrons vibrating in the atoms and antennas of the transmitters that create the electromagnetic waves. Note that one of the problems of Newton's theory of light outflow was precisely the explanation of the constancy of the speed of light, that is, the speed of emission of light corpuscles by luminous bodies. After all, the light corpuscles, causing different colors, had, according to Newton, different masses, and therefore the emission rates would be different. There are no such problems in Ritz's theory, where the emitted particles have a standard mass and arise in the process of the same type of decay, regardless of what frequency and energy of light they carry.

Interestingly, even Ritz gave a similar nuclear analogy, comparing charges that emit rheons with grains of radium that emit electrons, although in Ritz's time, scientists had just begun to get closer to unraveling the mysteries of nuclear decays. We are used to talking about the fission of nuclei, elementary particles, and at the time of Ritz it was necessary to have tremendous courage to draw such a parallel, comparing the radium atoms emitting beta rays with electricity atoms - electrons, presumably emitting rheons. It is strange that scientists engaged in nuclear physics, stuffed with ballistic terms (target, cannon, nucleus, charge, bombing, shooting, recoil, etc.), will not remember about the BTR. On the contrary, here is the zone of undivided domination of the SRT.

The formation of rheons in the process of decay also explains the nature of their energy and tremendous speed, equal to the speed of light. This energy is released precisely during the decay of an electron and is imparted to the rheon. An example here is again the atoms of radium, ejecting electrons at a speed comparable to the speed of light. Another example is given by heavy nuclei that successively emit

several alpha particles of enormous energy, and their energy and speed, again, are standard for a given nucleus and are determined only by the magnitude of its mass (Fig. 8). The same is true for the electron, but since the rheons have an insignificant mass, the mass of the electron after decay changes little, and all the rheons are emitted at the same rate. Thus, like bullets fired from a gun or arrows - from a crossbow and ballista, rheons are ejected by an electron with the same speed, given only by the mass of the projectile and the parameters of the propellant (gunpowder charge, bowstring tension, decay energy).

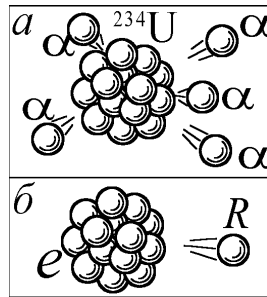


Fig. 8. a) The nucleus of uranium-234, which becomes, after five successive α -decays, the nucleus of lead-214; b) the emission of rheons by an electron as a consequence of a similar decay.

Thus, Ritz's working hypothesis is in full agreement with the modern data of nuclear physics, at least, it does not contradict them. Note that such a substantiation of the foundations from the standpoint of logic and experiment was not carried out either in Maxwell's theory, or in the theory of relativity, or in quantum theory. There they simply postulated some already initially absurd propositions, on which the whole theory was later built. It didn't matter that these theories yielded conclusions that were consistent with most experiments, as long as the foundations were shaky. No matter how reliable a building looks, it won't last long if it has a flimsy foundation. And the theory of relativity, Maxwellian electrodynamics and quantum theory are examples of theories with an initially rotten foundation.

The constructions of theories have much in common with the method of mathematical induction, where a certain initial position (basis) is taken as a basis and more general and less obvious laws are consistently and rigorously derived from it. But if the basis is wrong, untested and not intuitively obvious, then all these conclusions, as any mathematician will say, are worthless. And even if the conclusions turned out to be right by accident, this does not at all prove the validity of the foundations of the concept under discussion. The foundations of Maxwellian electrodynamics, the theory of relativity and quantum theory are still not supported experimentally, theoretically, or from the standpoint of common sense (as, say, the obvious axioms of Euclidean geometry). Such defective structures are said to be "a colossus with feet of clay."

But back to the more adequate and natural Ritz theory. The constant rate of emission of rheons is not the only thing that the BTR has to explain. A more serious problem arises. The BTR claims that rheons are energy carriers of the

electric field. In addition, this, apparently, is also the building material from which electrons are composed. But if this is so, and the electron emits rheons in the process of decay, then it must lose mass, like the decaying nuclei of the same uranium. Meanwhile, as experience shows, an electron is a stable particle with a constant mass. There was, however, an assumption made by Dirac that the mass of an electron can slowly decrease, and experiments sometimes seemed to even confirm this. Perhaps the mass was lost precisely due to the emission of rheons, which carry away each insignificant mass in comparison with the electron?

Let's try to calculate how quickly an electron should lose its mass. The relation found in the previous section (§ 1.4) will help us with this. Namely: $r/c = (4M/m)/N$. Recall here: r is the radius of an electron, c is the speed of light, M is the mass of an electron, m is the mass of the rheon it emitted, N is the number of rheons emitted by the electron per unit time. The meaning of this expression is easy to understand. On the left is the time it takes for light to travel a distance equal to the radius of an electron: $r/c = (2.8 \cdot 10^{-15})/(3 \cdot 10^8) \approx 10^{-23}$ seconds. And on the right - the fourfold number of rheons contained in the electron, divided by the frequency of their emission. In fact, in order of magnitude, this is the time it takes for an electron to lose all its mass, to use up its entire charge, the supply of rheons, like a machine gun that has fired a clip. It turns out that the electron completely decays in a time of the order of 10^{-23} seconds. Meanwhile, the electrons not only do not disappear in such a short time, but they do not lose weight over much longer times.

Why does the constant leakage of rheons from the electron not cause their gradual loss of mass and energy? How can rheons flow from an electron in an inexhaustible stream?

Apparently, the fact is that the electron not only emits, but also absorbs rheons emitted by other charges. There is a constant exchange of particles. Assuming this, Ritz was the first to express the idea of exchange interaction, which was accepted by late physics, say, in quantum electrodynamics (QED). If we apply the figurative language of the ancient atomists, who called microparticles the seeds of things, grains of matter (for their standard small size, multiplicity and the function of the fundamental principle), then the electron scattering rheons is like a plant, say, a dandelion scattering spores in all directions, seeds that give the beginning of new plants, just as the rheons give the continuation of life to other electrons.

In the process of exchanging rheons, new rheons come from all sides to replace the ones that have left. Countless electrons, scattered over the endless expanses of the Universe, with their diameters will sooner or later cover the sphere surrounding the electron of a certain, albeit very large, radius R (Fig. 6). Then the number of electrons on the sphere is $P = 4\pi R^2/\pi r^2$. From each electron of the sphere, $Nr^2/4R^2$ rheons come to the central electron every second (§ 1.4). This means that in total from the entire sphere, $PNr^2/4R^2 = N$ rheons will come to the electron. That is, the electron absorbs in a unit of time exactly as many rheons as it loses. Everything is as in the well-known Olbers paradox (§ 2.5, § 2.6), according to which the endless Universe with stars, if there were no absorption,

would become like a spherical mirror surrounding the Sun (Fig. 6), shining at every point just as brightly, returning all the emitted in a stream of light [81].

Something like this **all the rheons emitted by the electron will return to it, as if reflected, re-emitted by a giant mirror from a swarm of universal electrons. In addition, the rheons converge to the electron on average with the same speed c , which they had upon departure. So, despite the constant leakage of rheons, the electron remains unchanged in both mass and energy.** An electron can be likened to a floating drop of liquid in saturated vapor (Fig. 9). The drop constantly evaporates, ejecting billions of liquid molecules every second and losing mass and energy with them. But in parallel there is a process of moisture condensation: new vapor molecules settle on the drop, returning mass and energy to it: the drop is in dynamic equilibrium with the vapor. So the electron simultaneously evaporates and condenses the rheons. It is possible that the standard of electron mass is also set by the fact that it decays, loses rheons, only reaching a critical mass, just as heavy nuclei decay. Therefore, the electron would retain the standard critical size r_0 , which it could not exceed.

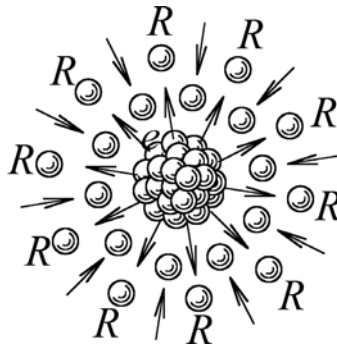


Fig. 9. Electron e , eternally exuding rheons R , does not lose weight, but is like a drop of liquid evaporating atoms, suspended in a saturated vapor.

Surprisingly, N. Tesla (§ 5.3) and two millennia before him by Democritus with Lucretius (epigraph § 3.11) put forward such an idea about the constant release of lumps of matter by an electron and dynamically maintaining its equilibrium size equal to the critical one. Likewise, Epicurus, discussing the luminiferous particles emitted by bodies, wrote in a letter to Herodotus: "From the surfaces of bodies there is a continuous outflow, imperceptible only because the diminution is compensated by replenishment" [77]. It is no coincidence that these ancient atomists proclaimed almost word for word the main idea of Ritz about the incessant emission of luminiferous particles by all bodies in all directions (Part 1, epigraph). The great Russian scientist Mendeleev came to the same idea, but on the basis of chemical considerations, in 1902. He showed that matter carrying electromagnetic and gravitational influences is not a continuous motionless medium, such as ether, but streams of standard particles. According to Mendeleev, given in the work "[An Attempt of a Chemical Understanding of the World Ether](#)", these particles, like rheons, have a speed of the order of the speed of light and a mass billions of times less than the mass of a hydrogen atom, as well as a huge penetrating ability due to their small size and high inertness (the

absence of interactions between them and other atoms). Mendeleev, like Ritz, found the justification for this in the phenomena of radioactivity, consisting in the ejection of certain emanations by atoms at a tremendous speed, emissions in the form of microparticles emitted, evaporated by some bodies and absorbed by others.

So, an electron raining with rheons can be compared to a Bengal fire, sending out sheaves of sparks (Fig. 7), but eternal fire, inexhaustible due to the constant restoration of its charge. Like the legendary firebird Phoenix, the electron sprinkling with sparks of rheons does not burn, but is reborn from sparks and ashes, resurrects (it is not for nothing that our ancestors, simulating electricity and light with the help of fire, armchair, produced the verb "resurrect" from the word "kres", that is, "fire"). The electron really turned out to be, in a sense, inexhaustible, as V.I. Lenin in his work "Materialism and Empirio-Criticism", created in the same significant 1908th year as Ritz's ballistic theory. The electron turned out to be a truly inexhaustible fabulous self-shaking wallet, from which no matter how many coins you take, it is always full. If we compare an electron with a machine gun (Fig. 3), then with one that never fires its ammunition, with a machine gun with an endless machine-gun belt closed in a ring, constantly reloading due to the inflowing stream of bullets (reuse of cartridges and bullets was sometimes practiced by on the battlefields for the lack of shells and cartridges). So the electron is not just a firing point, but a Long-Term Firing Point (DOT) with a constantly replenished kit, an ammunition depot.

In general terms, we substantiated the fundamental hypothesis of Ritz's theory and found that it does not contradict either general physical concepts, or experiment, or common sense. Moreover, the theory in many respects orders and systematizes our ideas about electricity, gives them a visual interpretation, which is in full agreement with the progressive atomistic program for the development of physics.

§ 1.6. *Electric attraction and arheons*

We could try to explain the phenomena [of electrodynamics] by the mechanical influences exerted by these particles, but the difficulties that we will come to in doing so seem insurmountable.

Walter Ritz, "Critical Analysis of General Electrodynamics" [8]

So, Ritz was the first to develop a simple mechanical model to explain the interaction of charges. And, although he gave his hypothesis with all reservations, like Copernicus, calling his model only a convenient method of description, even being sure of its truth, official science and fellow scientists still rejected Ritz's concept, just as the official church and scientists once did -theologians rejected the teachings of Copernicus. It is noteworthy that physicists, who initially rejected Ritz's theory, eventually returned to his model of the exchange interaction of charges. Modern quantum electrodynamics (QED), developed by R. Feynman, in fact, repeats Ritz's idea, albeit in a perverted form. According to QED, the interaction of charges is also carried out through the particles emitted by them, called virtual photons. Each charge emits virtual photons, which, when absorbed by other charges, transfer their momentum to them, which creates the Coulomb

interaction. The constant exchange of virtual photons between charges gives rise to the exchange Coulomb interaction.

As you can see, this hypothesis completely repeats Ritz's idea, and even the very name “virtual photons” suggests that the idea was gleaned from him, because, not being quite sure of the reality of the particles he introduced, Ritz called them “fictitious” in his articles (synonym the word “virtual”) [8]. The fact that Feynman borrowed the exchange model of interaction from Ritz is also confirmed by the fact that Einstein, who worked with Feynman at Princeton University, in 1941 acquainted him, and later J. Wheeler with Ritz's works on electrodynamics [6, 146]. Einstein himself was well acquainted with the BTR, since he studied with Ritz and even argued with him in print on this topic. Soon after 1941, Feynman's papers on QED and the exchange model of charge interaction began to appear, however, without reference to Ritz's Ballistic Theory, where this model was first proposed. The plagiarism of Einstein and Feynman is also confirmed by the fact that QED is based on the idea of leading and lagging potentials [150], to which Walter Ritz paid so much attention in his work [8]. The same Ritz exchange model has been successfully applied to explain other types of interactions, say, nuclear, again without reference to Ritz. Ritz's idea was simply stolen, without a word mentioning him and his ballistic theory, which should have been accepted along with this model.

This kind of injustice in relation to Ritz's ideas has been done more than once. So, Ritz explained in 1908 with the help of ballistic theory the secular displacement of the perihelion of Mercury, and Einstein 8 years later used his explanation, fitting it to his general theory of relativity (§ 2.3). Another example: Ritz explained the emission spectrum of hydrogen on the basis of the magnetic model of the atom he created and gave its general formula. Bohr used his results to construct his model of the atom, without mentioning that the correct formula for the spectra was first given by the classical model of the Ritz atom (§ 3.1). Ritz also predicted the existence of an elementary magnetic moment for an electron [101, p. 480]. But again, speaking now about the Bohr magneton, no one mentions this (§ 3.19). Scientists shamelessly appropriated and perverted Ritz's achievements, taking advantage of his early death and the fact that he did not have time to create a scientific school that could stand up for his honor. Only now this inconvenient truth began to be revealed.

However, there is a significant flaw in quantum electrodynamics and its version of the exchange interaction. It easily explains how the repulsion of like charges, exchanging virtual photons, arises, but is not able to interpret the attraction of unlike charges. First, the momentum of a photon is always directed away from the charge that emitted it, and, therefore, the action is repulsive. Secondly, two virtual photons emitted by a positive and negative charge must be completely indistinguishable (photons differ only in energy), and therefore the test charge would react in the same way to both positive and negative charges, which, of course, is impossible.

There are no such problems in Ritz's theory. Although, at first glance, it seems that there, too, the attraction of opposite charges cannot be explained. After all, particles scattering from the charge should, in theory, produce only repulsion.

But, in reality, there is one non-standard solution. The peculiarity of this path is that it explains the attraction of charges by means of the hypothesis of the negative mass of the positron. Indeed, let us consider the attraction of an elementary negative charge - an electron e^- - and an elementary positive one - a positron e^+ (antielectron). Rheons emitted by an electron hitting a positron do not repel, but attract it: a positron is fundamentally different from an electron in the nature of its interaction with rheons. Likewise, the particles emitted by a positron are radically different from rheons, since they no longer repel, but attract an electron. Why, then, the rheons emitted by the electron, when absorbed by the positron, instead of repelling, attract it, forcing the positron to move towards the electron? It seems incredible. Indeed, according to Newton's second law, the acceleration is $\mathbf{a} = \mathbf{F}/M$, where $\mathbf{F}$ is the force of the impact of the rheons (impulse imparted by the rheons per unit time), and M is the mass of the particle undergoing impacts. (In this case, under the acceleration a and force F , we further mean their projections onto the axis directed from the first charge to the second.) It follows from the equation that the acceleration has the same sign as the force, and, therefore, is directed there. In the case of the electron, this is the case. However, a positron - an elementary carrier of a positive charge - is an antiparticle, a representative of the antiworld, in which everything is the other way around. And it is very likely that this "vice versa" applies not only to the charge, but also to the mass. In other words, the mass M of the positron is equal in magnitude and opposite in sign to the mass of the electron. That is why a positron, unlike an electron, is attracted, since its acceleration $a = F/M$ is directed in the direction opposite to the force F of the impacts of rheons: due to the negative mass M of the positron, the force and acceleration have opposite signs.

But negative mass is nonsense! And yet there is nothing strange about the negative mass of the positron. Since a positron is an antiparticle, and since antiparticles have all the characteristics opposite to those of particles, then the positron must have not only anticharge, but also anti-mass? Recall that, according to Newton's definition, mass is the amount of matter. This means that if we are dealing with antimatter (also called minus-matter), then its quantity is negative: antimatter has a minus mass. And the positron was predicted by Paul Dirac precisely as an electron with negative energy and mass [109], therefore the positron behaves in experiments as the complete opposite of an electron. Dirac was the first to admit the existence of antimatter, and this idea seemed natural to him even at school, when he answered "minus two fish" in a competitive problem on the number of fish caught by fishermen [144]. However, later the idea of minus-matter was abandoned by both physicists and Dirac himself, and the positron was considered a particle with a positive mass. But in Ritz's theory, the idea of anti-mass made sense. Another consideration in favor of the negative mass of the positron is that during the annihilation of an electron and a positron, their mass is believed to disappear without a trace. But, according to classical physics, the law of conservation of mass must be fulfilled. That is, the total mass of the electron and the positron was equal to zero both after and before the disappearance, from which the negative mass of the positron inevitably follows, which exactly compensates for the positive mass of the electron.

In reality, of course, all these issues - the process of annihilation, negative mass - are described much more complicatedly. In particular, it turns out that mass, like an electric charge, can be interpreted as a process, which was proposed by Ritz. In this case, the mysterious negative mass gets a classical, visual mechanical explanation. But for this it is necessary to consider the structure of the electron, the nature of time, and these questions go far beyond the scope of this chapter and will be discussed in more detail later (Part 3 and Part 5). Now, for convenience, it is quite sufficient for us to consider the positron mass negative. At least it doesn't contradict anything. Of course, this model is grossly mechanical. In the future, it can be clarified and even changed. But, as a first approximation, giving a visual mechanical interpretation, it is very convenient. Judging by some of Ritz's remarks from his "Critical Research on General Electrodynamics", he himself came to this mechanical model, but postponed its detailed consideration due to numerous problems (see epigraph). Two of them, - the interpretation of the interaction of unlike charges and the constancy of the electron mass, we have decided.

The positron, being in all the antipode of the electron, and the particles emits directly opposite rheons - it throws out antireons (or, in short, "arheons"), which have the same mass m as rheons, but again with the opposite sign. Accordingly, the force $F = Nr^2mc/4R^2$ (§ 1.4) created by their blows will also be negative - directed against the direction of their movement. So, under the influence of areons emitted by the positron, the electron will be pushed towards the positron: the magnitude of its acceleration $a = F/M$ will be, like a force, negative. At the same time, when a positron acts on a positron, the acceleration $a = F/M$ is positive: repulsion takes place, since both the force and the mass have a negative sign. In fact, the interaction of charges and their acceleration are determined by the ratio of the masses of the particles $a = F/M = (Nr^2c/4R^2) (m/M)$. If the particles are cobbled together from the same test, they represent charges of the same name, then m and M for them are of the same sign, which means that the acceleration a is positive, that is, repulsion takes place. If opposite charges interact, then m and M are of different signs, acceleration a is negative. And, therefore, the charges are attracted (Fig. 10).

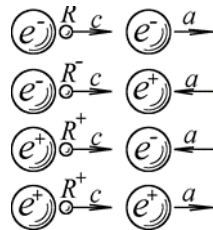


Fig. 10. The nature of the interaction of like and unlike charges by means of rheons R is determined by the acceleration a . Opposite charges "+" and "-" correspond to opposite signs of particle masses.

Well, since we are talking about the test from which electrons and positrons are stuck together, let's say a few words about the structure of these particles. Since electrons are constantly emitting myriads of rheons, then, apparently, it is from rheons that electrons are composed. Accordingly, positrons (anti-electrons),

with their minus mass, are formed by anti-rheons. The emission of these particles by charges, as already mentioned, occurs as a result of decay.

Of course, all this looks somewhat paradoxical: a positively charged positron, which is positive even by its name, has a negative mass. But negative mass is, as it was said, a convention. With the same success one could ascribe a negative mass to an electron, and a positron a positive mass. It is not the sign of the mass itself that is important, but the fact that the masses of the electron and positron have different signs, since the mass ratio (m/M) is important for the interaction. In the same way, the sign of the charge is completely conditional: nothing would change in nature and in physics if we ascribed a positive charge to an electron, and a negative charge to a positron, changing the signs of the charge for all other particles. The mass acquires approximately the same conventional meaning, but this will be discussed later (§ 3.20).

But the charge itself in the Ritz model acquires a specific physical meaning, since the interaction of charges is determined by the flux of rheons and arheons emitted by them. The charge Q is the total flow, the consumption of matter (rheons or arheons) emitted by a charged body per unit of time: $Q = -mN$. Accordingly, a particle emitting matter ($m > 0$) has a negative charge Q , say, an electron ejecting rheons. If the particle emits more antimatter (particles with $m < 0$), then its charge is positive, like a proton or positron. So, physically, the charge is the productivity of the field source, - the number of rheons emitted by it per unit time, these elementary units of matter. (If we recall the ballistic analogy with a Bengal fire or a shotgun charge, then their charge can also be defined as the productivity of the source, - the number of sparks or pellets thrown out at the moment, then two fires or a shotgun already contain a double charge, Fig. 7.) At the same time, it makes no sense to talk about the charge of the rheon itself. After all, it, in principle, cannot have a charge, since it does not emit rheons, does not create their flux. In the same way, it makes no sense to talk about the temperature or pressure not of a gas as a whole, but of one atom, because pressure and temperature are characterized by movement, by the impact of a collective of atoms.

The same visual interpretation is received by the electric field strength E , that is, the density, density of the field lines of this field: it characterizes the flux density of rheons, matter, and, therefore, the degree of influence of this flux on a unit charge (Fig. 11). This immediately implies the Ostrogradsky-Gauss theorem on the proportionality of the field flux E through a closed surface (the total number of lines of force emerging through it) to the charge Q in the volume bounded by this surface. Since Q is the total flow, the consumption of matter emitted by the charges in the volume (Fig. 6), then the same flow every second penetrates the surface around the charge Q , being equivalent to the flow of the field E through this surface, that is, the total number of outgoing lines of force. It turns out that the Ostrogradsky-Gauss theorem is simply the law of the continuity of the flow of rheons. It is no coincidence that it was Gauss, according to Ritz (§ 1.7), who came closer than others to the creation of fieldless electrodynamics based on the idea of emission and delay of electrical influences.

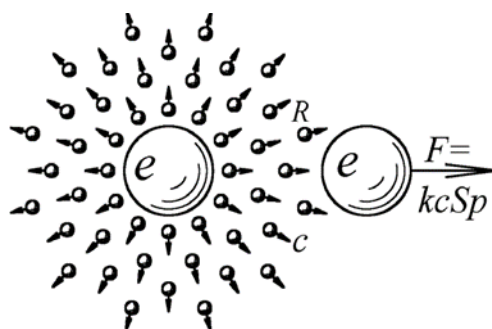


Fig. 11. One electron acts on the other through the rheons R that it fires, the intensity of which decreases along with their concentration k in proportion to the square of the distance.

So, the theory of outflow explains the meaning of the lines of force, Gauss's law, the negative charge of the electron and the positive charge of the positron. But what about the positive charge of a proton: where does it come from and how to explain the interaction of a proton with an electron? Apparently, the proton charge is due to the positron present in it. And precisely, a proton can decay into this very positron and a neutron that has no charge. It is no coincidence that many reputable nuclear physicists, including F. Soddy, considered the proton to be a composite particle formed from a neutron and a positron [139]. One must think that the charge of other elementary particles is associated only with the presence of electrons and positrons in them: only they are capable of emitting and absorbing rheons and anti-rheons. It is the electrons and positrons that enter other particles that give these particles an electric charge. This is the only way to explain the existence of a standard elementary charge - it is the charge of an electron and the same, but opposite in sign, charge of a positron. After all, a positron is a mirror copy of an electron - an electron reverse, having the same dimensions and mass. By themselves, particles of different masses and properties could not always have the same elementary charge. Therefore, in their composition there must inevitably be elementary charge units - electrons and positrons, which were introduced exactly in this way - as atoms of electricity. It was only later that other particles began to be endowed with an independent charge. The fact that the electric charge of a proton is associated with the presence of a positron in it also solves an important problem in the physics of elementary particles. Before it was not clear why there are much more particles, say electrons, than antiparticles - positrons. But, if an extra positron enters each proton, then the electrons and positrons in the atoms will be equally divided: the electrons of the atomic shell are exactly compensated by the positrons of the nucleus.

In general, we see that no matter how great the complexities of the mechanical model of the interaction of charges, noted by Ritz, may seem at first, they can be solved. At the time of Ritz, these difficulties seemed unavoidable, since it was not yet known about the decays of elementary particles, about antiparticles and antimatter, which, according to Dirac's initial hypothesis, had a minus mass. And yet, Ritz dared to come up with his revolutionary model of the exchange interaction of charges, through the particles they emit.

§ 1.7. The nature of magnetism

Poincaré showed that by imparting an impulse to radiant energy, everything can be put in its place. Obviously, such an assumption is quite natural if this energy is emitted [in the form of particles], and does not spread [in the medium] ... Based on these principles, it will be possible to derive electrodynamic forces depending on speed and acceleration, guided only by kinematic considerations. It is this problem, not solved by Maxwell's theory, that Gauss posed in his famous letter to W. Weber.

Walter Ritz, "Critical Analysis of General Electrodynamics" [8]

What are electrical and magnetic influences? Modern physics, unfortunately, cannot answer this question, justifying its helplessness with the Newtonian excuse: "It is enough that these forces exist and act in accordance with the stated laws" (in electrodynamics, these laws are Maxwell's equations). And only Ritz's ballistic theory, as shown above, for the first time in the history of science, clearly explained how charges interact. Ritz did not just describe the electrical interaction, but found its deep reasons, the beginning: he revealed the mechanism of interaction. But how did he explain the magnetic interaction? To understand this, consider again the interaction of two elementary charges.

Let us recall how, according to Ritz, the interaction of two electrons proceeds. The first electron emits, shoots out in all directions at the speed of light from special microparticles - rheons. After a while, some of them reach the second electron and are absorbed by it, and each rheon transfers to the electron an elementary portion (quantum) of the impact - the standard momentum p . The total repulsive force of electrons is $F = np$, where n is the frequency at which the rheons hit the electron, and p is the momentum transmitted by each rheon. If the speed of the rheons is V and their mass is m , then $p = mV$.

The frequency of hits in the area S , perpendicular to the flow of particles, is found as $n = kVS$, where k is the concentration of particles in the flow, and V is the speed of their flow. Hence, $F = np = kV^2Sm$. For an electron in a flow of rheons (from a stationary electron), the particle velocity is $V = c$, and S is the cross-sectional area of the electron, whence $F = np = kcSp = kc^2Sm$. With distance from the electron, the concentration k of rheons fired by it decreases in proportion to the square of the distance (Fig. 11). From here, as found above, Coulomb's law follows: the force F of repulsion of electrons decreases, proportional to the square of the distance between them (§ 1.4).

This is how Ritz's theory explains the strength of the electrostatic interaction of charges. Well, magnetic forces arise, as you know, from the movement of electric charges. Physicists say that, depending on the movement of charges, part of their electric field is converted into a magnetic field and vice versa (therefore, they speak of an electromagnetic field, considering electricity and magnetism to be only its various manifestations). But how this transition occurs, why it is caused by the movement of charges, and what magnetism is in general, modern physics cannot explain. Ritz's theory gives a simple and clear answer to this.

It was shown above that two stationary charges interact with a force $F = kc^2Sm$. Ritz's theory predicts a change in this force when charges approach each other. If one charge moves, Coulomb's law turns out to be not entirely accurate, which is associated with the finite speed of light, rheons, which carry an electric effect.

Indeed, let the electron emitting rheons be at rest, while the other moves towards it with the speed v . In this case, the speed V , with which the rheons hit the electron, according to classical mechanics, will no longer be equal to c , but $V = c' = c + v$. Accordingly, the impulse transmitted by rheons to the electron and the frequency of their impacts, and, ultimately, the force of repulsion of one electron by another, will also increase. Due to the increase in the speed V of the counter flow of rheons from c to $c' = c + v$, we obtain $F = k (c + v)^2 Sm$. The force will increase in comparison with that which would be experienced by resting charges at the same distance. On the contrary, the divergence of charges will reduce this force. It is this small change in the strength of electrostatic interaction that we perceive as a magnetic effect. The reason for these changes is explained by the ballistic model: an armored car that fires at a stationary target increases its firepower when it travels quickly towards the target (Fig. 12). Indeed, when moving towards the target, the frequency of impacts and the speed of bullets increase, and hence the power of impacts on the target: bullets drum on the target more often and harder. The effect will be even more noticeable for a machine gun mounted on an aircraft, the speed of which is already comparable to the speed of bullets.

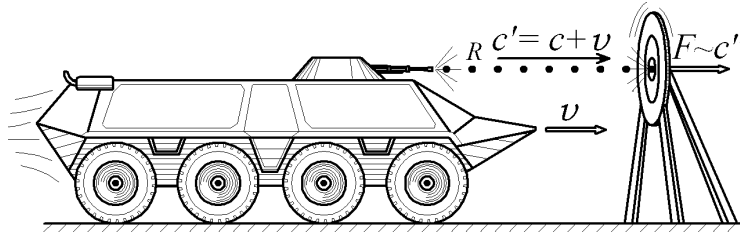


Fig. 12. Like the firepower of a moving armored car, the force F of the interaction of charges approaching at a speed of v is increased due to the increased speed $c' = c + v$ and the frequency of impacts of rheons R .

Next, consider a charged thread and near it, at point O , charge q . The repulsion force of the charge from the filament is $F = q\tau/2\pi\epsilon_0 r$, where τ is the linear charge density of the filament, r is the distance from the charge to the filament, and ϵ_0 is the electrical constant. The force of interaction of the charge with a small section of the filament M of length dl , which has a charge τdl , is given by the Coulomb law $F = q\tau dl/4\pi\epsilon_0 OM^2$. The component of this force perpendicular to the thread will be expressed through the angles ϕ and $d\phi$ as $F_y = q\tau \cos(\phi) d\phi/4\pi\epsilon_0 r$ (Fig. 13). Let us find how the force will change when the charge moves parallel to the thread with the speed v . With respect to the moving charge, the counterpropagating rheons will have a velocity c' different from c due to the vector subtraction of the velocity v of the charge from c . And the speed of c' rheons will be directed not along MO , but along $M'O$ (stellar aberration has the same nature - the deflection of light rays caused by the motion of the Earth, § 1.9). From the triangle of velocities OMM' : $c' = [c^2 + v^2 - 2cv\sin(\phi)]^{1/2}$ or, expanding in a series and considering v/c small, we obtain $c' \approx c [1 - \sin(\phi)v/c + (v/c)^2 \cos^2(\phi)/2]$. The strength changes accordingly: $F' = F(c'/c)^2$. But, since the force also changes direction (F' acts along c'), the component F_y that interests us will change to a somewhat lesser extent: $F_y' = F_y (c'/c) = [1 - \sin(\phi)v/c +$

$(v/c)^2 \cos^2(\varphi)/2] \cos(\varphi) d\varphi q\tau/4\pi\epsilon_0 r$. It remains to find the total force of action on the charge from all elements of the thread, integrating F_y within φ from $-\pi/2$ to $+\pi/2$. As a result, the total force $F_y' = (1 + v^2/3c^2) q\tau/2\pi\epsilon_0 r = q\tau/2\pi\epsilon_0 r + v^2 q\tau/6\pi\epsilon_0 r c^2$. The first term is the force of interaction of the thread with a resting charge, and the second is the addition to it, which has arisen due to the motion. So, the movement of a charge with a speed v along the filament causes an increase in the repulsive force (or attraction) by the amount $v^2 q\tau/6\pi\epsilon_0 r c^2$.

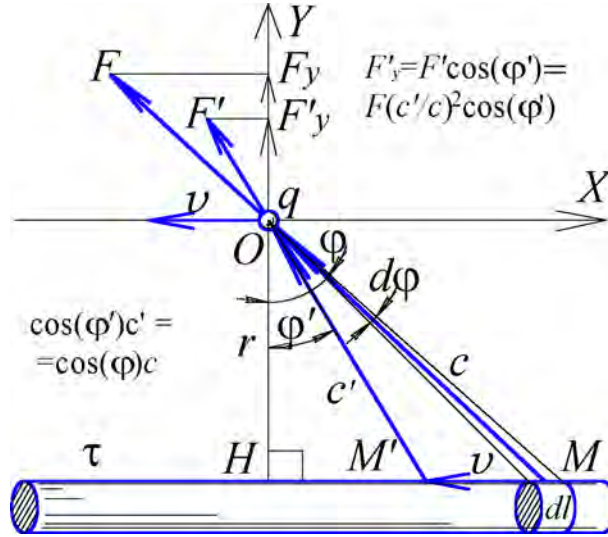


Fig. 13. The projection F_y of the repulsive force of the charge by an element of length dl of an infinite charged filament changes when the charge moves in proportion to the speed c' rheons relative to it.

This result has very important implications. Consider two parallel conductors with co-directional currents. Since the current in the metal is created by the movement of electrons, we replace each conductor with a moving negatively charged thread (Fig. 14). The first thread has a linear charge density $-\tau_1$ and a velocity v_1 (in projection onto the x-axis), and the second, respectively, has $-\tau_2$ and v_2 . In general, each conductor is neutral, so we add fixed positively charged filaments $+\tau_1$ and $+\tau_2$ (they correspond to positive and fixed metal ions).

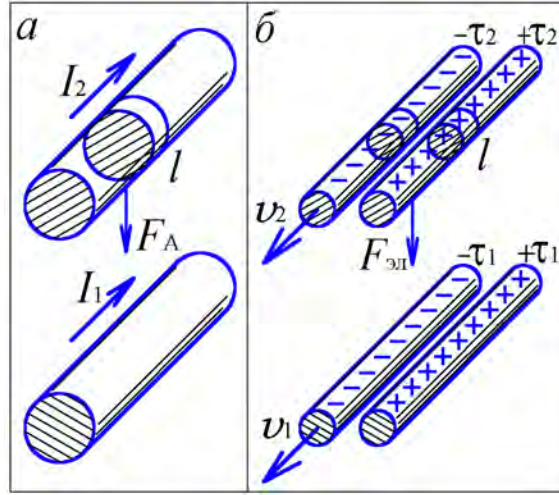


Fig. 14. Representation of conductors with current (a) by combinations of pairs of charged filaments (b) allows expressing the ampere force of their attraction as the sum of the forces of electrical interaction of the filaments.

Let us find with what electric force F the first conductor (filaments $+\tau$ and $-\tau_1$) acts on a small element of length l of the second conductor (filaments $+\tau_2 l$ and $-\tau_2$). The sought force F_{el} consists of four forces:

1. F_1 - action of a fixed thread $+\tau_1$ on a fixed charge $+\tau_2 l$;
2. F_2 is the effect of a stationary thread $+\tau_1$ on a moving charge $-\tau_2 l$;
3. F_3 - impact of a moving thread $-\tau_1$ on a stationary charge $+\tau_2 l$;
4. F_4 - the impact of the moving thread $-\tau_1$ on the moving charge $-\tau_2 l$.

The charge velocity $q = \tau_2 l$ relative to the corresponding filament is for the case

1. zero, and therefore the repulsive force $F_1 = \tau_1 \tau_2 l / 2\pi\epsilon_0 r$ (according to the formula F_y);
2. v_2 , and the force of attraction is $F_2 = \tau_1 \tau_2 l / 2\pi\epsilon_0 r + v_2^2 \tau_1 \tau_2 l / 6\pi\epsilon_0 r c^2$;
3. v_1 , and the force of attraction is $F_3 = \tau_1 \tau_2 l / 2\pi\epsilon_0 r + v_1^2 \tau_1 \tau_2 l / 6\pi\epsilon_0 r c^2$;
4. $(v_1 - v_2)$, and the repulsive force $F_4 = \tau_1 \tau_2 l / 2\pi\epsilon_0 r + (v_1 - v_2)^2 \tau_1 \tau_2 l / 6\pi\epsilon_0 r c^2$.

The resulting force of attraction $F_{el} = F_2 + F_3 - F_1 - F_4 = v_1 v_2 \tau_1 \tau_2 l / 3\pi\epsilon_0 r c^2$. Thus, if in the absence of currents $F_{el} = 0$, then the movement of charges in the conductors violates the balance of interaction forces, the forces cease to compensate each other. As a result, conductors with current are attracted with the force F_{el} , or they are repelled if the currents are directed in different directions ($v_1 v_2$ is negative). The quantity $v_1 \tau_1$ is nothing more than the strength of the current I_1 in the first conductor, and $v_2 \tau_2$ is the strength of the current I_2 in the second. Taking this into account and applying the well-known relation $1/c^2 = \epsilon_0 \mu_0$, we obtain $F_{el} = \mu_0 I_1 I_2 l / 3\pi r$. But in fact, the interaction of parallel currents is similarly described by the Ampere's law $F_A = \mu_0 I_1 I_2 l / 2\pi r$, which, however, gives the magnitude of the force one and a half times greater (Fig. 15). That is, the

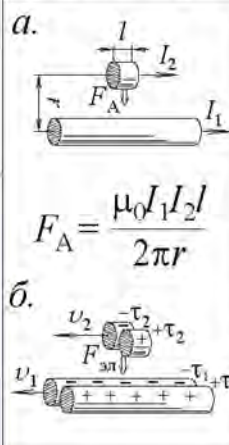
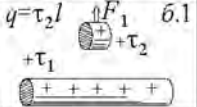
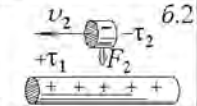
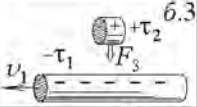
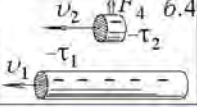
Взаимодействие токов I_1, I_2 по закону Ампера (а) и в случае представления проводников заряженными нитями (б)		$v_{\text{отн}}$	$F_q = \frac{q\tau_1}{2\pi\epsilon_0 r} (1 + \frac{1}{3}(v_{\text{отн}}/c)^2)$	$F_{\text{эл}} = F_2 + F_3 - F_1 - F_4$
		0	$F_1 = \frac{\tau_1 \tau_2 l}{2\pi\epsilon_0 r}$	$F_{\text{эл}} = \frac{v_1 v_2 \tau_1 \tau_2 l}{3\pi\epsilon_0 r c^2}$ или с учётом того, что $v_1 \tau_1 = I_1, v_2 \tau_2 = I_2$ и $c^2 = \frac{1}{\epsilon_0 \mu_0}$, имеем: $F_{\text{эл}} = \frac{\mu_0 I_1 I_2 l}{3\pi r} = \frac{2}{3} F_A$
		v_2	$F_2 = \frac{\tau_1 \tau_2 l}{2\pi\epsilon_0 r} + \frac{v_2^2 \tau_1 \tau_2 l}{6\pi\epsilon_0 r c^2}$	
		v_1	$F_3 = \frac{\tau_1 \tau_2 l}{2\pi\epsilon_0 r} + \frac{v_1^2 \tau_1 \tau_2 l}{6\pi\epsilon_0 r c^2}$	
		$v_1 - v_2$	$F_4 = \frac{\tau_1 \tau_2 l}{2\pi\epsilon_0 r} + \frac{(v_1 - v_2)^2 \tau_1 \tau_2 l}{6\pi\epsilon_0 r c^2}$	

Fig. 15. The change in electrostatic force caused by the movement of charges leads to the appearance of a magnetic force of their interaction.

magnetic force has an electrical nature: conductors with current are attracted or repelled by an electric force equal to the Ampere's force with an accuracy of 1.5. This difference in the coefficients is due to the fact that the experiment does not measure the effect of current elements, but of closed conductors, and a more accurate calculation will probably eliminate this small difference. In addition, the ratio of electrical and magnetic units, which is equal to the product of the speed of light and the root of the coefficient in Ampere's formula [60], has not yet been accurately measured. Note that Maxwell himself, having measured this ratio, found that it was not equal to $c = 3 \cdot 10^8$ m/s, but, contrary to his theory, averaged $2.45 \cdot 10^8$ m/s [152]. This speaks in favor of the coefficient $1.5 = (3 \cdot 10^8 / 2.45 \cdot 10^8)^2$.

Since it is difficult to study the elements of current in experiment, it is better to test the theory by examining the movement of individual charges. So, experience has shown that in a magnetic field B , a charge q flying at a speed V perpendicular to B , describes a circle. This means that the particle is acted upon by the constant Lorentz force $F_l = qVB$ directed to the center of the circle. Let's check if this is so in the Ritz model. To do this, we will again split a straight conductor with a current I , which creates a field B , into a positively charged thread and moving with a negative speed v . Then the action of F_{el} current on a charge flying at a speed V along the wire will be composed of two forces (Fig. 16):

- 1) F_1 - the impact of a stationary thread $+\tau$ on a mobile charge q ;
- 2) F_2 - the impact of the movable thread $-\tau$ on the flying charge q .

The charge speed q relative to the corresponding filament is

- 1) V , and therefore the repulsive force $F_1 = q\tau/2\pi\epsilon_0 r + q\tau V^2/6\pi\epsilon_0 r c^2$;
- 2) $V + v$, and the force of attraction is $F_2 = q\tau/2\pi\epsilon_0 r + q\tau(V + v)^2/6\pi\epsilon_0 r c^2$.

Hence the force of attraction $F_{\text{el}} = F_2 - F_1 = q\tau (2Vv + v^2)/6\pi\epsilon_0 r c^2$. Or, if we take into account that the velocity of the flying charge V is much greater than the velocity v of the electron drift, we obtain $F_{\text{el}} = qVv\tau/3\pi\epsilon_0 r c^2$. So, due to the

movement of charges, the forces F_1 and F_2 cease to balance each other, and the conductor acts on the charge with a force that depends on the current $I = v\tau$. As a result, $F_{el} = qVI/3\pi\epsilon_0rc^2$, or taking into account $1/c^2 = \epsilon_0\mu_0$ and the well-known expression for the current field $B = \mu_0I/2\pi r$, we find $F_{el} = qVB/1.5$. This, up to a factor of 1.5, gives the Lorentz force $F_l = qVB$. That is, the Lorentz force is of a purely electrical nature. The same force can be easily obtained from BTR and for a charge flying perpendicular to the conductor. Since the Lorentz force does not depend on the direction of motion of the charge, then according to the Ritz theory, the charge must describe a circle in a magnetic field B , as required by experiment.

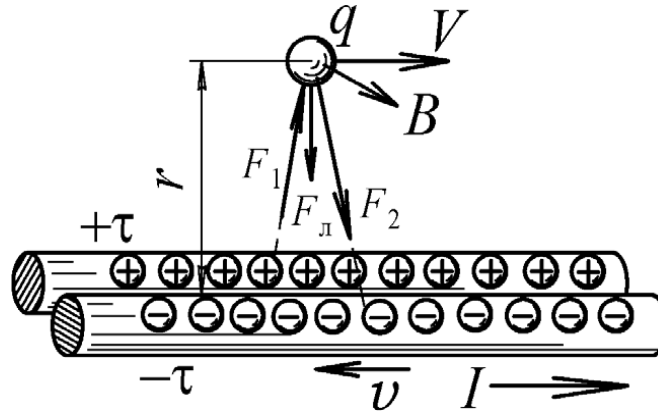


Fig. 16. The appearance of the Lorentz force in the form of the difference between the forces of attraction and repulsion of the threads caused by the movement of charges.

So, there is no need for a magnetic field, because what is considered to be a magnetic force is just an uncompensated addition of an electric force created by the movement of charges. In turn, this additive is a natural consequence of the ballistic model of the interaction of charges and the mechanical addition of the speed of propagation of light and electrical impact (in fact, the speed of rheons) with the speed of the source. In other words, as Ampere and Ritz argued, magnetic forces and fields, generally speaking, do not exist. For their manifestations, we mistakenly take the result of a change in electrical forces caused by the movement of charges. That is why it was not possible and will never be able to find magnetic "charges" - the monopoles predicted by Dirac, the existence of which seemed to be a natural consequence of the equality, reversibility of fields and the symmetry of Maxwell's equations. It turns out that, contrary to Maxwell, light can easily propagate without the help of a magnetic field. On the contrary, it is the final speed of light, rheons, that generates magnetic effects.

Thus, the ballistic model and Ritz's theory not only agree with all electrical and magnetic effects, but also allow us to understand their nature within the framework of the classical picture of the world. The very idea of the influence of the movement of a charge on the magnitude of the electric force and the explanation through this of the magnetic effects arose a long time ago. Long before Ritz (as he himself notes [8]) it was expressed by Gauss and developed by Weber, who in the middle of the 19th century built electrodynamics on its basis, considering magnetic and induction forces as a consequence of changes (during the movement and acceleration of charges) of electric forces [72, 106]. Moreover,

the electrodynamics of Ampere and Weber has long been accepted by scientists and opposed to Maxwell's theory.

But Weber's concept was rejected, and, ironically, by the very fact from which it should have flowed. The fact is that Weber was a supporter of the theory of action at a distance, that is, the instantaneous spread of influences, without the help of any intermediate agent. And he did not derive his formulas describing the effect of motion on the magnitude of the electric force, but empirically selected them based on experiments [72, 106]. And meanwhile, as it was shown, and as argued by Gauss (Weber's teacher), they can be deduced strictly, adhering to the exact opposite principle - considering that the impact is transmitted not instantly, but with a delay, through some intermediate agent (rheons). It is easy to verify that the assumption of an instantaneous transfer of action with an infinite speed of rheons ($c = \infty$) would lead, on the contrary, to a constant value of force that does not depend on the movement of charges. So, Ritz substantiated the approach of Weber and Gauss and thereby completed the process of reducing magnetic effects to electrical ones, begun by Ampere. It was Ampere who first understood that magnetism is a fiction, and a magnet is only a set of elementary molecular circular currents, that is, ultimately, the movement of charges. Thus, it is more correct to speak not about the connection between electrical and magnetic effects, but about the fact that the latter are only a particular manifestation of the former. It is interesting that Ampere's hypothesis about the electrical nature of magnetic forces, as a consequence of the interaction of elementary currents of bodies, was put forward by Democritus and Lucretius, who explained the magnetic effect of the impacts of microparticles (Rheons § 4.19) exuded by magnets and an electron (amber) from bodies emitted by the body.

The fact that a magnetic field is a fiction can be easily verified by examining two beams of electrons flying in parallel with the same speed. According to Maxwell, this movement of charges will create a magnetic field, which is why between the beams, in addition to the Coulomb repulsive force, there will also be a magnetic attraction force, as between two currents. But if we switch to a moving frame of reference associated with flying electrons, the magnetic force will disappear, although the force of interaction of the beams according to the classical principle of relativity should remain the same. Making ends meet in Maxwell's theory is possible only through the theory of relativity, according to which the disappearance of magnetic attraction is exactly compensated by the relativistic decrease in the Coulomb repulsion of beams [96]. Just like in Michelson's experiment, where they tried to explain the absence of changes with a change in speed by the fact that it is exactly compensated by the contraction of the interferometer arms, until they realized that the principle of relativity is true (§ 1.9). But, since this principle discovered by Galileo is true, isn't it easier to assume that the electric force of the interaction of beams does not depend on the system in which it is measured, while the magnetic force does not arise at all? Indeed, the Ritz electric force, as we have seen, does not depend on the absolute speed of the charges in a certain frame of reference, but only on their mutual speed in relation to each other. It is this dependence, which proves that the charge imparts its speed to the influences, and is perceived by us in the form of magnetic effects.

The idea of a purely electrical nature of magnetic forces has always been on the surface, which is why it has been rediscovered many times in our time. After all, anyone knows that magnetic forces are generated by the movement of charges, from which one step to the thought that a change in the Coulomb interaction of charges from their movement creates magnetic effects due to the finite light speed of electrical influences and retarded potentials. It is no coincidence that many scientists, including N.K. Noskov, V.M. Petrov [96]. By the way, V. Petrov, considering the interaction of conductors, back in 2004 put forward a number of interesting ideas, including the non-uniform distribution of moving electrons over the metal, which makes it possible to solve a number of difficulties in Ritz's theory, for example, when explaining the phenomena of induction, self-action of the electron current, and also the form of Ampere's law and the value of the coefficient in it.

It should be noted that the theories of Weber and Ritz lead to the law of interaction of currents, which differs from the generally accepted one. Thus, it is believed that magnetic forces are always perpendicular to the current elements (Fig. 17). But this violates the principle of action and reaction, especially if one current flows along, and the other across the line MN connecting them; here one of the forces is generally zero. In Weber's theory, the forces of magnetic interaction are always equal and oppositely directed. And Ampere himself, who

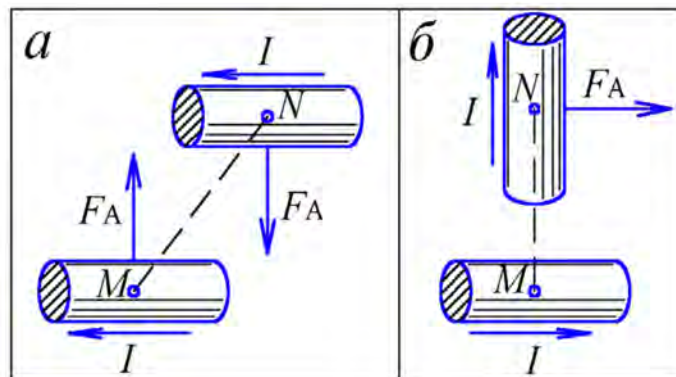


Fig. 17. Violation of Newton's third law by the generally accepted law of interaction of parallel (a) and perpendicular (b) currents: the forces are directed at an angle to the communication line MN , and in case b there is no force at all at point M .

discovered the interaction of currents, argued that magnetic forces act along the line connecting the elements. Of course, even in Ritz's theory, the action force is sometimes not equal to the reaction force and they are not directed strictly along the line connecting the elements or charges (§ 1.17, § 3.17). But this is caused by the finite speed of impacts and, unlike the Bio-Savard law, does not contradict the law of conservation of momentum, if we take into account the momentum carried by rheons flying in the space between the current elements. Therefore, experimentally found by Ampere and confirmed by Weber, the law of interaction of currents [106], as well as the law following from Ritz's theory, does not coincide with the generally accepted law of Biot-Savard-Laplace, following from Maxwell's theory.

The erroneousess of the generally accepted law has not yet been revealed experimentally because no one specifically set such a task, although from time to time there were reports in the press about deviations from the Bio-Savart law and the discovery of magnetic forces directed, according to Ampere, along the current elements (see articles by [V. Okolotin on the experiments of Grano and others](#)). But the discrepancy between the laws of Ampere-Weber and Bio-Savard has long prompted their comparative verification by experience. Of course, the experiments of Ampere and Weber are time consuming, but the equipment they need is the simplest. However, the problem also lies in the fact that in the experiment it is possible to observe only the interaction of closed currents, while the interaction of the current elements is difficult to study. An accurate establishment in an experiment of the actual law of forces from the current elements would be the simplest and most effective proof of Ritz's Ballistic Theory. And the most interesting thing is that in those rare experiments where such interactions of open currents were studied, deviations from the BioSavart's law and Maxwell's theory were actually discovered ([V. Okolotin, "Tekhnika-Molodezhi" No. 12, 1973](#)). Another way to test Ritz's electrodynamics is to study the motion of slow charges in a magnetic field, the speed of which is comparable to the speed of electron drift. Then the addition of v^2 in comparison with $2Vv$ can no longer be neglected, and there will be a noticeable deviation from the law $F_1 = qVB$ for the Lorentz force, which can be fixed. Moreover, it turns out that this force will act even on a stationary charge. Accordingly, when passing a current through a conductor, one could observe how nearby metal objects are weakly polarized. However, no one has yet set up such experiments.

§ 1.8. Electromagnetic induction and the completeness of Ritz's electrodynamics

It is interesting to note that, according to our theory, in bodies at rest, the phenomena of induction in a closed circuit arise only as a result of the finite velocity of propagation. Indeed, if we turn to the expansions of Section 3, we will see that, since the terms of the second order are weakly affected, only this finite velocity introduces accelerations, and it is the accelerations that determine the phenomena of induction.

Walter Ritz, "A Critique of General Electrodynamics" [8]

So, although at present the Maxwellian version of electrodynamics is generally accepted, long before it was adopted Ampere's electrodynamics, developed by Weber with Gauss. So simple and natural was their theory that almost the entire 19th century. everyone recognized only it, rejecting the vague theory of Maxwell that appeared later. Only the discovery of electromagnetic waves by Hertz in 1888 led to the recognition of Maxwellian electrodynamics and the oblivion of the original theory of Ampere. But already in 1908, Walter Ritz showed that within the framework of the Ampere-Weber approach, it is possible to easily describe all electrodynamic effects, including the electromagnetic waves predicted by Maxwell, and also naturally explain a number of phenomena that Maxwell's theory either could not predict at all, or simply postulated. Ritz revealed the deep

mechanisms of electrical, magnetic, gravitational influences, and explained relativistic effects - without the theory of relativity.

Ampere, aptly nicknamed "Newton of electricity", built electrodynamics avoiding hypotheses and relying only on experience. So, he discovered the interaction of currents and reduced magnetism to it, showing that magnets are sets of circular molecular currents. As in Newton's law of gravitation, Ampere reduced electrical effects to the forces of interaction of elementary particles and currents - central forces directed along the line of joining particles. Ampere explained the similarity of the laws of interaction of charges, currents and masses by the unity of electric, magnetic and gravitational forces. Unlike the simple and natural electrodynamics of Ampere, Maxwell operated with abstract, artificially introduced concepts such as ether, electromagnetic field, vector potential, off-center, vortex forces.

And Ampere's electrodynamics had only the same flaw as Newton's theory - it was the theory of action at a distance: the interaction of two points was determined only by their mutual position, regardless of what lay between them, and as if the impact was transmitted instantly, without any intermediary [60]. Two spaced points immediately experienced the forces of repulsion or attraction, directly and instantly acting at any distance according to the law of Coulomb, Ampere or Newton. Ritz continued the Ampere-Weber program, and it was the Ritz mechanical model that freed the theory of long-range action from the main vice - by taking into account the material intermediary carrier - the rheons, which transport the effects from charge to charge with a delay from the final speed of rheons. When the charges move, it is the delay of the impact that leads to its changes, which have the form of magnetic and inductive forces. Comparing the charge with a machine gun that shoots rheons and gives them, like bullets from a traveling armored car, additional velocity, Ritz explained Michelson's experiment, which was fatal for Maxwell's theory, and also revealed the nature of magnetic and relativistic effects.

However, Faraday decided in a completely different way to bypass the main difficulty of the theory of action at a distance. Observing the iron filings lined up along the lines of force of the magnet and the wires with current, he decided that there is a kind of ubiquitous medium-field, transmitting the impact from one body to another - this is how the field concept of short-range action appeared. According to Faraday and Oersted, who discovered the magnetic effect of the current, the effect is created not by the charges and currents themselves, but by the disturbances of this medium-field (ether) caused by them, which makes the attraction of two currents resemble the interaction of two vortex-vortices on water. Oersted and Faraday saw the rationale for such an off-center, vortex nature of the interaction of currents in the location of the magnetic needle near the wire with current. It is always directed not towards the wire, but perpendicular to it, which is why the iron filings line up around the wire in closed rings, which led Oersted and Faraday to the idea of vortices of a certain medium near the currents. Maxwell mathematically developed this theory, relying on the hypothesis of the medium-field (ether), although even then everyone considered the field concept

of Oersted-Faraday to be naive, and their speculations about the reality of lines of force and vortices - childish babble.

And from the height of the modern level of science, it is clear that Oersted, Faraday and Maxwell were wrong. Lines of force and the field, like the field of velocities, pressures, are not physical, but mathematical objects. However, scientists believe in the physical field-ether, as they clung to caloric for a long time after the discovery of the mechanical nature of heat. Michelson's experiment proved the falsity of the ether and Maxwell's electrodynamics based on it [152]. The laying of sawdust along the lines of force does not indicate the presence of a medium-field, but about the orientation of each grain of sawdust by the central Ampere forces. As Ampere showed, any magnetic grain or arrow is, in fact, a coil with a current formed by a set of molecular currents and perpendicular to the magnetic arrow. So, the arrow is oriented not by vortex forces, "twisting in circles" near the current, but by the central Ampere forces directed to the wire: the section of the loop where the current is co-directed with the current in the wire is attracted by it, and the section where the direction of the current is opposite is repelled. Therefore, the coil is located in the same plane with the wire (Fig. 18), and the magnetic moment of the coil (the axis of the magnetic arrow or an iron grain) is perpendicular to this plane and the wire.

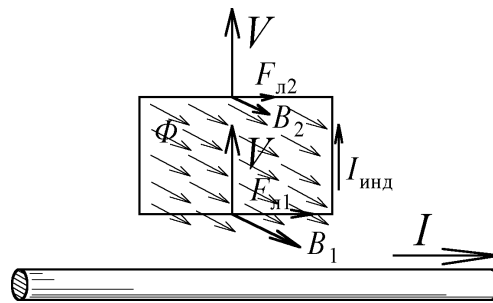


Fig. 18. The movement of the wire frame leads to a decrease in the flux Φ of the field B through the frame and creates Lorentz forces in it, which induce the EMF of induction with a current I_{ind} in the circuit.

The defect of the Maxwellian theory was that it gave equal rights to electric and magnetic fields capable of reciprocating and generating each other [60]. Ampere, however, considered magnetic influences secondary, reducing magnetic effects to the interaction of mobile charges (currents). Only the electric interaction $F_0 = e^2/4\pi\epsilon_0 R^2$ of charges e is real, and the magnetic one is its particular manifestation. Weber developed this idea by giving a refined expression $F = F_0 [1 - V^2/c^2 + 2Ra/c^2]$ for the elementary force of interaction of charges, taking into account, in addition to their distance R , relative radial velocities V and accelerations a [106]. The terms containing V and a gave magnetic and inductive forces as small additions of electric force from the movement of charges. This is how the term "electrodynamics" arose, where, in contrast to electrostatics ($F = F_0$), the interaction of mobile charges was studied. And it would be more correct to call Maxwell's concept the theory of "electromagnetism" in view of assigning equal roles to electricity and magnetism without explaining the reasons for the transition from one to the other.

However, Weber's formula was also empirical. It was rigorously substantiated by Walter Ritz, who received the formula as a direct consequence of the mechanism he discovered of the interaction of elementary charges (electrons) - through the exchange of standard microparticles (rheons). This is how he deduced from his model the forces of magnetic interaction (see § 1.7). In his main work [8], Ritz explained not only all magnetic effects, but also the phenomenon of electromagnetic induction discovered by Faraday. Its essence is that a change in the magnetic flux Φ of the vector B through a closed circuit (say, a wire ring) induces an induction EMF in this circuit, which creates an induction current and, according to Lenz's rule, interferes with the change in flux [60].

Consider a rectangular wire frame and a conductor with current lying in its plane (Fig. 18). According to Faraday's law, moving the frame away from the wire at a speed V will induce the EMF of induction $U = -d\Phi/dt$ in the frame. But this induction force, by its nature, is purely electrical, because, like a magnetic force, it is caused by a small change in the electrical interaction of charges from their movement. It is easy to calculate that the EMF $U = -d\Phi/dt$ is created by the difference between the Lorentz forces $F_{11} - F_{12}$ acting on the charges in the near and far parts of the frame, since the B_2 field is less than in the near B_1 [45]. By virtue of the classical principle of relativity, the same will be obtained if the frame is motionless, and the conductor with current is removed. A more complicated case is when the wire and the frame are stationary, but the current in the conductor and the magnetic field B created by it and its flux Φ through the frame change (Fig. 19). In this case, due to the Ritz effect and the delay of electrical influences, different parts of the frame will perceive the influence of the conductor charges moving with acceleration a with different delay and intensity. This will again generate the electric induction force $U = -d\Phi/dt$ and the current in the frame.

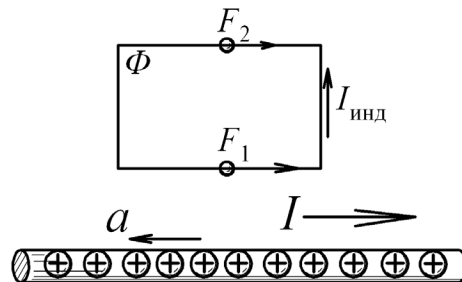


Fig. 19. The deceleration of charges in the conductor (acceleration a is directed against the speed) reduces the value of the current I and the induced flux of induction Φ through the frame, and also creates a difference in forces that induce the EMF and the induction current in the circuit.

So, magnetic, induction and other electrodynamic effects, including relativistic ones, appear in the BTR as small additions to the electric force from the uniform or accelerated movement of charges. These additions arise when higher orders are taken into account in the expansion of the electric force in a series in powers of V/c and Ra/c^2 . Ritz attributed the influence of these small, but very significant corrections to the main importance in his electrodynamics, showing that these additives are caused by the delay of the effects, the finite speed of their propagation (see the epigraph), which changes the frequency f of the arrival of

rheons to the charge, which means the force of the impact on it. That is, the electrodynamic effects are a direct consequence of the Doppler and Ritz effects - changes in the frequency $f = f_0 [1 - V^2/c^2 + Ra/c^2]$ from the motion of the source (see § 1.10 and § 1.20). Therefore, a similar expression is obtained for the interaction force of charges $F = F_0 [1 - V^2/c^2 + 2Ra/c^2]$ - this, like all electrodynamic effects, is a direct consequence of the space-time relations discovered by Ritz and the final velocity c rheons, that is, delay electrical signals. It is the unified kinetic nature of the Doppler and Ritz effects that makes it possible to understand why the change in the flux Φ through the circuit, both from the velocity (Fig. 18) and from the acceleration of charges (Fig. 19), generates the same induction EMF, and also to find exceptions to this empirical Faraday rule.

Maxwell's electrodynamics was preferred to the original Weberian one also because he considered electromagnetic phenomena in media, while Weber spoke only about interaction in a vacuum. In addition, it is easier to study the electrodynamics of media within the framework of the field, ethereal approach, in the language of the physics of continuous media, to which the ether was referred. But, as Lorentz showed in his electronic theory, all the conclusions of Maxwell's electrodynamics for dielectrics, metals, refractive media are obtained in the previous description of elementary interactions of charges in vacuum. It is only necessary to represent the environment as a set of charges (electrons and ions), displaced and vibrated under the influence of external sources, thereby generating secondary influences and waves that are superimposed on the original ones and therefore transform them. So here, too, Ritz's concept is more logical than Maxwell's, introducing its own ether properties for each medium. However, scientists led by Lorentz tried to embed the electronic theory, which denies the special role of the medium, into Maxwellian theory, although it fit into Weber's electrodynamics much more naturally.

Explains Ritz and electromagnetic waves, which gave recognition to Maxwell's electrodynamics (§ 1.11). As Ritz showed, electromagnetic waves were obtained in Weber's electrodynamics, and much more simply. If Maxwell needed endless transformations of the electric and magnetic fields for the propagation of waves, then in Ritz's electrodynamics, light oscillations arose as a natural consequence of the transmission of alternating electrical influences with a finite speed of particle flux equal to the speed of light c . Hertz's experiments proved the reality of electromagnetic waves, the electrical nature of light, but did not at all confirm the physical reality of the field or ether and the Maxwell theory based on them. Thus, Ritz's electrodynamics describes the same effects as Maxwell's electrodynamics, in most cases naturally leading to the same results. And only in subtle and yet unexplored effects can one find a discrepancy between these electrodynamic theories, which will allow one day, strictly, on the basis of experiments, to make a choice in favor of one of the theories. But already now, the fact that in Ritz electrodynamics all phenomena are interpreted purely mechanically, clearly, speaks in favor of the BTR. The existence of magnetic and induction effects in the BTR naturally follows from the model of the interaction of charges and does not need, in contrast to Maxwell's theory, in the adoption of artificial additional hypotheses about abstract electric and magnetic fields.

Physicists, however, idolize Maxwell and his equations. Admiration for Maxwell's equations reaches the point that they are deified, as if they contain all the wisdom of nature, and everything follows from them. Meanwhile, these equations are constructed purely formally, as arbitrary generalizations of empirical laws. So, the first Maxwell equation $\text{rot}\mathbf{H} = \partial\mathbf{D}/\partial t + \mathbf{j}$ and the fourth equation $\text{div}\mathbf{B} = 0$ are just generalizations of the well-known laws of Biot-Savard-Laplace and Ampere, which make it possible to find the magnitude of the magnetic field of a conductor with current. Maxwell's second equation $\text{rot}\mathbf{E} = -\partial\mathbf{B}/\partial t$ is simply Faraday's generalized law of electromagnetic induction [88]. Finally, the third equation $\text{div}\mathbf{D} = \rho$ is, again, nothing more than a generalization of the Coulomb law, which sets the electric field $\mathbf{D}$ of a charge, and the Ostrogradsky-Gauss theorem. It is sometimes argued that Maxwell, in addition to generalizing these well-known laws, made an important and even ingenious addition - he discovered the displacement current ($\partial\mathbf{D}/\partial t$ is the density of this current), which, as follows from the first equation, creates a magnetic field $\mathbf{H}$, like a conduction current ($\mathbf{j}$ is its density).

But in fact, all this followed from the same laws of Bio-Savard and Ampere. Consider the first equation in integral form $\int_L \mathbf{H} d\mathbf{l} = d/dt \int_S \mathbf{D} d\mathbf{s} + I$. It reads as follows: "the circulation of the vector $\mathbf{H}$ along the closed loop L is equal to the change in time of the flow of the vector $\mathbf{D}$ through the surface S , bounded by the contour L , plus the conduction current I through this surface." Take the contour L in the form of a ring, and on the axis of the ring, perpendicular to its plane S , place a current element that does not intersect this plane, that is, in the equation $I = 0$. But according to the Bio-Savard's law, a magnetic field $\mathbf{H}$ is still induced on the L ring, directed along the line of the L contour, that is, having a nonzero circulation. Therefore, Maxwell was forced to add the displacement current $d/dt \int_S \mathbf{D} d\mathbf{s}$ to the right side of the equation in order to take into account the effect of current elements that do not cross the area S predicted by the Biot-Savart and Ampere law. Current is the movement of charges, which leads to a change in the field flux $\mathbf{D}$ created by the charges. through the surface S : if the current element is directed to the ring, then the charges approach and the flux $\mathbf{D}$ created by them increases, which is why a magnetic field is created on the contour L . That is, the Maxwellian displacement current is nothing more than a convenient equivalent of conduction currents that do not cross S , then are directly unaccounted for in his equation.

From this point of view, Maxwell's first equation turns out to be simply a reflection of the long-known law of conservation of charge: the increase in the flux of the field $\mathbf{D}$ created by the charges through the closed surface S corresponds to the inflow of charges through this surface (that is, the electric current) [88]. All this proves once again that Maxwell's displacement current is a fiction [96], and Maxwell's equations are just a convenient generalization of the long-found laws of electrodynamics. Physicists believe that it is precisely by this generalization that Maxwell's equations are remarkable, for they express much more empirically discovered laws of Coulomb, Ampere and Faraday. But, as Ritz showed, it is precisely because of their excessive generality that Maxwell's equations often admit physically impossible solutions. The true electrodynamic theory should

give a unique, and physically correct solution. Therefore, Ritz criticized Maxwell's electrodynamics and especially his partial differential equations, which have many physically inadmissible solutions [8]. Ritz believed that this kind of equation should be banished from the fundamental laws of Nature.

In Ritz's ballistic theory, the impact is found not analytically, but in a synthetic way: not from differential equations, but as a result of the integration of elementary impacts. Therefore, Ritz's theory always gives the only and, moreover, the correct solution. As you have seen, the BTR easily and naturally explains the laws of Coulomb, Ampere and Faraday - that is, it is complete and comprehensively explains everything on which Maxwell's equations are based. At the same time, Ritz's theory does not need abstract concepts of electric and magnetic fields, which play such an important role in Maxwell's electrodynamics. In Ritz's theory, we are talking directly about the impact. That is why Ritz's electrodynamics is also called fieldless.

However, the distributions of rheons and arheons given at each point in space in terms of concentration and speed of their flux are, in principle, to some extent equivalent to the previous concept of a field. Indeed, at each point, the effect on the current or on the charge is determined precisely by this distribution. But, in this case, we are no longer talking about the field as some kind of abstract physical matter. In BTR, the field has a purely mathematical meaning, and not the meaning of a special kind of matter. Originally, this is exactly how the field was introduced in mathematics and physics. For example, in aerodynamics the field of velocities, pressures, temperatures is just the spatial distribution of these characteristics. Similarly, in electrodynamics, the field originally characterized only the spatial distribution of electrical forces acting on a test unit charge. Only later did physicists begin to ascribe an independent physical meaning to the field, which, of course, is not true. The lines of force of the field are about the same unreal; they are purely mathematical images introduced for the convenience of description. It is interesting to note that Maxwell and Faraday, like the field, considered the lines of force to be real objects. It is clear that with this approach they could not build correct electrodynamics. Thus, it was Faraday and Maxwell who directed classical physics on the wrong path, leading it away from the visual mechanical models and electrodynamics of Gauss-Weber. The theory of relativity, and even quantum mechanics, were only a consequence, a further development of Maxwell's abstract-analytical path.

So, if in the future we will use the term "field" from time to time, then only in the mathematical sense, meaning the force acting on a unit resting charge. Also, for convenience, in our calculations, we will use the usual notation of the fields **B** and **E** and the formulas for them, bearing in mind that the same magnitudes of influences are obtained in the ballistic fieldless Ritz theory. Only out of the desire not to complicate the reader's understanding of the subsequent chapters of the book, we will use the designations and methods of calculation accepted in electrodynamics. In the same way, we still use, for example, the formulas of thermodynamics, we talk about pressure, gas temperature, although these characteristics are essentially just mathematically constructed abstractions that characterize the movement of particles, gas molecules. And these abstract

concepts arose at a time when scientists had no idea about the molecular kinetic theory. However, the concepts of pressure and temperature turned out to be very convenient macroscopic statistical characteristics of a gas as an ensemble of particles. It is easier to talk about the pressure and temperature of a gas than to consider microscopic quantities - the velocities and coordinates of individual molecules. So, we will often use the familiar concepts of fields in order to avoid complex analysis based on the distribution of rheons and arheons in space. At the same time, as Ritz showed, knowledge of the field magnitude, which is a macroscopic statistical parameter, is often insufficient to determine the effect, just as knowledge of the spatial distribution of gas pressure is still insufficient to find the force of gas pressure on the plate - this force also depends on the plate velocity in gas and angle of attack (inclination of the plate to the flow)

The electrodynamic theories of Ampere, Weber, and Gauss were quite successful in and of themselves, since they reduced magnetic effects to electrical ones. However, there were problems in explaining electromagnetic waves, electrodynamic effects, especially in environments. In addition, there was no mechanism to explain the electrical and magnetic forces. Lorentz's electronic theory was the first step towards the abolition of aether and Maxwell's theory. After all, Lorentz reduced the electrodynamics of media to the electrodynamics of a vacuum, in fact, to the electrodynamics of Weber and Gauss, it was enough only to accept that the medium is a set of electrons and ions that create their own fields that are superimposed on external ones and thereby affect the field in the medium. The next step was the Ritz ballistic model, which proposed a mechanism for the interaction of stationary and moving charges, and also made it possible to visually explain electromagnetic waves. The theories of Ritz and Lorentz became for electrodynamics what molecular kinetic theory (MKT) was for thermodynamics with aerodynamics. Maxwell's thermodynamics and electrodynamics are purely phenomenological theories that establish a connection between external experimentally measurable characteristics (pressure, temperature in thermodynamics, electric and magnetic effects in electrodynamics). And the molecular-kinetic theory gave thermodynamics a theoretical foundation, reduced it to visual, mechanical foundations, not only strictly showing HOW everything happens, but also explaining WHY. Likewise, the theories of Ritz and Lorentz explained the laws of electrodynamics, proceeding from visual mechanical models, giving, like the atomistic theory, a microscopic description. Electric and magnetic forces were interpreted in ballistic electrodynamics, similar to the forces of pressure and viscosity in statistical thermo- and aerodynamics, as impacts of microparticles that carry out remote transfer and exchange of impulses between interacting volumes.

Such an internal, causal (microscopic) explanation is not only more convincing and clear than an external (phenomenological) description, but also more correct, accurate. Of course, Maxwell's phenomenological electrodynamics also successfully describes a wide range of phenomena, which is why it is still used in calculations. And this is understandable, because the ethereal theory of Maxwell-Faraday, built semi-empirically, was specially adjusted for this range of phenomena (just like the theory of Ptolemy-Aristotle with its cosmic etheric gears

and epicycles - for the apparent movement of celestial bodies). But on the other hand, outside this circle, the theory no longer worked, because it did not reveal the real internal mechanism of phenomena. Therefore, when the range of phenomena expanded, Maxwell's electrodynamics began to misfire one after another. Just as the empirical laws of aerodynamics turned out to be unsuitable at transonic and supersonic speeds, so Maxwell's electrodynamics failed at near-light and superluminal speeds. Already at a cosmic speed of the Earth $V = 30 \text{ km/s}$ in the Michelson experiment, discrepancies of the order of V^2/c^2 that were unexplained by Maxwell's theory were discovered. Even more noticeable were the deviations from the predictions of Maxwell's theory in the experiment of Kaufmann, where electrons moved at a near-light speed (§ 1.15). But scientists fixated on Maxwell's theory, trying to save it at any cost, invented the theory of relativity, like another epicycle in Ptolemy's theory, designed to reconcile observations with theory. And only Ritz, following the path of Copernicus, built the BTR that revealed the internal mechanisms of phenomena, and therefore immediately predicted all the effects of near-light electrodynamics, like the MKT, which made it possible to understand the laws of transonic and supersonic aerodynamics.

So, we have before us two options for electrodynamics. One, invented by Faraday and Maxwell, is generally accepted, although it is based on abstract electric and magnetic fields, equal and mutually reversible. The second option, discovered by Ampere, developed by Weber and justified by Ritz, is rejected, although it relies exclusively on experience and simple visual mechanical models. Which option should you choose? This question has long been answered by Michelson's experiment, which abolished the ether and Maxwell's electrodynamics based on it. However, scientists in inertia of mind could not abandon this theory, which contradicted the experience and mechanics of Newton, and, rejecting classical mechanics, built the mechanics of the theory of relativity - a formal reconciling link that reconciled Michelson's result with Maxwell's electrodynamics. However, since contradictions arose in Maxwell's theory, and experiment rejected the ether, it is more natural to abandon this field theory, preserving classical mechanics and electrodynamics in agreement with it, the foundations of which were already laid in the theory of Ampere-Weber-Gauss and the corpuscular theory of the outflow of light by Democritus-Newton.

This, of course, does not mean that Maxwell's electrodynamics will cease to be used. Its equations, the terms "field" and "potential" will remain in the arsenal of physics, due to their familiarity and convenience of calculations, but at the same time their formal, conditional, approximate nature, limiting the range of applicability of Maxwell's theory, will be clearly recognized. And to recreate an accurate picture of what is happening and understand the essence of phenomena, for example, the nature of light, one will have to consider a detailed, microscopic picture drawn by Ritz's theory. This is how we still use the terms and equations of phenomenological thermodynamics and aerodynamics, we operate with the concepts of "heat", "pressure", "temperature", although we understand, thanks to MKT, their conventional, statistical, relative nature and limited applicability. The previous phenomenological theories retain their applicability, being simpler and

more convenient (in comparison with microscopic ones), since they give an approximate description, not being interested in details, mechanisms, the essence of what is happening, but this is precisely what limits their accuracy and scope of applicability. For an exhaustive and accurate description, it is already necessary to involve microscopic theories, such as MKT and BTR, from which Maxwell's formulas of thermodynamics and electrodynamics follow only as a first approximation.

In general, as Ritz notes, his **ballistic kinetic electrodynamics predicts in most cases the same effects and values of electrodynamic actions as Maxwell's theory**, and only with the help of the precision experiments proposed by Ritz can a choice be made in favor of one theory or another. Some of such subtle experiments, in which the impacts according to Maxwell's theory must be compensated, were actually carried out, and effects were revealed that speak of the falsity of Maxwellian electrodynamics, although these "paradoxes" do not like to mention ([V. Okolotin, "Technology-youth" No. 12, 1973](#)). However, the discovery of relativistic effects that contradict Maxwell's theory confirms Ritz's theory. And only the introduction of an artificial reconciling link in the form of Einstein's relativistic mechanics saved Maxwellian electrodynamics from collapse, however, at a terrible cost - at the cost of abandoning classical mechanics and common sense.

§ 1.9. The nature of light, ballistic principle and Michelson's experiment

The only conclusion that, as it seems to me, can be drawn from this, is that this very ether does not exist, or more precisely, that we must abandon the use of such a representation, and that the movement of light is a relative movement, like everyone else, that only relative speeds play a role in the laws of nature. And finally, that we must abandon the use of partial differential equations and the application of the concept of a field to the extent that this concept introduces absolute motion.

Walter Ritz, "A Critique of General Electrodynamics" [8]

The question of the nature of light has remained one of the darkest places in physics for many centuries. A certain gap in this darkness was brought by Newton, following which the light began to be considered a stream of the smallest particles of light, corpuscles, in the present, - photons. Later, the opposite point of view was recognized, according to which light is a wave in a certain motionless medium (ether). Then it turned out that neither one nor the other was true: light cannot be considered either a particle or a wave. After that, the barely dawning light on the question of light completely faded, and from the standpoint of modern physics it is no longer possible to clearly and intelligibly explain what light is and how, without being either a wave or a particle, it can be both at once.

So what is light? Perhaps only one person in the whole world was able to give a clear, intelligible answer to this question, clearly, accurately and consistently explaining the process of emission and propagation of light, the phenomena of interference, diffraction and the emission spectra of bodies. It happened exactly a century ago, in a turning point for science in 1908, when the Swiss physicist Walter Ritz appeared in a number of German and French scientific journals with

a series of articles, where he built a new electrodynamics and a model of the atom on the basis of classical mechanics, which explained all the properties of light. But this glimmer of hope soon faded, as Ritz - this beacon of knowledge - died out, having lived only 31 years, and was consigned to oblivion.

Like Sherlock Holmes, Ritz was guided by the principle that, on the basis of firmly established facts, everything impossible should be discarded, and what remains will be the solution to the problem. With regard to light, such an indisputable fact was that light is a periodically changing (oscillatory) electromagnetic effect from a distant source. This immediately ruled out the hypothesis of photons, - particles of light, because one particle is not capable of carrying light, since light is a process extended in time, while the effect of a particle is limited by a short impact time. To represent light (the process of fluctuations in the field) in the form of a stream of photons is as absurd as to represent sound (the process of fluctuations in pressure) in the form of a stream of sound particles; the spread of heat (the process of chaotic vibrations of atoms) - in the form of a stream of heat particles. All such particles will be from the category of fluids (such as phlogiston, caloric), at one time very common in science and taken each time for lack of an intelligible explanation.

In addition to the fact that the photon hypothesis has problems with explaining the interference and diffraction of light, photons do not allow us to understand much more simple - not vibrational (light), but a constant electric and magnetic effect. In the same way, it would be impossible to imagine a constant pressure by means of sound particles, which exists even in the absence of sources, and therefore of sound particles, just as electrical action is possible without light sources. Therefore, Ritz rejected light corpuscles as introduced by Newton and Einstein.

But if not photons, then what is it that carries light and electrical impact from the source to the receiver? The analogy with the propagation of sound and heat, as well as the vibrational (wave) nature of optical phenomena, led scientists to the idea that light is waves in the ether, which carries an impact from point to point. However, it soon became clear that the ether is as much a fiction as the photons. First of all, it was not possible to construct a consistent mechanical model of the ether and explain how light, electrical and magnetic influences move in it. Ether should be superdense, and rarefied, and hard, and fluid at once. Finally, the ether was excluded by many experiments - Michelson, Troughton-Noble, the effect of stellar aberration.

In Michelson's experiment, an attempt was made to establish the speed of the Earth's movement in the ether. To do this, we compared the travel times of the light beam in the interferometer along and across the speed of the Earth's motion. It is clear that the speed of light in the ether along and across would be different [74, 152]. After all, the speed of movement of wave disturbance in the ether - the speed of light according to Maxwell's concept would be obtained constant only relative to the ether. Therefore, the speed of propagation of light relative to a moving observer would be different in different directions and the times of movement of light would be different. But experience revealed the equality of times, which indicated the falsity of the ether theory and Maxwell's

electrodynamics based on it. Michelson's experiment essentially proved that there is no such difference and the speed of light is constant relative to the source. This is exactly the result predicted by Ritz's corpuscular theory of light, where light was carried by particles ejected by a source and borrowing the speed of the source. It is no coincidence that Michelson himself, describing the experiment, at the very beginning of his famous article mentioned the corpuscular emission theory, which easily explained stellar aberration and the result of Michelson's experiment.

These and many other experiments and considerations prompted Ritz at the beginning of the last century - long before Einstein and other scientists - to reject the ether and Maxwellian electrodynamics. It was Ritz (not Einstein!) Who first rejected the ether, proving its uselessness. For these revolutionary views, Ritz suffered, his ballistic theory was forgotten, so everyone was obsessed with the ether and Maxwell's theory. When the ether was rejected, everyone turned to the theory of relativity, although Einstein did not openly reject the ether and kept it, in fact, in formulas, indicating only the fundamental undetectability of the ether [81]. The differences between the three theories - Maxwell-Lorentz's ether theory, Einstein's theory of relativity and Ritz's ballistic theory - were popularly told in his introductory professorial speech by P. Ehrenfest, who communicated a lot with Lorentz, Einstein and Ritz [171, p. 12]. It was Ritz who found the third possibility - the golden mean between the two extremes - the theory of ether and the theory of relativity. If the theory of ether rejects both postulates of SRT, and the theory of relativity accepts both of them, then the BTR recognizes only the first postulate (in fact, the principle of relativity of motion, proved by Galileo), but rejects the second postulate, which contradicts mechanics and kinematics, about the independence of the speed of light from motion source.

So, the impossible (photons and ether) was discarded by Ritz. What's left? Ritz understood that since the ether theory was erroneous, then the light must still be a stream of particles emitted by the source and scattering away from it at the speed of light s . But he also understood that these particles cannot be, like Newton and Einstein's, quanta of light. So, Ritz concluded, these particles must be quanta, atoms of an electric field, impact! Since light is an electromagnetic wave, he reasoned, then the speed of light is the speed of propagation of an electric field. This means that the particles emitted by atoms with a speed c do not transfer the light itself, like Newton's corpuscles-photons, but only an electrical effect. Thus, Ritz immediately resolved all issues. In the words of Sherlock Holmes, Ritz gave not just a guess, but a hypothesis that explained all the facts without exception.

Recall that Ritz admitted that any elementary charge (electron) constantly emits microparticles in all directions - rheons R , having a standard mass m and scattering from the charge at a standard speed with, like a swarm of identical pellets fired by a gun. When these particles collide with other charges, they transfer their momentum mc to them, playing the role of elementary quanta (atoms) of electric impact. And the Coulomb force of repulsion of charges is made up of the impacts of many rheons in the same way as the force of gas pressure is made up of the impacts of many atoms (Fig. 6). This simple hypothesis made it possible to preserve the merits of the corpuscular and etheric theories, avoiding their vices.



Fig. 20. Ballistic principle: an increase in the speed of a light beam by the value of the speed v of the source. An analogy of firing a machine gun and a ray gun from an armored car on the move.

Indeed, since light is just a variable electromagnetic effect carried by a stream of particles emitted by a source, then there is no need for an intermediate medium-ether. And, if a stationary electron, throwing out a constant, stationary flow of spark-rheons (Fig. 7), has a constant electrical effect, then the oscillating electron creates a variable effect (light), just as the waves of a Bengal fire periodically change the strength and direction of the flow of sparks. According to the laws of mechanics, the light speed of the particles emitted by the electron must add up with its speed. And since light is the oscillation of an electric field carried by rheons, then its speed will also be formed by a sparkling analogy with the speed of electrons and a light source. Just like in mechanics, there will be no chosen frame of reference (all inertial frames are equal). The mechanical addition of the speed from rheons carrying light with the speed V of the source explains both Michelson's experiment and stellar aberration, which proved the dependence of the speed of light on the speed of the source. This addition of the speed of light rays with the speed of the source is completely analogous to the mechanical addition of the speed of emission of particles of α - and β -rays (helium nuclei and electrons) with the speed of their source (a grain of radium). It is this classical addition of velocities that constitutes the essence of the ballistic principle and the BTR (Fig. 20)

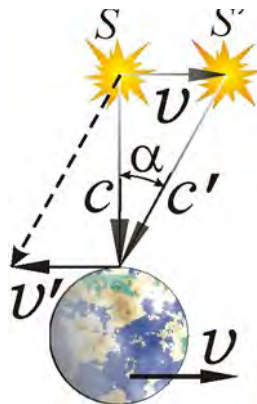


Fig. 21. The phenomenon of stellar aberration. Due to the motion of the Earth, the star is seen not in its real position S , but at the point S' from the mechanical ballistic addition of the speed of light c and the star v' .

Such a purely mechanical addition has long been evidenced by the effect of stellar aberration, discovered by J. Bradley back in 1727 [152]. The essence of the effect is that each star is seen not in its real position S , but in an offset - S' .

Due to the orbital motion of the Earth, its speed $\mathbf{v}$ is vector subtracted from the speed of light c coming from the star (in other words, c is added with the speed $\mathbf{v}' = -\mathbf{v}$ of the star relative to the Earth). The resulting speed of light, equal to c' , deviates from the original direction SO by an angle of aberration $\alpha = v/c$, and the light beam comes along the $S'O$ direction, in which the star is observed (Fig. 21)

This kinematic explanation of the effect naturally followed from Newton's theory of the outflow of light, depicted as a swarm of particles. Light rays from stars are seen to be deflected on Earth in its orbit, just as drops of sheer rain jets appear oblique to a running pedestrian or passenger on a bus [40]. Representing light in the form of a stream of particles, Bradley not only explained this effect according to the ballistic principle, but also determined the speed of light and the particles carrying it from the magnitude of the angle of aberration α [74]. From Bradley's kinematic considerations, it immediately followed the independence of this angle from the medium filling the telescope (Airy's experiment), since even before entering the telescope, the rays in the observer's system go at an angle α . So, the displacement of the apparent position of the stars in the sky due to the motion of the Earth and the result of the Michelson experiment (the constancy of the speed of light relative to the source during its movement) testify in favor of the fulfillment of the laws of mechanics and the Galilean principle of relativity for light: the speed of light is added to the speed of the source!

From this dependence of the speed of rheons on the speed of the charges that emitted them, as shown above (§ 1.8), naturally follows the existence of magnetic and induction forces of the corresponding magnitude. At the same time, rheons easily explain the wave properties of light. Indeed, during the oscillations of the charge that give rise to light, its effect on other charges changes periodically: a periodic distribution of rheons appears in space, which has a periodic oscillatory effect and is in many ways similar to a wave. But, if ordinary waves are the transfer of vibrations from point to point in a standing medium, then in the flow of rheons the "wave" moves along with the flow, having its speed c . Periodic influences of these streams add up (interfere) like waves. So Ritz proved the correspondence of the conclusions of his emission electrodynamics (ballistic theory) and Maxwell's theory, simultaneously ridding physics of the ether fog - the same fiction as all other ghostly media from phlogiston to caloric.

Having introduced the concept of rheons, Ritz was able to interpret light as a wave electromagnetic process, but already without a carrier medium (ether) in which these waves would propagate. If a resting charge, emitting rheons, creates a constant electric field, then an oscillating one already generates an electromagnetic wave (light), which moves like a chain of bullets fired by a machine gun from an armored car scurrying between two points (Fig. 22).

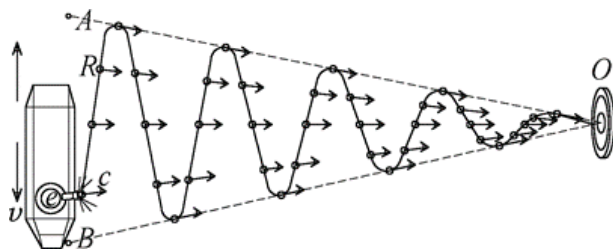


Fig. 22. An armored car, maneuvering between points A and B , depicts an oscillating electron e , firing rheons R at target O . The burst given by the "electronic machine gun" forms a wave-like chain of rheons and causes lateral vibrations.

Rheons ejected by the charge towards point O form a traveling wave in space, like bullets fired by a machine gun towards target O and flying up to it from one side or the other and, accordingly, pushing it back and forth (so does the field in t . About swings from side to side). In the absence of a machine gun, such a wave, according to the theory of expiration, is easy to simulate using a narrow stream from a hose-gun for watering plants. Driving them quickly to the right and to the left, one can observe how flying water droplets form a wave in space, a wavy chain running at the speed of the droplet ejection by the source (in the case of light, at the speed of the ejection of rheons by an electron). Several such waves, crossing and not interfering with each other (from the low probability of collisions of drops, bullets, particles), can add up and interfere. So it turns out that light is a transverse electromagnetic wave brought from a source to a receiver not by the medium, not by the field, but by particles.

So, **according to Ritz, light has a quite clear structure: it is a stream of homogeneous particles with a periodic (in density) spatial distribution, which moves along with the stream at the speed of light c .** Physicists have long known such beams of particles with a periodic distribution: they are widely used in accelerators and in microwave technology. For example, a klystron microwave device operates on a beam of periodically distributed electrons formed by it, forming regular bunches and rarefaction of the flow [103]. Likewise, oscillating charges in antennas form periodic beams of rheons carrying light. And physicists themselves have long depicted the movement and refraction of light by military analogy (hence the word "front"), likening a ray of light to a column of marching soldiers, whose periodic rows, like wave fronts of light formed by rheons, move together with the soldiers [95, p. 150]. These movable wave distributions are not waves in the strict sense of the word. After all, a wave is an excitation propagating in a stationary medium, and here we have a "wave" moving together with the medium, with a stream of particles - a convective (drift) wave. So the transfer of heat is in the form of heat conduction (without the transfer of the medium) and convection (with its rapid transfer). This medium-borne periodic distribution was called the "kinematic wave" for distinction [103]. These movable wave distributions are not waves in the strict sense of the word. After all, a wave is an excitation propagating in a stationary medium, and here we have a "wave" moving together with the medium, with a stream of particles - a convective (drift) wave. So, the transfer of heat is in the form of heat conduction (without the transfer of the medium) and convection (with its rapid transfer). This medium-borne periodic distribution was called the "kinematic wave" for distinction [103]. Therefore, Ritz's electrodynamics is often called kinetic, ballistic, emission. The very Latin word "emission", "emit", which is widely applied to light in many languages, including English, means not just "to emit", but - "to emit", "to eject", implying the propagation of light in the form of particles ejected by the source (approximately also talk about the emission of electrons, ions, etc.). And the term "laser" (from the English LASER, see "Used abbreviations") is derived from the words "emission", "induced emission of radiation" and, in its meaning, fully corresponds to the Russian term "ray gun". It is no coincidence that we also use

expressions like "a lantern casts rays of light", "a pillar casts a shadow", implying a mechanical ejection of light-carrying particles.

Many authors are perplexed why the SRT replaced the ether, if the BTR explained not worse the phenomenon of stellar light aberration and the negative result of the Michelson experiment, as well as other results that do not agree with the ether theory. Perhaps scientists were afraid to accept the BTR, believing that this is a return to the corpuscular theory of Newton's outflow, according to which all luminous bodies emit light particles - corpuscles that enter the eye and give rise to the sensation of light (now corpuscles are called photons). But the corpuscular theory did not explain the phenomena of interference and diffraction, which revealed the wave properties of light. Therefore, scientists once abandoned corpuscles, accepting the theory of the ether that conducts light vibrations and waves.

However, the BTR was not a simple repetition of the expiration theory. The spiral of knowledge has made a full turn, but its new turn did not coincide with the old one. On the contrary, Ritz was well aware that light is an electromagnetic wave, and he built his theory on the basis of electrodynamics, where there is no place for photons. Ritz, however, did not need them, because he showed that all the so-called "quantum effects", allegedly revealing the emission of atoms of separate portions of light quanta, upon close examination, turn out to be irrelevant to the structure of light, but are entirely due to the discrete structure of matter and atoms (see Part 3 and Part 4).

Thus, presenting light as a stream of particles (simpler than photons), Ritz easily and clearly explained its wave and quantum properties, the processes of emission and propagation of light in vacuum and media. That is why there are still many supporters of the ballistic theory, as the most natural consequence of the Michelson experiment and the aberration of starlight. It is no accident that soon after Ritz put forward his theory, similar ideas were independently proposed in 1910 by J. Kunz, R. Tolman, D. Comstock, O. Stewart, J. Thomson [6, 93]. It is not for nothing that such great minds as Alhazen and Kepler, who are deservedly recognized as the founders of scientific optics in the East and West, considered light to be a stream of particles ejected by bodies at a tremendous speed. This ancient idea of the ejection of luminiferous particles by bodies, revived by Galileo, Gassendi and Newton, prevailed not only throughout the 17th-18th centuries, but also in Ancient India, Greece and Rome, where for many centuries they adopted the luminous principles of Kanada, Democritus, Epicurus and Lucretius. forgotten in the dark, middle ages. The principle of scattering light by the sun and bodies was obvious to our ancestors, who revered Agni-Zeus-Perun as the supreme deity, throwing the light of lightning. It is no coincidence that on the signs of modern Russian radio operators and signal troops, as on ancient Roman shields, periodically jagged lightning is knocked out, thrown out by a charge and depicting the rapid flight of radio waves and light.

The idea that light is a stream of flying particles, and not vibrations of a standing medium, is close to everyone, as if we intuitively feel the true structure of light. It is not for nothing that painters and animators, who are sensitive to nature, often depict the light of a candle in the form of diverging concentric

circles, waves of light from individual rays, sparks emitted by a source. Even in language, it has developed so that light is described as something scattering like grains of matter, arrows, shells and bullets. So, the term "light scattering" implies the scattering of light by secondary sources in all directions, like seeds (their role is played by rheons). We also say: "a ray of light flew out, was emitted, flew, fell, bounced, reflected, hit, pierced." The very terms "ray", "radiation" are related to the words "bow", "splinter", "archer", since the rays of light have long been likened to arrows launched at great speed from a bow, not in vain and they are drawn in the form of arrows [82]. The Latin word "lux" (light) and the English word "look" have the same origin. So, beam laser weapons in science fiction were dubbed a beam gun, by analogy with a machine gun and a mortar, throwing, throwing shells. It is no coincidence that the Greek word $\beta\omicron\lambda\eta$ (bole), translated as "throw", "blow", also means a "ray of light" thrown by a source like projectiles. From this Greek root such words as ball ("ball" in English), ballista, ballistics, fireball, disco ball, bolometer (a device for measuring the energy of light) come from. By the way, the word searchlight - a device that lets out a powerful beam of light - in English also means a grenade launcher, a flamethrower: the word "project" means to shoot, to throw (not in vain a bullet, a projectile in English - projectile). Therefore, the Ritz ballistic theory of light (BTR) got its name very aptly.

The phrases "stream, source of light", expressions "light spreads", "shed light", "light streams, pours" - also imply the ejection of some matter by the light source, flowing out of it in the form of rapidly scattering particles. It is no coincidence that the BTR is also called the emission theory and the outflow theory [93, 153]. And charges with currents are usually called "field sources", which is natural, since they exude rheons. It turns out that intuitively we know about the structure of light, there is much more charge than any scientist who considers light as a wave rolling in an electromagnetic field. And intuition does not let us down. So, cosmic, channel, cathode rays, α -, β -rays turned out to be streams of homogeneous particles. Therefore, γ -, X-rays, rays of visible light and radio beams should also end up as streams of particles, and not some abstract, massless, immaterial photons, but - real particles with a standard mass. Only particles (not waves!) Can explain the gigantic speed of light (it is common in the world of microparticles), the straightness of its rays, the ability of light to transfer momentum (light pressure) and not decay in a vacuum (§ 3.21). It is not for nothing that simple optics has so much in common with electronic, ballistic optics, used in picture tubes, electron microscopes, where the functions of light beams are performed by electron beams [36, Vol. 1]. The same is true with respect to neutron optics, where flying particles also form rays similar in properties to optical radiation and moving according to the same laws of geometric optics. This optical-mechanical, ballistic analogy, known as the principle of least action, was gradually established by the efforts of Heron, Alhazen, Fermat, Hamilton precisely on the basis of the ancient representation of light in the form of a stream of particles.

So, Ritz's Ballistic Theory sheds light on the greatest and most confusing question in the history of physics about the structure of light, because light

in BTR is represented not by vibrations of an abstract incomprehensible electromagnetic field-field, but by the movement of elementary particles. According to Ritz, the nature of light is crystal clear: light is simply a stream of rheon particles modulated by a source, constantly emitted by charges and responsible for the electrical effect. Photons, ether, electromagnetic vacuum turned out to be superfluous. The need for a particle-wave dualism has disappeared as well. Everything that was explained with the help of photons was explained by waves, and everything interpreted in the language of ether, field, waves, was explained by means of particles (rheons). Light, optics, electrodynamics were reduced to visual mechanical models. In this Ritz saw the main merit of his theory. Only a theory that gives a simple visual representation in the form of particle mechanics can be considered truly materialistic. So, in thermodynamics, chemistry, the theory of electricity and magnetism, a mystical, abstract spirit also reigned for a long time, until they were reduced to mechanics - to the movement, collision and interaction of particles.

A true theory of light must be atomic, kinetic, just like the theory of matter. This was well understood by all the great atomists: Kanada, Democritus, Epicurus, Lucretius, Gassendi, Newton, Lomonosov and Tsiolkovsky. It is not surprising, therefore, that even 2500 years ago Democritus came to the same ideas as Ritz did about the propagation of light in the form of particles emanating from all bodies, forming periodically flying films (wave fronts according to S.I. Vavilov [31]). And soon the follower of Democritus, Epicurus, formulated the ballistic principle in his letter to Herodotus: "It may well arise in the surrounding air and such delaminations for the formation of hollow and thin surfaces, and such outflows that preserve the position and movement of solids. We call these prints" visibility "(eidos)" [77, p. 295]. The distances between these films-fronts of particles (in the present, wavelengths) determine, according to Epicurus and Lucretius, the color of the light rays. The same was taught by the ancient Indian atomist Kánada, who considered any ray of light to be a stream of periodically located standard point particles (no less than six), unable to give birth to light separately.

It is striking how Maxwell, one of the authors of the molecular-kinetic theory of gases and heat, created ether instead of kinetic electrodynamics. And only Ritz, like Sherlock Holmes (Fig. 23), removed the shackles of mysticism from optics, electrodynamics, physics of the atom, where dark mystical concepts still reigned



Вальтер Ритц Шерлок Холмс Профессор Эйнштейн

Fig. 23. Great thinkers.

- all these fields, ethers, photons, quanta, quasiparticles, waves of probability. As long as scientists believe in mysticism, do not stand firmly on mechanical, materialistic ground, science cannot be considered mature. This is why the representatives of official science who criticize Ritz's approach are, in their helplessness, like representatives of the official police who belittled the methods of Sherlock Holmes. Ritz was the first, but quickly extinguished ray of light, which for a moment cut through the darkness and illuminated the darkness that reigned in the teaching of light for centuries. Unfortunately, apparently, science also has a kind of mafia - the ruling elite pursuing special goals, going against the laws of Nature and cracking down on uncomfortable people [25]. There is also a "Professor Moriarty", in a fight with which "Sherlock Holmes" dies. This "scientific" superstructure probably sent Ritz and his theory into oblivion in due time, and darkness reigned in science for a long time. Only now all over the world researchers began to realize that the world is arranged much simpler than it was believed that the laws of nature are not only easily comprehensible, but also beautiful, natural, logical. It is the BTR that brings light to science and fundamental physics, like the luminiferous rheons discovered by Ritz.

§ 1.10. The Ritz effect

The speed of light emitted by a source depends on the speed of the latter only at the moment of radiation. Then the speed of light does not change: it is not affected by the further movement of the source ... Therefore, waves emitted at different moments, when the speed of the source had different values, can arrive at the target simultaneously, due to different speeds of light propagation.

Walter Ritz, "A Critique of General Electrodynamics" [8]

So, the basis of the BTR is the ballistic principle, which says that the speed of light, and the particles carrying it (rheons), add up with the speed of the source, just as the movement of the gun gives additional speed to the fired projectile. But so far, we have considered only the uniform motion of the source, relative to which the speed of light has always had a constant value c . Now let us study the case of an accelerating source (relative to it, the speed of light is equal to c only at the moment of emission). For this, we turn again to the ballistic model. Imagine an armored car going into the attack with acceleration a , firing a burst from a machine gun at a stationary target located directly on the course (Fig. 24). The bullets in the queue follow each other at equal time intervals T . Let us find with what period T' they hit the target.

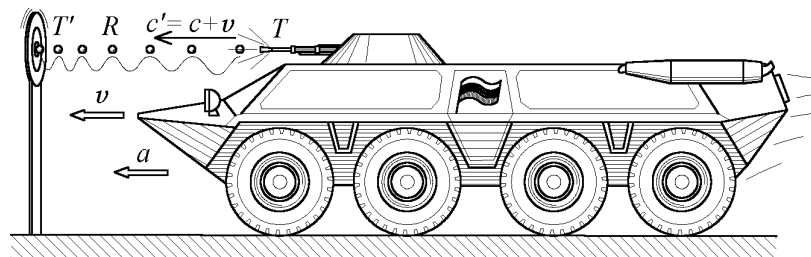


Fig. 24. An armored car going into the attack fires a machine-gun burst at the target. Bullets fired at period T hit the target at period T' .

The first bullet will reach the target in time $t_1 = L_1/v_1$, where L_1 is the distance to the target, initially equal to L (Fig. 25.a), and v_1 is the bullet velocity equal to the sum of the standard velocity c of bullets from the machine gun barrel and the velocity v armored car at this moment: $t_1 = L/(c+v)$. The next bullet will arrive at the target in time $t_2 = T + L_2/v_2$, where T is the time elapsed from the first shot to the second, and L_2/v_2 is the actual movement time of the second bullet. The segment L_2 , which it has to pass, will be less than L by the value of the distance traveled by the armored car during the time T , equal to vT , that is, $L_2 = L - vT$ (Fig. 25.b). The bullet velocity v_2 will also be different. The armored car moves at an accelerated rate, and after a time T its speed will be aT higher than the initial one. And the same speed of the second bullet will exceed v_1 , i.e. $v_2 = v_1 + aT = c + v + aT$. As a result, we have:

$$t_2 = T + \frac{L - vT}{c + v + aT}.$$

The time interval $T' = t_2 - t_1$ between two bullets hitting the target can be found as:

$$T' = T \left(1 - \frac{v}{c + v + aT} - \frac{La}{(c + v + aT)(c + v)} \right).$$

Considering the values of v and aT as small in the denominators (in comparison with the speed of ejection of bullets c), we obtain $T'/T = 1 - v/c - La/c^2$, or the same for frequencies ($f = 1/T$): $f'/f = 1 + v/c + La/c^2$. That is, the bullets on the target drum more often (with a frequency $f' > f$) than they fly out: the movement, as it were, adds the rate of fire to the machine gun.

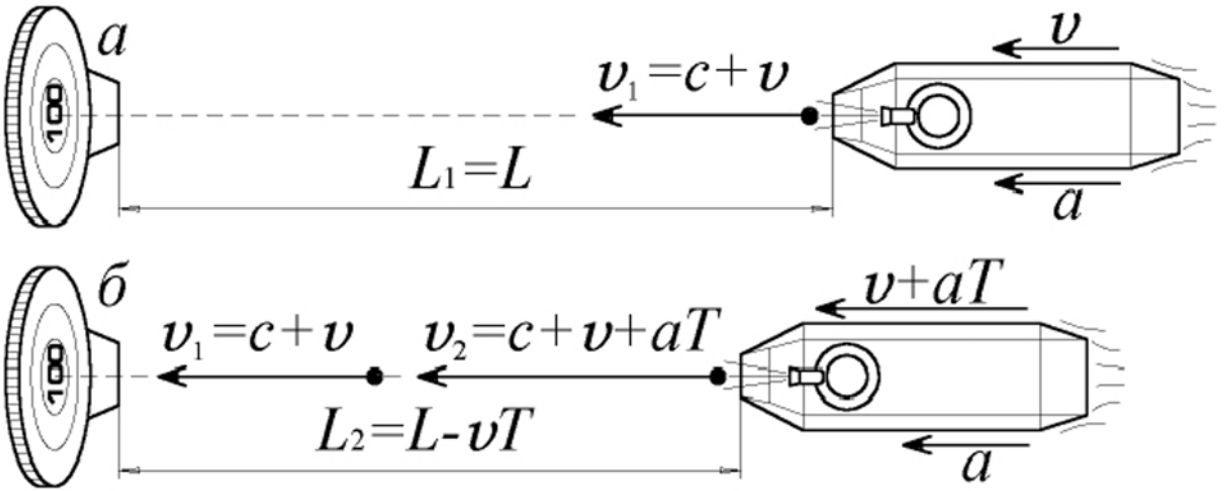


Fig. 25. Positions and speed of bullets, armored car at the beginning and after time T .

Applying the ballistic model to light (an armored car is a light source, and bullets are Rheons corresponding to wave crests and "fired" at the speed of light c), we get the same result: the apparent frequency of arrival of light waves, pulses from a moving source differs from the true one.



Fig. 26. Doppler effect - a change in the frequency of light due to movement.

Here, of course, there is no real distortion of the time scale, as in the theory of relativity. There is only an apparent change, as in the well-known Doppler effect (Fig. 26). The found formula will be reduced to it in the case of uniform motion of the source ($a = 0$). It is the Doppler effect $T'/T = 1 - v/c$ that traffic police use to determine the speed v of vehicle movement. To a motionless observer with sensitive equipment, the headlights of an approaching car will seem a little bluer than in reality. If the car is carried away, the light of its taillights, on the contrary, will seem a little redder than real: the movement changes the frequency of the light. This is due to the fact that when driving, the distance between the car and the observer changes. Therefore, two consecutive signals, say - two shots from a car, fired at an interval of a second, will travel this distance at different times (Fig. 27). So, when firing from a car going to the observer at a speed of 30 m/s, the second bullet will have to fly 30 meters less. Therefore, with a bullet speed of 300 m/s, the second bullet will win a tenth of a second at this distance. For this time

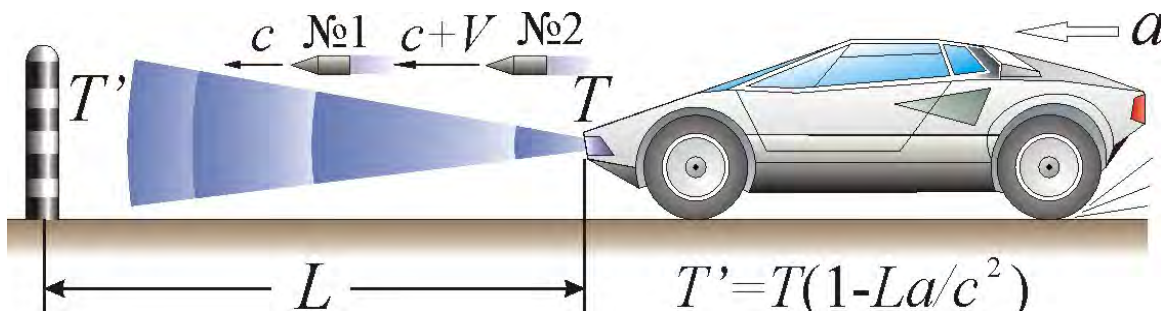


Fig. 27. The Ritz effect - the change in the frequency of light from acceleration. The starting car, having gained speed V after a time T , informs it to bullet #2. It gradually catches up with #1. As a result, bullets arrive with a gap $T' < T$.

difference stroke and the period between signals will be reduced for the observer: bullets will follow with an interval of 0.9 seconds, instead of 1 second. Likewise, for light, which is a flying sequence of wave fronts, the movement transforms the period and repetition rate of pulses, wave crests, that is, it changes the color of light according to the Doppler effect. But the formula found by Ritz back in 1908 [8] predicts, in addition to the Doppler effect, another effect.

Indeed, let the initial velocity v of the accelerated light source be zero. Then we arrive at the formula for the periods $T'/T = 1 - La/c^2$, or, taking into account the smallness of $La/c^2 \ll 1$, we obtain for the frequencies of light $f = 1/T$ and $f' = 1/T'$ the ratio $f'/f = 1/(T'/T) = 1 + La/c^2$. That is, even at zero speed, when the Doppler effect does not give any frequency shift, such a frequency shift of the signals is predicted by the Ritz formula (the frequency change is due to the increased speed

of the rear wave crests, signals: they catch up with the front ones, gradually reducing the gap, wavelength, Fig. 24). Let, for illustration, these signals again be two pistol shots from the car at the pole. The first shot is fired from a vehicle that has barely started accelerating and therefore has zero speed. Then the first bullet will move towards the pillar with a standard shot speed $c = 300$ m/s, having covered the distance $L = 900$ m to the pillar in a time $L/c = 3$ seconds. When, after the first shot, after a time $T = 1$ s, the second is fired, the machine, having an acceleration $a = 10$ m/s², will pick up the speed $V = aT = 10$ m/s. The car will additionally report this movement to the second bullet, so that its speed will already be $c + V = 310$ m/s, and the travel time will become $L/(c + V) = 2.9$ s, which is approximately $LV/c^2 = 0.1$ second less than the flight duration of the first bullet. Consequently, the bullets will come to the column with a gap $T' = T - LV/c^2 = T(1 - La/c^2) = 0.9$ s, less than the initial $T = 1$ s. As you can see, the effect is in many ways similar to the Doppler effect, but in contrast to it, it is determined only by the acceleration of the source a and grows with the distance L . By analogy with the Doppler effect, let us call such a method of influencing the frequency, unknown to science, the "Ritz effect" (Fig. 27).

In reality, this effect is usually rather small in comparison with the Doppler effect, and therefore it has so far rarely been detected and paid no attention to it. Indeed, the denominator of the expression La/c^2 contains a huge value of c^2 . Therefore, with accelerations a and lengths L achievable in terrestrial laboratories, the frequency correction $\Delta f = f' - f$ turns out to be extremely small and difficult to detect. But, as we will see, the effect becomes clearly visible at giant cosmic distances L (Part 2). Since in space the value of $\Delta f/f = La/c^2$ becomes large enough, this leads to giant shifts in frequency and period. This makes it possible to explain not only superpowerful explosions of supernovae and other variable stars, the spectral characteristics of objects, but also the cosmological redshift, predicting its correct value based on the BTR. However, on terrestrial scales, where the value of the Ritz effect $\Delta f/f = La/c^2$ of the frequency shift f , proportional to the distance L and the radial acceleration a of the source, is extremely small, it can still be fixed using the Mössbauer effect (§ 3.7). It was he who made it possible to reveal the frequency shift predicted by Ritz in the Bömmel experiment, where the radial acceleration a was given to a gamma-ray source located at a distance $L = d$ from the absorber. The shift in the frequency of gamma rays was $\Delta f/f = ad/c^2$, which exactly confirmed the Ritz formula [153, p. 136].

True, in the theory of relativity, acceleration can influence the frequency. However, in the Ritz effect, like the Doppler one, the frequency does not depend on the acceleration a itself, as in the theory of relativity, but only on its projection a_r onto the observer's line of sight - on the "radial acceleration". You can check this using the same Mössbauer effect. In astronomy and physics, it is customary to characterize the effect of frequency change for definiteness precisely by ray projections. So, the Doppler formula is written in the form $f'/f = 1 - V_r/c$, where V_r is the radial velocity of the source (in the observer's system), positive when it moves away and negative if the source approaches the observer. Here f is the frequency of light waves, signals, impulses launched by the source, and f' is the frequency of their perception by the receiver. Similarly, it is convenient to rewrite

the formula of the Ritz effect in terms of the radial acceleration a_r of the source. It is positive if directed away from the receiver or observer, and negative in the opposite case (that is, - opposite in sign to the acceleration a from Fig. 25). Thus, the formula for the Ritz effect will be written in the form $f'/f = 1 - La_r/c^2$ or $T'/T = 1 + La_r/c^2$, taking into account that $La_r/c^2 \ll 1$ (Fig. 28).

Although the Doppler and Ritz effects are markedly different, they still have a common nature, since both are caused by the relative motion of the source and receiver. Ritz showed very clearly in his work [8] that the reason for the change in the frequency of the received light in both effects is a change in the distance L

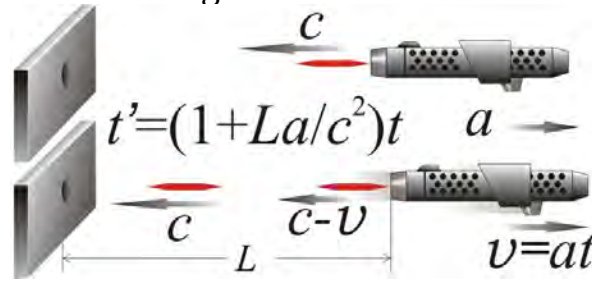


Fig. 28. Light pulses, launched by the laser after a period of t , arrive at the target with an interval of t' : due to acceleration, the speed of the second pulse is reduced.

between the source and the receiver - in their relative motion, leading to the accumulation or deficiency of waves on the path between the source and the receiver. The accumulation of waves at a distance, say, from the divergence of the source and the receiver, means that fewer waves arrive at the receiver per unit time than are emitted. And convergence, on the other hand, means that fewer waves are placed on the path and, therefore, the receiver absorbs more waves than is emitted by the source. Therefore, Ritz derived the corresponding formula $T'/T = 1 + (1/c) dL/dt$, where dL/dt is the rate of change in the distance L between the source and the receiver at the time of registration of radiation [8]. Since $L = V_r t + a_r t^2/2$, and the velocity $dL/dt = V_r + a_r t = V_r + La_r/c$ (V_r and a_r are the radial velocity and acceleration at the moment of emission, $t = L/c$ is the time during which the light comes from source to the receiver), then we obtain the simple formula $T'/T = 1 + V_r/c + La_r/c^2$, found above and taking into account both the Doppler effect and the Ritz effect. In the original note by Ritz [8], the synthesis of these laws was as follows:

$$\frac{dt'}{dt} = \frac{1 - \frac{u_r}{c}}{1 - \frac{r w_r'}{c^2}} = 1 - \frac{1}{c} \frac{dr}{dt}.$$

Here dt' , dt are elementary time intervals between the emission of two signals (rheon particles) and their reception, u_r is the radial velocity of the receiver, w_r' is the radial acceleration of the source, r is the distance between the source and the receiver. A lot is concentrated in this beautiful, laconic formula, which speaks about the nature of electricity, magnetism, light, mass, space, time, phenomena of space and microcosm. For example, Ritz himself used this formula to show that the electrical effect of one charge on another depends not only on their relative velocity u_r (§ 1.7), but also on the radial acceleration of the source $w_r' =$

a_r (§ 1.8). The latter leads to the fact that the concentration of $n' = n(1 - La_r/c^2)$ rheons, near the second charge, differs from the concentration of n rheons emitted by a uniformly moving charge. The concentration of rheons changes because all rheons emitted during the time interval T in the direction of the second charge will come to it during the period $T' = T(1 + La_r/c^2)$. And since an electron in all directions emits the same number of rheons in each time interval T , then when the charge is accelerated, the concentration and frequency of impacts of rheons on another charge should change, similar to the frequency of light $f' = f(1 - La_r/c^2)$. For the same reason, the brightness of light I from an accelerating source changes: all the energy emitted during time T and carried by rheons comes to the observer within the interval $T' = T(1 + La_r/c^2)$. That is, near the receiver, the concentration of light, the density of its energy flux, called brightness, should change to the value $I' = I(1 - La_r/c^2)$. This is of key importance for understanding the nature of the variability of cosmic sources (§ 2.11).

The Ritz form of writing "time intervals transformation" leads to an interesting conclusion: both the Doppler effect and the Ritz effect are a kind of law of conservation of the number of waves, conservation of time, in other words, the law of the continuity of the flow of time (similar to the laws of conservation of charge, mass and their continuity streams). If the distance between the source and the receiver does not change over time $dL/dt = 0$, then, regardless of how the source and the receiver move, the frequency should not change, because, otherwise, on the segment L over time, waves would either accumulate ad infinitum, or completely disappeared, which is impossible. Therefore, if the source and the receiver are installed on the same platform, then, no matter with what speed or constant acceleration they are moving, the receiver will always register the frequency of the source. If the distance increases $dL/dt > 0$, then the number of waves on it should also increase proportionally, which leads to a decrease in the frequency of received signals. Thus, the Ritz and Doppler effects are, in fact, one whole. There is, as it were, a single Doppler-Ritz effect (EDR) $T'/T = 1 + (1/c) dL/dt$, the particular manifestations of which are the Doppler effect itself $T'/T = 1 + V_r/c$ or the Ritz effect $T'/T = 1 + La_r/c^2$. When passing from one frame of reference to another, one effect passes into another.

So, let us have a stationary receiver and a rapidly receding source. According to the Ritz effect, this will lead to the fact that the frequency of the received light will be less by an amount proportional to the distance to the source and its acceleration. But we can go to the frame of reference associated with the source. In this system, the source is at rest, and therefore the Ritz effect can no longer lead to a frequency shift. But, in this non-inertial system, the receiver is already moving at an accelerated rate. Acceleration of the receiver does not give a frequency shift according to the Ritz effect, but leads to the fact that, at the moment of registration, the receiver will pick up some speed and move away from the source, leading to a frequency shift already according to the Doppler effect, exactly equal to the shift according to the Ritz effect obtained in another frame of reference. Thus, the effects are one and the same, since from the point of view of waves there is equality not only between all inertial frames of reference, but also between the accelerated ones.

And yet, for the sake of convenience and to avoid errors, it is always best to switch to the inertial frame of reference, usually associated with the receiver, since the acceleration of the source is often variable and this transition is not always possible. Indeed, in this case, more waves accumulate on some sections of the path, and less on others. So, if a platform with a fixed source and receiver moves with variable acceleration, say - oscillates, then, although on average the frequency recorded by the receiver will be the same as that of the source (for a sufficiently long period of time, the same number of waves arrive as were accumulate), the frequency recorded at each moment will change with the platform oscillation period, since the wave density is different on different sections of the path. And therefore, it is more correct and simpler to talk about a change in the frequency of the light of the source, based on its acceleration and speed at the moment of emission of light in the receiver's system, or, even more precisely, in the inertial frame of reference. This avoids confusion and mistakes. These are the depths of the Doppler effect, space-time relationships, discloses Ritz in his great work [8]. Speaking about the change in the time scale of a moving object according to the Ritz and Doppler effect, it is necessary to always remember that in these cases we are dealing only with an imaginary, apparent change in frequencies and times, in contrast to the theory of relativity, where the movement of a source supposedly affects time itself (§ 1.20).

And one more thing makes the Doppler and Ritz effects similar: the Doppler effect was not recognized for light radiation for a long time, primarily due to the unknown nature of light [153]. Only half a century after its discovery in 1842, the Doppler principle was able to establish itself thanks to the experiments of the Russian astrophysicist A. Belopolsky, who did a lot, as we will see, and to recognize the Ritz effect (§ 2.4, § 2.12). In the same way, physicists now deny the reality of the Ritz effect, since they still have not figured out the nature of light. But all the phenomena of space literally scream about the Ritz effect, as well as about the Doppler effect (Part 2). And, if it took half a century to establish the Doppler effect, then, as we see, a whole century was not enough for the recognition of the Ritz effect, discovered in 1908. Hopefully, this scientific injustice will soon be corrected, so that the Ritz effect finds important applications in science and technology (§ 5.16).

§ 1.11. Electromagnetic waves

In general, both theories [Maxwell's theory and ballistic theory] give identical results for Hertz's oscillations.
Walter Ritz, "A Critique of General Electrodynamics" [8]

As shown in the previous sections, Ritz was the first to explain the nature of light in a clear and intelligible way. For this, he did not need either a contradictory ether or paradoxical photons. Ritz managed to find a fine line between these two extremes. An uncompromising revolutionary in science, he rejected both aether with photons and the double-entry bookkeeping of particle waves in quantum mechanics. In ballistic theory, Ritz presented light in the form of a stream of rheon particles, which, radially scattering from electrons at the speed of light c , carry

electromagnetic effects and vibrations from charge to charge. Let us explain this using the model of the simplest emitter - a pulsating dipole (Hertz's dipole), in which two opposite vibrating charges, periodically converging and diverging, change the dipole moment.

The rheons emitted by the ends of the dipole will alternately push the charge Q in one direction or the other, as the "waves" of rheons arrive from the alternating states of the dipole (Fig. 29). This alternating electrical effect is accompanied by magnetic, caused by the movement of charges. These two vibrational actions on a charge, be it an electron in a receiving antenna or in a molecule of visual pigment of the retina, we call light, electromagnetic waves. Thus, Ritz, retaining the idea of Democritus, Galileo and Newton about a light ray as a stream of particles-corpuscles, was able to explain the wave properties of light: interference, diffraction, polarization. So, in the case of interference, the effects on the charge of two pulsating dipoles mutually annihilate (Fig. 29). The photonic model of light did not explain either the wave properties, or how the vibration of charges gives rise to light and photons.

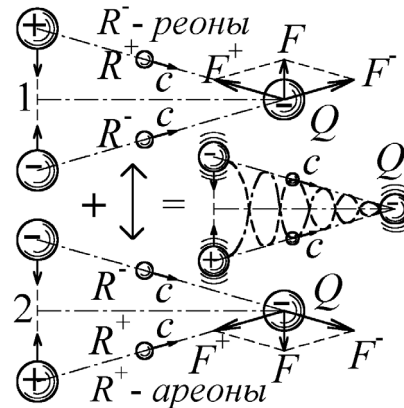


Fig. 29. Rapid alternation of states 1 and 2 of a pulsating dipole gives rise to a wave-like stream of rheons, oscillating the charge Q .

It is interesting that Democritus himself, who was the first to put forward the idea that light is carried by particles emitted by luminous bodies, the model of light in many ways resembled Ritz's. Indeed, according to the correct remark of S.I. Vavilov, Democritus, in his theory of outflow, also explained the wave properties of light. According to Democritus and Epicurus, luminiferous particles emitted by luminous bodies formed in space periodic, rapidly following clusters, films, similar to wave fronts [31, p. 101]. Similarly, in the Ritz model, rheons form periodic distributions in space, which explains the wave properties of light. And, just like in BTR, these particles follow orderly rows, waves, the order of which is not disturbed even when passing through transparent bodies (Part 1, epigraph). This even allowed Democritus to explain the interference of light, when he noted that due to entanglement, mixing, superposition of these periodic films, light can be extinguished, disappear, creating a false sensation [31, p. 104]. That is, light, combined with light, can give not only light, but also a shadow, and this is interference!

As Lucretius [77] shows, Democritus believed that white light is a mixture of colors, and the color itself is not an intrinsic property of particles (rheons), but is a spatial characteristic of the clusters, films formed by them (the period of wave fronts). According to Lucretius, talking about one's own colors, about the warmth of individual atoms and luminiferous particles, is as meaningless as about events, pictures of history, as the properties of individuals. It is interesting that these ancient atomists, having discovered the molecular-kinetic nature of heat and pressure, argued that, just as we do not feel heat, the impact of individual atoms, we do not distinguish between impacts of individual light waves provided by particles (rheons), and the eye perceives they are only averaged, in aggregate, due to the high repetition rate of particles [77].

In contrast to these theories of outflow, the field, wave theory of light, rejecting ether as its material basis, no longer allowed to understand how light propagates, because it did not explain what kind of matter it is - an electromagnetic field, what are its properties, since it is not ether. Even such a resourceful physicist as R. Feynman did not find a way to represent the field, except as a set of numbers assigned to each point in space. Therefore, we must admit that the field is not a physical object, but a purely mathematical abstraction, like non-existent lines of force. The field only sets the parameters of the system at each point in space. No wonder they talk about the field of velocities, pressures, temperatures, that is, - about the distribution of this parameter in space. So we will understand by the electromagnetic field not a substance, but exclusively the distribution of the density and speed of the flow of rheons in space.

In the same way, speaking in the BTR about electromagnetic waves, we do not mean the physical concept of a wave - a perturbation moving in a certain stationary medium, be it a field or an ether, but we mean only a periodic, wave distribution of concentrations and velocities of rheons, shifting along with their stream. And the wave here has only a mathematical meaning. After all, and calling waves sinusoidal wavy lines, road waves, dune ridges, no one puts a physical meaning into the word "wave". The problem of physicists of the last century was that they endowed their abstract mathematical constructions with physical meaning, reality. Such a formal description of nature led to nonsense. Ritz was the first to consider the ether and the field as a mathematical abstraction, a phantom [6]. And Einstein, absolutizing the movement of light and invisibly preserving the ether in his equations, did not openly reject it and was essentially an "etherist" who repeatedly defended the ether, especially in 1920.

In general, from the point of view of classical physics and from the standpoint of the BTR, the following can be said about light:

1 ° The motion of light is not absolute and has a speed with only relative to the source that emitted it and the inertial frame of reference associated with it. Relative to other bodies, the speed of light in vacuum is the vector sum of the speed of the source V at the moment of emission and the beam of light c .

2 ° Light is a process of alternating electromagnetic action, transferred from charge to charge by a stream of rehon particles flying

at a speed c , the speeds and concentrations of which are distributed in the stream in a periodic, wave manner.

3 ° The generation of light, electromagnetic waves is continuous and is always produced by oscillation of charges with a frequency equal to the frequency of radiation. And all "quantum" effects, the discrete nature of the radiation, the spectrum, are caused by the discontinuous structure of matter, atoms, but not light.

These propositions, which run counter to the theory of relativity and quantum physics, and in fact save nothing of them, constitute the revolutionary foundation of Ritz's theory and his model of the atom. And this is inevitable, since the BTR is based on a visual classical approach, representing its last stronghold. Ritz's ideas revived in the 1960s, proving their superiority. Some, for example R. Feynman, returned to these ideas without referring to him. Other scientists, for example P. Moon, B. Wallace, J. Fox, and others have found their rigorous substantiation. And today the BTR, getting out of the deep defense and forcing all the obstacles, goes to the firing line, again and again proving its superiority, both in space (Part 2) and in the microcosm (Part 3).

So, Walter Ritz showed that light is still a wave, but a special, kinematic wave [103]. If waves are usually understood as a perturbation diverging in a stationary medium, then according to Ritz's theory, light is a wave moving along with the medium - with a stream of rheon particles emitted by the oscillating charges of the source and therefore borrowing the speed of the source. The flow of particles has a wave distribution of concentration and velocity in space, shifting with the flow. This exotic type of waves accompanied by medium transfer is also found in plasma, in microwave klystrons [36, Part II; 103]. In plasma, such waves, flying together with the modulated particle flux, are called "Van Kampen waves" and are obtained as one of the solutions to the kinetic equation of A. Vlasov, a physicist whose many ideas have something in common with those of Ritz. By the way, the notorious de Broglie waves are believed to move together with matter and particles. It turns out that quantum mechanics in some way repeated the Ritz model of light, but only this last one gave a clear rational explanation to the properties of light. Only Ritz managed, balancing on a ballistic model of light, to walk along the razor's edge, not dodging an iota either towards particles or towards waves, remaining at the height of common sense. All others tilted to the sides and fell into the abyss of mysticism or obscurantism. This is how hundreds of scientific research institutes of CHAVO (Particles-Waves), occupied instead of science with absurd inventions, arose.

So far, we have considered electromagnetic waves in the BTR qualitatively. Now, for a better understanding of the process of emission and propagation of light, we will analyze them quantitatively - using the example of the same simple antenna (Hertz dipole) - a metal rod through which an alternating current $I(t)$ flows. Such a rod emits electromagnetic waves with a frequency equal to the frequency f of current oscillations. Since the current is the movement of charges, the antenna can be represented as oscillating charges of different signs, periodically changing places (Fig. 29). In fact, it is an electric dipole with a

variable dipole moment. Accordingly, the dipole will exert an effect periodically varying with frequency f on a charge placed next to it. The spatial distribution of rheons in this case is of a periodic nature (Fig. 30) and is trivial, since it reflects the case of a quasi-stationary action of the antenna on the charge.

This case, however, clearly demonstrates the impotence of the photonic model. After all, a photon, having energy hf , carries information about the oscillation frequency f . However, it is not clear how a continuous oscillation of charges with a frequency f generates photons of the form hf , since this quantity is specified according to quantum theory only by the difference in energies before and after radiation. It is all the more unclear how a group of independent photons, or even a single photon, can cause the test charge to vibrate with frequency f . Scientists easily manipulate photons when they are emitted and absorbed by an atom, because no one really knows the mechanism of this radiation and one can get off with foggy quantum transitions. But scientists are immediately lost, as soon as they are asked to explain how photons of the radio frequency range arise and are

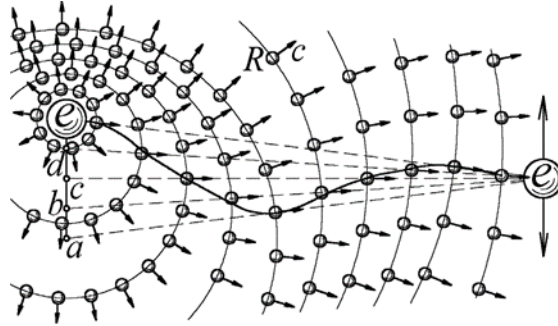


Fig. 30. An oscillating electron, sequentially occupying positions a, b, c, d, e, creates a wave-like stream of freely flying rheons, traveling at the speed of light and vibrating another electron.

absorbed in devices such as antennas, where everything is transparent and it is impossible to catch up with fog. The hypothesis of photons would instantly disappear if the mechanism of the atomic emitter became clear (§ 3.1).

But let us return to the analysis of the antenna and consider its radiation no longer in the quasi-static zone, but in the wave zone, when the charge is far enough from the antenna and the time of movement of light to the test charge becomes much longer than the period of current oscillations. It is in the wave zone that what is called light, electromagnetic waves, arises. Indeed, in the quasi-static zone, the electric impact, although large, quickly decreases with distance r : the dipole field decreases in proportion to r^3 . In the wave zone, the electric E and magnetic H fields decrease as $1/r$, and the light intensity EH - as $1/r^2$. But how is this possible, if even for a single, uniformly moving charge, the fields E and H fall off as $1/r^2$, and for a system of charges - even faster?

The thing is that in the BTR there is a previously unknown Ritz effect, which is valid both for light and for any other electrical influences carried by rheons (§ 1.10). Its essence is that when a charge moves with a variable speed (with acceleration a), it gives the rheons a different additional speed, which is why the rheons are grouped together - they cluster or diverge, and the stronger, the further they fly away from the source (this is how the klystron forms initially homogeneous electron flux bunches, nodes [36, Part II; 103], see § 2.11).

Accordingly, the force of the impact of rheons increases or decreases in proportion to their flux density $n' = n(1 - ra_r/c^2)$: a hail of rheon bullets drumming on the charge more or less often (Fig. 31). And if the charge fluctuates (the projection of its acceleration a_r changes), then this leads to a grouping of rheons emitted with positive radial acceleration, and - rarefaction of those emitted with the opposite one, - the antenna, modulating the flow of rheons in speed, modulates

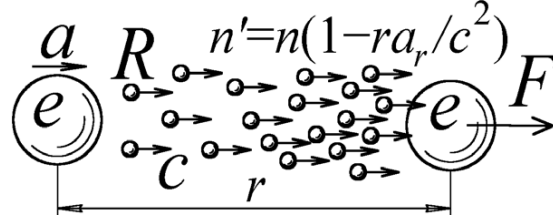


Fig. 31. The Ritz effect. The movement of a charge with acceleration a increases the density n of the flux of rheons emitted by it, the frequency of their impacts on another charge, and the repulsive force F if the radial acceleration $a_r < 0$.

it in density. Periodic rarefaction bunches of rheons appear in space, moving with their light speed c . Since the BTR is also called the theory of outflow (§ 1.9), the light waves of the rheon flux density from vibrating or spinning charges are similar to visible waves from rotating lawn sprinklers and fireworks wheels (see cover), emitting multi-turn spirals scattering at the speed of droplets and sparks. As the rheons move, the density of their clumps increases (Fig. 32). Fluctuations in the concentration of rheons in the flow lead to fluctuations in the electric field E , proportional to ra_r/c^2 . These vibrations are recorded by the receiver, while the constant component of the field of mobile electrons is neutralized by the same field of stationary positive metal ions.

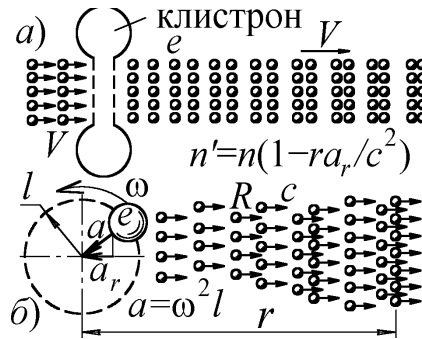


Fig. 32. a) the klystron modulates the flux density of n electrons, giving them different speeds, b) similarly, charge or star oscillations that change the speed of rheon launch form periodic rarefaction bunches of the rheon flux, giving rise to oscillations of electric force, frequency and brightness of light.

The field of a stationary charge q is found as $E = q/4\pi\epsilon_0 r^2$, and for an oscillating one, the amplitude of field oscillations will be $E_{ra}/c^2 = qa/4\pi\epsilon_0 rc^2$ (Fig. 33). Since the amplitude of the acceleration of a harmonically oscillating charge is $a = \omega^2 l$, where $\omega = 2\pi/T$ is the cyclic oscillation frequency, l is the antenna length, then the amplitude of the electric field oscillations in the wave zone is $\Delta E = q\omega^2 l/4\pi\epsilon_0 rc^2$. But $q\omega$ is the amplitude of the current I , and $c^2 = 1/\epsilon_0\mu_0$. Hence, $\Delta E = I\omega\mu_0/4\pi r$. This is exactly how the electric field of the emitter is located in the

wave zone [88]. As you can see, the field actually decreases as $1/r$. A similar calculation can be easily performed for the magnetic field H , which also decreases as $1/r$. After all, the magnetic effect, as an electrical one (more precisely, as a particular type of it), is proportional to the concentration of rheons in the stream. And the radiation power density (light intensity), equal to the product of E and H , decreases, as expected, in proportion to r^2 , and the radiation power increases with its frequency ω . Gives the BTR and the correct antenna pattern.

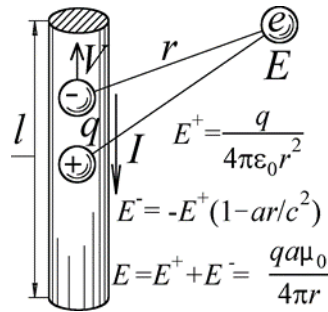


Fig. 33. Oscillations of the current in the Hertz dipole correspond to the oscillation of the acceleration of charges with amplitude a , which leads to a periodic change in the field near the test charge.

Note that vibrations of electrons in antennas can also lead to distortion of the sinusoidal form of an electromagnetic wave. After all, moving electrons impart their speed to light, and therefore half of the rheon period are launched at a speed greater than c , and half - with a lower one. This means that some rheons, catching up with others, could greatly change the sinusoidal profile of the wave, as it was assumed and found in binary stars (§ 2.10), but which, however, was not noticed in radio waves. However, as Ritz showed [8], such distortions cannot be noticeable due to the fact that the electron velocities in the antennas are much less than the speed of light, and the inhomogeneity of electrons in velocities can lead only to small wave periodic perturbations of a homogeneous rheon flux, due to which electromagnetic waves. But if the speed of the vibrating electrons approaches the speed of light, these distortions can become noticeable even at terrestrial distances. So, in synchrotrons, electrons are already spinning at near-light speeds, and therefore, according to Ritz, they should emit nonharmonic waves. This should manifest itself in the complication of the radiation spectrum, since an inharmonic periodic signal, when decomposed into a spectrum, gives, in addition to the fundamental frequency, many multiples of it. If electrons usually emit waves only with the frequency of their rotation, then in the synchrotron the synchrotron radiation emitted by them through the BTR will have a complex frequency spectrum. Radiation will go not only at the electron rotation frequency, but also at doubled, tripled and other multiple frequencies, as well as for binary stars, the distortions introduced by the rotation of stars in orbit generate brightness and spectrum variations - with frequencies that are multiples of the star's rotation frequency [3].

And, indeed, in synchrotron radiation, as the electron velocity increases, the spectrum becomes more complex, which contains, in addition to the fundamental frequency, multiple harmonics. Moreover, as the speed of electrons approaches light, the intensity of higher harmonics increases, being given by the expansion in a Fourier series of cylindrical functions. But just with the help of cylindrical

(Bessel) functions, they describe the shape and spectrum of kinematic waves [36] generated due to the ballistic principle by double stars and klystrons (§ 2.10). It is no coincidence that in klystrons the electron bunching effect, similar to the Ritz effect for light, is used to multiply the radiation frequency. In synchrotron radiation, this effect is especially pronounced: as the speed of electrons approaches the speed of light, their invisible HF radiation, due to the transformation of the spectrum (which can also be understood as a manifestation of the Ritz effect from a giant centro-rapid acceleration), becomes visible: spinning electrons begin to glow first with red, then blue light. Thus, the so-called "relativistic" electronics does not contradict, but just confirms the BTR, refuting the SRT and Maxwellian electrodynamics.

Nevertheless, oddly enough, it was Maxwell's consideration of electromagnetic waves that led to Einstein's theory of relativity, when he tried to understand what an observer would see, riding a light wave and moving at the speed of light. It turned out that he would register the constant values of the electric and magnetic field of the wave in the absence of nearby charges and currents, which is impossible according to Maxwell. Hence, Einstein concluded that the observer cannot move at a speed equal to or greater than c . In fact, the problem is not in mechanics, but in Maxwell's theory, which erroneously gives the same field values - regardless of the observer's motion. And, according to Ritz, the fields change, and an observer flying at the speed of a light wave simply will not see it (all fields will vanish), since the rheons carrying the wave do not catch up and do not overtake him, and therefore have no effect. So, even on a balloon flying in a wind stream, the observer does not feel a breath, since the balloon flies at the speed of the wind, that is, - the total speed of air atoms. This can be understood without referring to the BTR, but remembering the Doppler effect: the faster the observer moves away from the source, the lower the frequency and energy of the light signals received by him. At the light speed of the observer, the energy and frequency of light vanish: the observer does not register anything, and Einstein's reasoning loses its meaning. And it was on such and such incorrect thought experiments, without involving any real facts, experiments, and the whole theory of relativity was built. Already from this it is possible to draw a conclusion about the degree of its "legitimacy".

It is no coincidence that physicists in the study of electromagnetic processes often use Galileo's transformations, not Lorentz's, and not only for convenience, but also because relativistic formulas are sometimes generally inapplicable. For example, when analyzing laser light pulses and solitons, it is often convenient to switch to a traveling coordinate system moving at near-light speed, including for describing changes in the pulse shape, for analyzing how one pulse overtakes another and interacts with it, exchanging energy due to nonlinear effects. And, applying Galileo's transformations, they get results consistent with experience! Likewise, when analyzing waves in a plasma, physicists calmly pass into a traveling frame of reference, using Galileo's transformations for convenience. Moreover, this moving system often moves with superluminal speed (superluminal propagation of concentration fronts is possible in plasma), at which the Lorentz transformations are generally inapplicable, and relativistic formulas

give absurd results. And Galileo's transformations not only continue to operate at such speeds, but easily lead to correct results. But physicists, realizing that this contradicts the letter of the SRT laws, carefully call such a transition to a running coordinate system by the formal term "comparison of electrodynamic systems".

The initial premise of Einstein, who believed that only the Lorentz transformations retain the form of Maxwell's equations (covariance), turned out to be false as well. In fact, Galileo's transformations do not change Maxwell's equations if, when switching to a new reference system, the field values change accordingly ([Miller M.A., Sorokin Yu.M., Stepanov N.S. // Phys. . 3, 1977](#)). It is this transformation of the fields that Ritz's electrodynamics asserts: the fields inevitably change due to the finite speed of propagation of influences (§ 1.7). Likewise, in space with radar, as B. Wallace notes, scientists have long been using the classical Galilean formula for adding the speed of light to the speed of a source (§ 2.1). So it turns out that physicists and astrophysicists, in words recognizing the theory of relativity, in fact have long been using the formulas of classical mechanics of Galileo and the ballistic principle, and, first of all, in the area for which the theory of relativity was conceived: to describe electromagnetic processes and Sveta. And, calculations according to SRT are not only more complicated, but sometimes completely unacceptable, giving absurd results that do not correspond to experience!

§ 1.12. Interference, diffraction, reflection and refraction of light

The new theory describes electromagnetic waves well. Hypothetical particles, periodically distributed in space and time, cause oscillations of electrons. The addition of their effects by interference creates various phenomena: reflection, refraction, etc.
Walter Ritz, "A Critique of General Electrodynamics" [8]

It was shown above that although light is carried by particles, it still has many of the properties of a wave. In the BTR, the wave properties of light arise not as a manifestation of an abstract-formal corpuscular-wave dualism, but as a natural consequence of the mechanical model of electricity proposed by Ritz. Therefore, despite the fact that Ritz's theory was in part a return to Newton's corpuscular theory of light, the BTR solved the main problem of this theory of outflow. Indeed, as Ritz showed, his theory easily explained the phenomena of interference and diffraction (light bending around obstacles), which were a stumbling block for corpuscles. Consider how light and BTRs get around these stumbling blocks.

First of all, in Ritz's theory, light is capable of interfering (§ 1.11). In other words, two beams of light are able not only to enhance, but also to extinguish each other. This would indeed be impossible if radiation propagated in the form of light quanta. After all, the addition of two identical beams would double the number of light particles entering the photodetector, would double the energy brought by the corpuscles, and hence the intensity of light. But in Ritz's theory, light is transferred not by quanta, not by particles of light (photons), but by quanta of the electric field, or by rheons. Light, according to Ritz's theory, is an alternating electrical effect carried by particles. As shown above, two such influences, two alternating electric forces from two sources emitting light in

antiphase, neutralize each other. Rheons still come from sources, but their effects on the test charge in the receiver will cancel each other out, being directed in different directions, or add up if the influences from two sources come in phase. Thus, Ritz's theory explains in an elementary way the phenomena of interference, say, Newton's rings, interference fringes, etc.

However, supporters of ether and Maxwellian electrodynamics may argue that within the framework of the concept of light as a stream of particles, it is impossible to explain the phenomena of diffraction, i.e. light bending around obstacles. A light wave traveling in the ether or transmitted by an electromagnetic field could easily bypass the screen, creating a bright spot behind it. But how is this possible for a wave moving in a straight line with a stream of particles? However, already Lorentz showed that the "bending" of the screen by light is not at all the same as the flow around obstacles by waves on the water. It turns out that the light falling on the metal screen is not at all delayed by it: electromagnetic waves (carried by rheons) freely pass through all obstacles. Where, then, is the shadow behind the screen? Electrodynamics gives a simple answer to this: an electromagnetic wave, passing through a metal, makes its electrons vibrate, and the vibrating electrons serve as sources of secondary waves emitted in antiphase with the incident one. These secondary waves created by the screen, interfering with the transmitted wave, just extinguish it (Fig. 34).

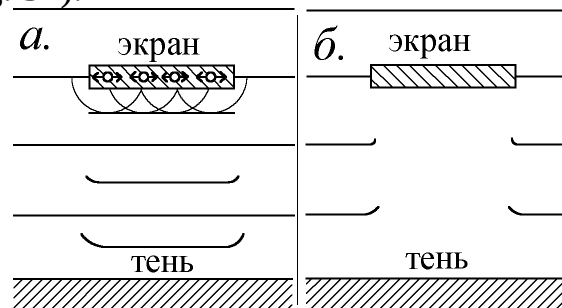


Fig. 34. The nature of the shadow: a) for light waves; b) for waves in the medium.

This is how a shadow appears behind the screen. Sometimes they also fight with noise at airports - they do not delay it, but they put devices that generate noise in antiphase. It turns out that the expression "the screen casts a shadow" has not a figurative, but a completely physical meaning, since the shadow is created by the radiation of the screen emanating from it in the form of luminiferous rheon particles thrown out by the metal. In exactly the same way, in electrostatics, a metal screen shields an electric field - behind a metal plate, the field is equal to zero. But this happens not because the metal delays the electric effect (according to Ritz's theory, rheons easily pass through any obstacles), but because the field, acting on the electrons of the metal, redistributes the charge in the metal in such a way that the charge of the polarized metal creates a secondary field, which, adding up with the original, completely extinguishes it. Roughly the same thing happens in electrodynamics, in an electromagnetic wave.

At a sufficiently long wavelength, the interference of the secondary waves emitted by the circular screen with the incident one creates a light spot in the center of the shadow and more complex interference patterns (Fig. 35). For this,

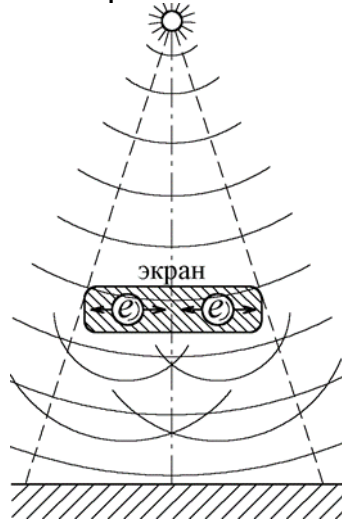


Fig. 35. Diffraction of light is created by the interference of secondary waves coming from the vibrating electrons of the screen.

the luminous flux does not need to bend around the screen. It was Lorentz who clarified this issue. In his electronic theory, he showed that the commonly used Huygens principle, according to which every point on the wave front in empty space can be considered a secondary source, is incorrect. Only charges can serve as a source of waves: waves do not arise in empty space. An electromagnetic wave passing through a medium causes vibrations of electrons in the atoms of this medium. Oscillating electrons emit secondary waves with their own oscillation frequency. These secondary waves, adding up, interfering with each other and with the initial wave, give rise to various phenomena: a change in the wave velocity in the medium, dispersion, diffraction.

So, the diffraction pattern behind the screen is created not by the waves from the source that have circled the screen, but by the screen itself, which is the source of secondary waves. If the screen is a metal plate, then these are free electrons of the metal. If the screen is an opaque dielectric, then these are bound electrons of atoms and molecules. They, again, not only extinguish the incident radiation, but generate antiphase radiation during oscillations, which extinguishes the light behind the screen.

The fact that the light reflected by the medium or transmitted through it is not created by the source itself, but precisely by the medium, is at least convinced by the phenomena of reflection and refraction (refraction of light by the medium). Indeed, when light is reflected by a metal polished mirror, we see the source not in its real position, but in a completely different one: we see not the light of the source itself, but only its reflection. The rheons of the incident wave hitting the metal cause the electrons of the metal to vibrate with the frequency of the incident rheon wave. These electrons, when vibrating, emit secondary waves and, thereby, create a new ray of light and an imaginary image of the source. At the same time,

the original rheons freely pass through the metal and continue their path in the original direction.

In the same way, the rays are refracted in the medium, which is why the light source is seen not in its true position, but in a displaced one. A ray of light passing through the prism, as it were, changes its direction. But as follows from Ritz's theory, rheons carrying a light wave always propagate in a straight line and at a constant speed, even passing through material media. The medium does not affect the movement of the rheons in any way. Therefore, the beam should, meeting the environment, propagate in the same direction, like a bullet piercing glass. The fact that this direct initial ray disappears and a new ray emerges, coming from the medium in a new direction, just proves that the medium generates under the action of the incident light - secondary waves that quench the original ray through interference and generate a new one going in a different direction ... Energy re-emission occurs, due to which we observe not the original light of the source, but only the secondary radiation of the medium. So, in the mirror and in the prism, we observe the light not of the source itself, but the light re-emitted by the atoms of the reflecting and refractive medium (Fig. 36).

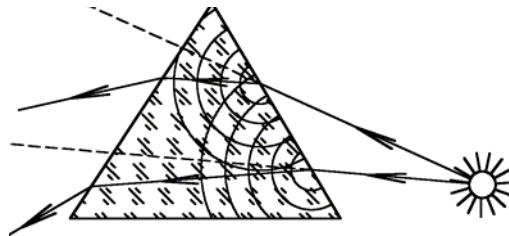


Fig. 36. When light passes through the medium, we see not the direct (initial) light of the source (it is extinguished by interference), but the secondary radiation of the medium that re-emitted the light.

For the same reason, the speed of light in the medium changes. After all, rheons, according to Ritz, are always emitted by charges with the same speed, equal to the speed of light, and this speed is maintained throughout their path. Rheons and oscillating charges of the medium emit at the same rate. Therefore, the initial wave and secondary waves emitted by the charges of the medium propagate with speed c . However, the addition of these waves gives a new distribution of rheons. And, although the rheons themselves move with a speed c , the density distributions formed by them are displaced with a different, lower speed. This can be illustrated with two combs. If we fold the combs so that one is slightly turned in relation to the other, we will see a moiré pattern - an alternation of dark and light stripes formed by the teeth of the combs. In this case, the distances between the stripes differ from the distances between the teeth. If we begin to move the combs along their axes at constant speeds, we will find that the moiré stripes move at a different (greater) speed. Likewise, the distributions of rheons arising from the addition of two waves, corresponding to the crests of a new wave, move with a speed different from the speed of the rheons. And the distances between the new crests are different from the distances between the crests of the original wave. Both the speed and the wavelength change in the medium. The reason for this will be discussed in more detail in the next chapter.

Thus, to describe light moving in a medium, it is no longer enough to have only the characteristics of the source - it is necessary to take into account the parameters of the medium, which itself becomes a source of waves. That is why Ritz sincerely admired the electronic theory of Lorentz, since it deprived the ether of many advantages (important for explaining diffraction, the change in the speed and direction of light in a medium due to a change in the density of the ether, etc.). Thus, according to Ritz's correct remark, Lorentz's electronic theory was a partial return from Maxwellian electrodynamics to the electrodynamics of Ampere, Weber and Gauss, where there were problems just in the interpretation of phenomena in media. It is interesting in this sense to note that Democritus and Lucretius, who developed the corpuscular theory of light, close to the rhythmic one and even explained the interference with it, were well aware of the role of the intermediate material medium: air, mirrors and other media located on the way to the eye. So, Lucretius argued that light, interacting with environments, creates secondary radiation, is transformed, passing them, and, already in this altered form, is perceived by the eye [77, p. 131]. The same atomists asserted that bodies do not create barriers to light, but freely let its particles pass (Fig. 34), and only the secondary radiation that has arisen in the medium, merging with this light, creates a shadow and other effects.

Likewise, the great minds of the Renaissance: Leonardo da Vinci, Galileo, Newton, having revived the views of Democritus on light, did not see a contradiction in the representation of light as a stream of particles running in waves. All these thinkers-engineers boldly used a ballistic analogy in their works on optics, citing as an example cannons, shotguns and ballistas, bows and crossbows to depict how impacts, impulses, including light ones, scatter and are transmitted from one body to another. Already Leonardo da Vinci showed that light scatters from lamps in myriads of particle-images forming successive spherical fronts, such as spherical blast waves from fire and fragments from the explosive bomb invented by Leonardo. These light waves, according to Leonardo, like the waves of fragments, freely pass through each other and interfere, like waves on water. Following this, Galileo in his "[Conversations](#)" likened a distant source of light to an artillery battery, sequentially throwing out nuclei and flashes of light. With the tremendous speed of these light projectiles, Galileo explained the gigantic speed of propagation of light and its thermal, destructive effect, especially noticeable in incendiary mirrors. And the same Galileo, in his [Dialogues](#), substantiated the ballistic principle, showing that the movement of a weapon (or a light source) imparts an additional velocity to the projectiles (or light particles) thrown out. Finally, Newton realized that particles of light, flying like projectiles through air and water, cause by their impacts vibrations of their particles (electrons), emitting from this new particles of light, forming secondary light waves, like a flying projectile, scattering atoms of air and splashing water from its path.

The formation of secondary waves in the medium, caused by the main wave, partly resembles the Huygens principle, according to which each point in space at the wave front can be considered as a new source of secondary waves. But there is a significant difference. According to Ritz, secondary sources arise only in the

environment, in screens, - only where there are charges, since, according to electrodynamics, only oscillating charges can be a source of waves, because waves cannot be born in empty space. According to Huygens, the opposite is true: secondary waves arise in empty space and do not arise where there are material obstacles, screens. This was a direct consequence of the ether theory. After all, the aether, according to the theory, should be present even in a vacuum, and the disturbances in it, indeed, were transmitted from point to point by means of secondary waves. But, since there is no ether, then the Huygens principle can no longer be used. It can be used now - only as a convenient formal technique that does not reflect the real essence of what is happening and therefore sometimes gives a false result.

Nowadays, all these questions of interaction of waves and matter, from the point of view of the electron theory of Lorentz, are considered in detail in the course of molecular optics [74, 136]. Any textbook on electrodynamics [88] also tells about such an interpretation of diffraction. And, nevertheless, in the school and university curriculum, light continues to be considered as a wave moving in an environment, they continue to use the incorrect Huygens principle. That is why, in the future, many are no longer able to get rid of the imaginary need for a stationary medium for the propagation of light, from the idea of ether. As Einstein correctly noted, Lorentz was the first to show the limitations and uselessness of the ether, and with it the Maxwell electrodynamics based on the ether. The experiments of Michelson and Troughton-Noble finally dispelled all illusions about the reality of this ephemeral substance with contradictory properties.

So, Ritz's theory, depicting light as a stream of particles, perfectly explains the phenomena of interference and diffraction and offers, in fact, the first consistent way in the history of science to describe the wave properties of light within the framework of the corpuscular approach. However, it is possible that a similar corpuscular model of light existed in antiquity, as the example of Lucretius or Da Vinci shows. The idea that our ancestors considered light to be a wave-like stream of particles capable of bending around obstacles, diffracting onto them is already suggested by the word *lux* (light) itself, which has a common root base with the Russian word *bow*, ray, torch, and with the English *look* (*look*, § 1.9). After all, our ancestors likened the rays of light to a stream of arrows from a bow, and at the same time the word "bow" meant "curved", "wavy" (hence the phrase "bend of the river", "bow of the saddle"), since the classic bow had a complexly bent, wavy shape. And therefore, perhaps, this small arms reflects the ideas of the ancients and about the wave structure of light, capable of bending around obstacles, allowing the light source to literally "shoot from around the corner."

§ 1.13. Interaction of light from a moving source with the environment

Therefore, I will assume that any charged point emits at every moment in all directions fictitious particles, infinitesimal and launched at birth with the same radial velocity c , which retain their uniform motion, regardless of what bodies they encounter.

Walter Ritz, "A Critique of General Electrodynamics" [8]

The first postulate of the theory of relativity about the equality of inertial systems, including for the phenomena of optics and electrodynamics, is beyond doubt. However, the second postulate - about the independence of the speed of light from the mutual motion of the source and the observer - is not only not proven by experience, but also contradicts the first (hence all the paradoxes of SRT). After all, the equality of all systems follows precisely from the classical law of addition of velocities. As Galileo showed, the falling of bodies inside a standing and floating ship is identical because, in the case of motion, the falling bodies are told the speed of the ship (Fig. 37). The same property was found in light: for it, as Michelson's experiments and the aberration of starlight showed, the classical rule for adding velocities (adopted in the BTR) worked. Michelson, who graduated from the naval academy and sailed a lot himself, essentially repeated Galileo's experience with a ship, but used the Earth itself as a ship, and light as an abandoned body. From these experiments followed the relativity of the movement of light and the first postulate of the STR (in fact, just Galileo's principle of relativity). The second postulate, on the contrary, made the movement of light absolute, as if its speed c was not influenced by the relative movement of the source and the observer. It is not for nothing that Max Planck called the theory of relativity "the theory of absoluteness."

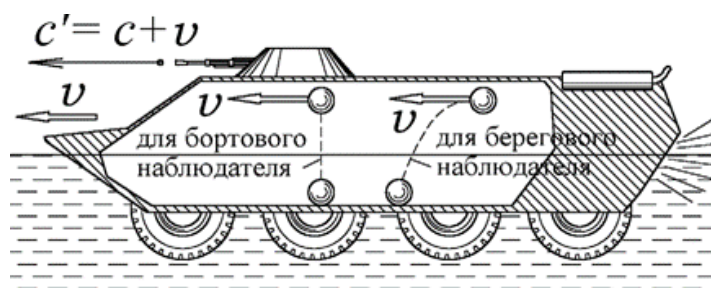


Fig. 37. The movement of the ship (amphibian) is transmitted to the falling body, which, as if inside a system at rest, falls vertically. The same speed is transmitted to light and projectiles (for a coastal observer).

Until now, talking about the ballistic principle of adding the speed of light to the speed of a source, we talked about the motion of light in a vacuum. If the electromagnetic wave flies in the medium, then, as noted above, the situation changes dramatically: passing through the medium, be it air or dense bodies, the wave acts on the electrons of the medium, causing them to oscillate, which is why they emit secondary waves, which, adding up with the original, give rise to the phenomena of refraction, dispersion and diffraction. Therefore, an already chosen frame of reference arises, associated with the material environment. Describing waves in such an environment is much like describing them with the help of ether. This is why Maxwell's aether-based theory is still in use, showing no disagreement with experience. However, in space, in airless space, there are deviations from Maxwell's theory. Judging by the results of radar and astronomical observations, the prevailing frame of reference associated with the atmosphere disappears, and the speed of light begins to depend on the speed of the source (Part 2).

In this section, we will be interested in precisely experiments in terrestrial laboratories, where light moves in a medium. Thus, as contradicting BTR, the well-known experiment on the influence of the motion of a source on the speed of light in a medium is sometimes cited — the Fizeau experiment [93, 153]. According to its results, if a source moves towards the medium with a speed V , then in the medium the phase speed of light from this source is no longer c/n , but $c/n + V/n^2$. Pauli considered this proof that the speed of the source does not add up according to the classical law with the speed of light. But, as it was said, the ballistic principle does not have to work here, because the speed of light in a medium is determined not only by the source, but also by the atoms of the medium, the secondary radiation of which is added to the initial one, forming a new wave. Let's calculate its phase velocity [136, p. 425]. If light has velocity $c + V$, then the field of a single incident wave is described by the equation $E_0 = e^{i(\omega t - k'x)}$, where ω is the cyclic frequency of the incident wave, and $k' = \omega/(c+V)$ is its wavenumber.

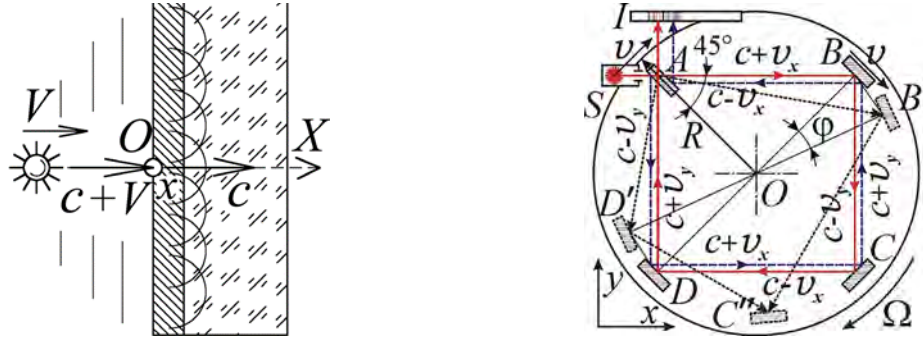


Fig. 38. Failure of the principle of relativity in the experiments of Fizeau (left) and Sagnac (right).

This wave excites secondary waves of intensity $E_1 = -ikxb e^{i(\omega t - kx)}$ in the medium [136], where $k = \omega/c$ is their wavenumber, x is the thickness of the passed layer of matter emitting a new wave (Fig. 38), b – a dimensionless coefficient characterizing the optical density of the medium (the concentration of atoms and the efficiency of their re-emission of a wave with a frequency ω). The field of the resulting wave $E = E_0 + E_1 = e^{i(\omega t - kx)} (e^{ix(k - k')} - ikxb)$, which, taking into account the expansion of $e^x \approx 1 + x$ at small x and $(k - k') \approx \omega V/c^2 = kV/c$ gives $E \approx e^{i(\omega t - kx)} (1 + ikxV/c - ikxb) \approx e^{i(\omega t - kx(1 + b - V/c))}$. Here $kx(b - V/c)$ is the phase shift that grows along with the light passed along the path x and thereby changes the phase speed of light c^* . In fact, in the medium the wavenumber $k = \omega/c$ is replaced by a new one $k^* = \omega/c^* = k(1 + b - V/c)$. Hence $c^* = ck/k^* = c/(1 + b - V/c)$. If $V = 0$, then we get the usual speed of light in the medium $c^* = c/(1 + b)$, where $(1 + b)$ is the refractive index n . If the speed V is different from zero, we get: $c^* = c/(1 + b - V/c) = c/(n - V/c) \approx c/n + V/n^2$. Thus, in the medium, the movement of the source changes the phase speed of light not by V , but only by V/n^2 . With respect to the source, the speed of light in the medium is $c' = c^* - V = c/n - V(1 - 1/n^2)$. The coefficient $1 - 1/n^2$ is called the Fresnel drag coefficient. So, if, on the basis of molecular optics, the re-emission of light by the medium is taken into account,

then the BTR will easily explain the Fizeau experiment and give the correct expression for the Fresnel drag coefficient.

As you can see, the presence of the environment violates the equality of reference frames. First, light in a medium moves at a speed different from the speed of light in this medium c/n . And, secondly, not all the speed of the source is transmitted to the light. But in reality there is no contradiction with the Galilean principle of relativity. Consider, for clarification, the famous illustration of the principle of relativity, proposed by Galileo himself. In his "Dialogue" he showed that we cannot notice the uniform movement of the ship, being in its hold. Items in the hold will fall in exactly the same way (vertically downward) as in a stationary ship. This happens because the speed v of the ship is imparted to falling objects. But if the ship itself and the objects falling in it move horizontally with a speed v , then their relative motion cannot be noticed. But this will only happen in the hold. If we go out on the deck of a ship, then equality is already violated. Due to the movement of the ship, the air blowing over it generates a headwind, which breaks symmetry, carries objects away. Therefore, objects thrown from bow to stern, carried away by the wind, will fly faster and farther than from stern to bow. Like air carrying falling objects in Galileo's experience, the medium partially transfers speed to light. In Michelson's experiment, the environment did not violate the principle of relativity and the ballistic principle only because the atmosphere moved with the Earth and the light source, just as the air in the hold of a ship moved with the ship in Galileo's experiment. But with the mutual movement of the source and the medium, the situation changes dramatically: the principle of relativity ceases to be observed.

So, if a moving source imparts its speed to light, as an additive to the speed c , then, when it enters a transparent medium due to the secondary radiation of the medium and adds it to the radiation of the incident wave, this additive will gradually disappear, as an object thrown out of train windows and air drag braked. The initial wave, getting into the medium and forcing its electrons to vibrate, is re-emitted by these countless repeaters and, moreover, is extinguished due to interference with secondary waves coming from them. This principle is known in electrodynamics as "Ewald and Oseen's extinguishing theorem". However, as applied to the BTR, this theorem was first investigated by J. Fox [2], who showed that, together with the damping of the primary wave, information about the velocity of its source is also lost. Therefore, in what follows we will sometimes call this rule of extinction of the additional source velocity for light - the "Fox principle". This principle is of great importance in the study of many phenomena in space and is especially important in terrestrial laboratory experiments.

It is interesting to note that some laboratory experiments have indeed confirmed that light, after passing through a medium, acquires its speed. Indeed, according to the BTR, the speed is equal to c relative to the source. The medium through which the light passes, itself begins to play the role of a source of light. And exactly, as already earthly experiments have shown, say the experiments of W. Kantor [4] and M.I. Duplishchev [47], transparent plates additionally impart their speed v to radiation, which is why the speed of light rays becomes not c , but $c + v$. The results of these experiments, despite their careful design, have been

challenged and glossed over [153]. However, no one has done this convincingly enough.

Physicists tried to detect a change in the speed of light not only in terrestrial sources, but also in celestial ones, which have known speeds. A similar experiment performed, for example, by R. Tomaschek, gave a negative result [152, 153]. As noted by J. Fox, this also does not testify against the BTR, since in a ground installation, light does not move in a vacuum, but in the atmosphere, following in the device additionally through a system of lenses and mirrors. Therefore, the principle of relativity and the law of addition of velocities are not applicable here, just as in Galileo's experiment, if it is performed not in the hold, but on the deck of a moving ship, where objects will no longer fall strictly vertically, as before, but will be blown away by the wind. So light, having an excess speed V of the source, can no longer keep it in the earth's atmosphere, but will be "slowed down" by it until it acquires the standard speed c/n relative to the medium. Likewise, for example, a lighter dropped from the window of a train running on the rails only at first falls vertically downward, having the speed of the train V . But then blowing with the oncoming air flow gradually blows it back, and it almost completely loses its initial speed V .

The same is for light. When a light beam enters the Earth's atmosphere at a speed of $c + V$, its electrical vibrations swing electrons in the atoms of the air. The vibration of electrons gives rise to secondary radiation with a velocity of c . As a result, as the beam moves through the atmosphere and brings more and more electrons into oscillations, its energy dissipates more and more, transforming into the energy of secondary radiation flying in the air with a standard speed c . As Fox showed, this reduction of the speed of light to c occurs in a layer of air about 10 cm thick. So, by the time the light beam has passed the entire thickness of the atmosphere, its speed will be equal to c without any trace of the initial speed of the source. Even more efficiently, the speed of the source is extinguished when the radiation of higher frequencies moves and in denser media. Fox calculated [2] that the contribution of the source speed to the speed of light decreases exponentially as the signal moves through the medium, and the characteristic length at which this contribution decreases by a factor of $e = 2.7$ is $d = \lambda/2\pi(n-1)$. That is, the shorter the light wavelength λ and the higher the refractive index n of the medium, the faster the contribution of the source velocity is canceled. Therefore, a signal from a source flying in the direction of radiation with a velocity V , when passing through a layer of medium with a thickness of l , will have a velocity $c' = c + kV$, where $k = e^{-l/d} \ll 1$, as deduced on the basis of astronomical observations by E. Freundlich [3] and P. Gutnik (§ 2.10). Thus, the speed of the source practically ceases to affect the movement of light signals in the medium, and the change in the speed of light can be detected only in high and ultrahigh vacuum, in the absence of mirrors, lenses and media in the path of the beam.

It is no coincidence that many experiments to test the ballistic principle, performed in terrestrial conditions, especially with the use of lenses, diaphragms or mirrors, gave an apparent contradiction with the BTR. Such experiments have invariably shown that light from a stationary and a moving source travels at the

same speed c . And, in fact, light was emitted at different speeds, but due to re-emission by stationary atoms of media, mirrors and lenses, this difference was quickly erased, and the detectors recorded the synchronous arrival of light signals. The experience of A.S. Mazmanishvili (["Electromagnetic phenomena", Vol.2, No. 1, 2001](#)), performed on the initiative of P.I. Filippov (colonel of artillery and defender of the BTR), but contrary to his expectations, he did not reveal the dependence of the speed of light on the movement of electrons in the accelerator and particle storage. Experience has shown that a direct pulse of synchrotron radiation, created by electrons flying at a tremendous speed, and a control pulse, re-emitted by a stationary quartz window, arrive at the detectors synchronously, without additional delay from the difference in the speed of light. This was considered a refutation of the BTR and proof of the SRT.

And, in fact, even in such a seemingly flawless experiment, carried out under vacuum conditions inside the accelerator chamber and in the absence of lenses and mirrors in the path of the direct beam, the effect of re-radiation is not excluded. So, it is necessary to take into account the influence of metal diaphragms and extended channels-waveguides on the path of a direct beam - their fixed walls may well serve as re-emitting centers that generate the same radiation, but with a speed c no longer relative to the electron, but relative to the installation itself, and therefore the incoming to the detector simultaneously with the control beam. In addition, it is possible that synchrotron radiation is generated not so much by moving electrons as by the stationary metal walls of the accelerator (storage ring), in which rapidly moving charges induce currents and cause oscillations of electrons, generating radiation, as in the Vavilov-Cherenkov effect. This and much more (§ 1.11, § 1.15, § 1.21) shows that the principles of operation of accelerators, particle storage rings, gyrotrons and other relativistic electronics do not contradict, but rather confirm the BTR.

Thus, a decisive experiment of a sufficient degree of purity can be carried out only in space under conditions of high vacuum and in the absence of any media or objects nearby, which inevitably introduce, according to the principle of re-radiation, discovered by Fox, distortions that completely neutralize the effect of the source velocity. And such effects in space, as Part 2 shows, are actually discovered, although even there, at gigantic cosmic distances, the influence of even an extremely rarefied medium, which slows down light rays, is often noticeable. However, with careful design, the decisive experiment can be carried out on Earth, if all the effects of the BTR are carefully taken into account, and, first of all, the Fox effect of light re-emission.

But let's get back to the analysis of the motion of light in a dense medium. At first glance, it seems that a contradiction arises between Fox's principle and the Fizeau experiment discussed above. Indeed, according to Fox, information about the speed of the source is gradually lost and light, as it moves in the medium, acquires the speed c/n relative to the medium. On the other hand, according to Fizeau's experiment, the opposite is true and the speed of light from a source approaching with a speed V is equal to $c^* = c/n + V/n^2$ relative to the medium, regardless of how far the light has traveled. How can these two statements be reconciled?

Everything is very simple. Fox talks exclusively about the group speed of light - about the speed at which information is transferred, the effect of light. It is this speed of movement of the envelope of the light wave that determines the signal delay. And in the interferometric Fizeau experiment, the phase velocity of light is measured, in fact, - the speed of movement of the high-frequency filling phase of the light wave pulse. The phase velocity, as is known, can differ greatly from the group velocity, both in the lower and in the higher direction. In particular, the phase velocity can even exceed the speed of light in a vacuum, for example, in waveguides, in a plasma. Therefore, it is necessary to very clearly distinguish what kind of speed is measured in experiments - group or phase? So, in the case of the Fizeau experiment, we did the calculation specifically for the phase velocity, since the measurement scheme was interferometric.

This distinction must be made not only for light moving in a medium, but also for light reflected by a mirror. The group speed of light, after being reflected from a mirror in a vacuum, becomes equal to c relative to the mirror, regardless of what speed the light source had. After all, the electrons of the metal coating of the mirror, vibrating under the action of the incident wave and re-emitting its energy, emit rheons already at a speed c relative to the mirror. For phase velocity, everything is more complicated. As Ritz showed, the phase velocity, after reflection, remains equal to the speed of light c relative to the source, regardless of whether the source approached the mirror or moved away [93]. After all, according to the BTR, light is a wave carried by rheons, and it is not the rheons themselves that are reflected, but the wave (the atoms of the mirror could only scatter the particles, but they will re-emit the wave directionally). Ritz showed that a wave having a velocity $(c + v)$ at normal incidence on a mirror is reflected with a velocity $(c - v)$, and vice versa. In other words, upon reflection, the phase velocity of the light wave is conserved not relative to the mirror, but relative to the source. In its frame of reference, the emitted and reflected light always has a speed of c . This is the basis of the BTR [93, p. 21], significantly distinguishing it from other, later and controversial versions of the ballistic theory, where light is transferred by photons, and the velocities of the emitted and reflected rays are different in the source system (Fig. 39). After all, photonic ballistic theories, based on the Newtonian theory of light, represent the reflection of light, photons - like an elastic rebound of a ball from a mirror surface, while maintaining the velocity relative to it.

That is why, in interferometric experiments with moving mirrors, where the phase velocity of light is measured, this ballistic law found by Ritz must be taken into account. Indeed, interferometric experiments show just such a dependence [93]. And due to the fact that the concepts of phase and group velocities are mixed, various misunderstandings arise, leading to the conclusion that the BTR is erroneous from experiments. More details about the role of phase and group velocities and their differences can be found in books [152]. True, it is sometimes argued that in a vacuum, a medium without dispersion, these speeds will still coincide. However, the BTR predicts the possibility of dispersion even in a vacuum, as was confirmed by space observations (§ 2.8). Therefore, in a vacuum,

these speeds may not coincide both in magnitude and, even, in direction (as in the case of stellar aberration).

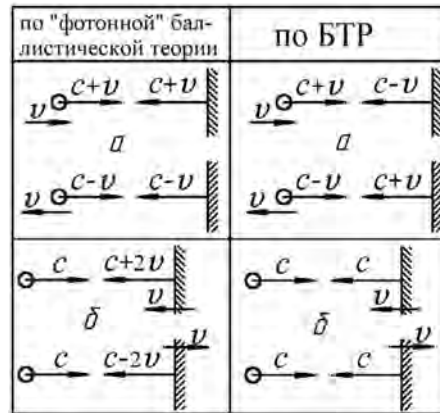


Fig. 39. Phase velocities of the emitted and reflected light during the relative motion of the source and the mirror (a - in the mirror system, b - in the source system).

The reason for the difference in phase and group velocities can be analyzed using the following example. When light is reflected by a mirror, as was said, the group speed of light should be equal to c relative to the mirror, since it is with this speed that the rheons are fired by the electrons of the mirror. On the other hand, the phase speed of light after reflection can become greater than c . It is clear that a signal with a speed of $c + V$ cannot be carried - it would be ahead of the rheons that carry light. But the phase, the wave fronts inside the pulse may well move at such a speed. After all, the wave distribution of rheons arises as a result of the addition of many light waves emitted by different electrons of the mirror. And the antinodes of this distribution may well move with a speed greater than the speed of the rheons themselves. Likewise, the moiré pattern that occurs when two combs are combined can move at a speed greater than the speed of the combs. Here the speed of the combs is the group speed, is the speed of the rheons. And the speed of movement of the moiré pattern - dark stripes resembling interference - is the phase speed. However, it should be noted that the group velocity is often not equal to the rheon velocity, since signal propagation also occurs during wave interference. Therefore, it is easier to always find first the phase velocity, and from it, on the basis of known relations, - the group velocity. In any case, it is unacceptable to confuse the concepts of phase and group velocity.

It is easy to understand why, when interacting with a mirror, the phase velocity of light from a moving source changes according to the Ritz law. If the mirror is at rest, and the source moves towards it with a speed v , then, according to the BTR, it emits light with a speed $c + v$ (Fig. 39.a). If the natural frequency of the source radiation is f , and the wavelength of light is $\lambda = c/f$, then, due to the Doppler effect, the mirror perceives light vibrations with a frequency $f' = f(1 + v/c)$ and re-radiates them with the same frequency. At the same time, the wavelength from a moving source remains unchanged: $\lambda' = \lambda$. When re-emitted, this spatial scale is also preserved, since light fronts cannot instantly approach or disperse. From here it is easy to find the phase velocity of the reflected light $c' = \lambda'f' = c/(1 + v/c) \approx c$

$-v$, that is, Ritz's law of reflection. (This conclusion can be strictly obtained on the basis of molecular optics by analyzing the interference of waves re-emitted by oscillating electrons of the mirror located at different depths, as was done for the Fizeau experiment, Fig. 38). If we take into account the second order of smallness, then $c' = c/(1 + v/c) \approx c - v + v^2/c$. This quadratic correction v^2/c becomes essential in the experiments of Tomaschek (§ 2.9), where it was neglected by adopting the approximate Ritz's law $c' = c - v$, which is why we got a discrepancy with the BTR. If this correction is taken into account, then it turns out that in the source system (Fig. 39.b) the light after reflection has a speed not exactly $c' = c$, but $c' = c(1 + v^2/c^2)$, and there is no discrepancy between the BTR and Tomaschek's experience is no longer observed.

Ritz's law of reflection is also important when explaining interference experiments in rotating systems, where we also encounter a violation of the Galilean principle of relativity, formulated for inertial systems, and rotation generates centripetal acceleration that violates the law of inertia. And, if with the help of mechanical experiments, using a Foucault pendulum or a gyroscope (§ 5.7), it is possible to detect the rotation of the Earth, then the ballistic theory, based on Galileo's principle for light, allows inside a closed system, without external references, to reveal its rotation through optical experiments. These include the Sagnac experiment, where two light beams, sent along a closed path, interfere, one in the direction of the rotation of the system, and the other against it (Fig. 38). The interference pattern changes when the system is spinning up, which makes it possible to find the speed and direction of rotation. It is sometimes believed that the Sagnac experiment contradicts the BTR, since the light beam, acquiring the speed of rotation of the system according to the ballistic principle, must move with it, without displacing the stripes [93]. In fact, it is the ballistic principle (the principle of inertia for light), as in the oscillations of the Foucault pendulum, that leads to a change in the direction and speed of light oscillations in a rotating system that has lost its inertia. The light beam flies freely between the mirrors, like a Foucault pendulum swinging freely between the extreme positions, while the non-inertial system rotates under it, giving out its rotation in displacement relative to the beam flying by inertia. Let us analyze the experience of Sagnac from the standpoint of the BTR. Light is emitted by a source S mounted on a disk rotating with a frequency Ω , which is why, according to the ballistic principle, the light additionally receives a peripheral velocity $v = \Omega R$ of the source. Next, the light beam is divided by a semitransparent plate A into two beams, one of which, when reflected from mirrors B , C and D mounted on the disk, describes a closed square in the direction of rotation, and the other against this direction, after which the beams are brought together, interfering on photographic plate I [153]. For convenience, let us consider the motion of a ray in a resting inertial frame of reference, where the ray does not bend and does not change its speed when moving between the mirrors (as it would be in a rotating frame of reference).

Let us find the difference in the times of the rays traversing the contour. The path $AB = L$ of the direct ray going in the direction of rotation is lengthened to $AB' = L(1 + v \sin 45^\circ / c)$, since by the time the ray arrives at mirror B , it will move

to point B' by the distance $BB' = \varphi R$ during rotation, where $\varphi = \Omega L/c$ is the small angle of rotation of the setup during the time the light moves along AB . Each segment of the direct ray path $AB = BC = CD = DA = L$ will grow to the value $L_1 = L(1 + v \sin 45^\circ/c)$. In this case, along AB , the beam, according to the ballistic principle, will fly at a speed of $c + v_x = c + v \sin 45^\circ$. After reflection on the mirror B and movement along BC , the phase speed of light along the BTR will remain relative to the source (Fig. 39) and become equal to $c - v_y = c - v \cos 45^\circ$. The same will happen with further reflections: in each of them, the phase velocity of the reflected light along the directions $BC = CD = DA$ is equal to the velocity of the parallel ray emitted by the primary source S [93, 153]. As a result, the total travel time of the direct ray along the contour $AB'C''D'''I$ will be $T_1 = L_1/(c + v_x) + L_1/(c - v_y) + L_1/(c - v_x) + L_1/(c + v_y) \approx 4L_1/c$. For a ray going against rotation, each segment of the path $L = AD$, on the contrary, will be reduced to the value $L_2 = AD' = L(1 - v \sin 45^\circ/c)$, and a similar calculation will give $AD'C''B'''I$ by the return beam $T_2 \approx 4L_2/c$. We obtain the same result for T_1 and T_2 even if the law of equality of the angles of incidence and reflection is violated by the motion of the mirrors and the path segments $AB'C''D'''I$ differ slightly. It is only essential that the rays converge at one point I (where the interference fringes are investigated), which, due to rotation, will shift by the time of arrival of the rays, lengthening the path of one and shortening the path of the other.

That is, in a first approximation, the effect of the source speed on the speed of light is neutralized (due to movement along a closed path, § 2.9), and the round trip times T_1 , T_2 differ from the usual $T = 4L/c$ only due to the change in the path of the rays, one of which catches up with the fleeing mirrors, and the other moves towards them. As a result, the difference in times $\Delta T = T_1 - T_2 = 8Lv \sin 45^\circ/c^2 = 8\Omega R^2/c^2$, and the difference in optical paths $\Delta = \Delta Tc = 4\Omega S/c$, where S is the area of the contour along which the light travels. This coincides with the result of the Sagnac experiment and similar experiments [153], for which the formula can be generalized to the case of a contour of any shape, for a given area S . The BTR explains even more simply the similar experiments of Harres and the principle of operation of a laser gyroscope, like a mechanical gyroscope, which detects the rotation of a system. In Harres's experiment, the beam entered the rotating system from a stationary source, so the fringes were shifted only due to a change in the length of the beam path. In the experiment with a laser gyroscope, the interference of laser beams in a ring resonator such as the Sagnac system creates beats at a frequency equal to the difference between the frequencies of the forward and backward beams. In this case, there is again an inequality of rays within the rotating system. If the direct beam has to catch up with the mirrors, which is why the frequency of arrival of light oscillations is reduced, then the mirrors go towards the return beam, and its frequency is increased. In this case, as shown above, the movement of the source itself is not essential: its influence is neutralized due to the closed path, while the movement of the mirrors in all sections leads to an extension or reduction of the path. It turns out that experiments with the rotation of optical systems are in good agreement with the BTR.

So, for light passing through refractive, reflecting and rotating systems, Galileo's classical principle of relativity, formulated for closed inertial systems, ceases to work. If this is remembered and the calculation is carried out correctly on the basis of the ballistic principle for the initial radiation, taking into account, in addition, the interference of radiation from secondary sources, then we will easily come to a result confirmed by experiment. At the same time, it is necessary to carefully pass from one frame of reference to another, applying the ballistic principle, Ritz's law of reflection, Fresnel drag coefficient or Fox's re-emission theorem, depending on whether we are talking about the phase or group speed of light.

§ 1.14. Field energy and light pressure

The pressure exerted by light on a mirror, even in a vacuum, contradicts, for example, the principle of equality of action and reaction, when it is applied only to matter. Therefore, we will be forced to "materialize" radiant energy in order to save this principle and the principle of conservation of energy in all cases when there is a body in which radiation does not encounter any material obstacle in a certain direction, and for which energy cannot, therefore, when -or fully recover.

Walter Ritz, "A Critique of General Electrodynamics" [8]

One of the main problems of Maxwell's theory and all modern electrodynamics is associated with the explanation of the field energy. As you know, electrical impact is transferred from charge to charge with a finite speed equal to the speed of light. However, as it was noted by Ritz, from the standpoint of Maxwellian electrodynamics, it is difficult to understand: in what form does the electric effect (its energy and momentum) exist in empty space, after it has left one charge, but has not yet arrived at another, - Maxwellian theory contradicts the law of conservation of energy and momentum! Even if the space between the charges was filled with motionless ether, it would not be possible to understand how the momentum and energy of the electric field can be transferred in it, in the absence of waves. And, since there is no ether, it is all the more problematic to explain this, since energy and momentum are inextricably linked with weighty matter. In the absence of matter, - mass m , the concepts of energy $E = mV^2/2$ and momentum $p = mV$ lose their meaning. In the same way, it makes no sense to talk about the temperature and pressure of empty space: temperature and pressure are, respectively, a measure of the energy and momentum of the particles of the environment.

But in Ritz electrodynamics this problem is easily solved. As shown above, the momentum from charge to charge is transferred by elementary, weighty particles - rheons moving at the speed of light. Through the medium of rheons, the charges exchange impulses, energy, in other words, they interact in full accord with Coulomb's law. The entire space between the charges is permeated with rheons flying at the speed of light. They form a dynamic environment with which energy and an impulse of electrical action are associated. But this environment of particles is fundamentally different from the stationary ether, and from the abstract electromagnetic field, and from virtual photons. In contrast to them, rheons are, firstly, a completely material substance, weighty, and therefore capable of transferring energy and momentum, and, secondly, always in motion.

Rheons and arheons are not only a building material that forms particles, but also a universal carrier of all types of interactions.

In the form of the kinetic energy of the rheons that have left the charge, the potential energy of the electric field exists around it. The field energy density w (energy per unit volume) is equal to $w = \varepsilon_0 E^2/2$, where E is the field strength [45, 60]. Inside a flat electric capacitor, the field $E = \sigma/\varepsilon_0$, where σ is the surface charge density on the capacitor plates having an area S (Fig. 40). Hence, in the capacitor $w = \sigma^2/2\varepsilon_0$. On the other hand, the density of electrical energy can be represented as the energy u of rheons enclosed in a unit volume, equal to the concentration of rheons k multiplied by the kinetic energy of one rheon $mc^2/2$. We find the concentration k from the condition that any of the Z electrons of the plate emits $N = e^2/\pi c \varepsilon_0 r^2 m$ rheons every second (§ 1.4). Half of them fall into the capacitor cavity. Hence, $k = ZN/Sc$, where $Ze/S = \sigma$, that is, $k = \sigma e/\pi c^2 \varepsilon_0 r^2 m$. As a result, the energy density is $u = kmc^2/2 = \sigma e/2\pi \varepsilon_0 r^2$.

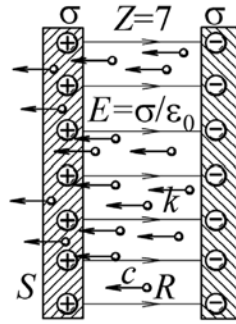


Fig. 40. Energy w of a flat capacitor as kinetic energy u of the flow of rheons inside it.

As we can see, the kinetic energy density of rheons $u = \sigma e/2\pi \varepsilon_0 r^2$ is $e/\sigma \pi r^2$ times greater than the field energy $w = \sigma^2/2\varepsilon_0$. This means that not all of the kinetic energy of the rheons can be converted into work. After all, the energy of a capacitor is found as work on charging it, performed against an electric force during separation, transfer of charges, say, by separating the capacitor plates [45, 60]. And the charges of one capacitor plate are not able to absorb all the rheons emitted by the other plate, since there are gaps between the electrons into which the rheons fly out. Due to this, rheons penetrate into bodies, carrying electrical, magnetic and gravitational effects to the deepest layers of matter, which makes them similar to other known particles - neutrinos, also arising in decay, having light speed, mass - much less than electronic and huge penetrating ability. If the charges on the plate were placed close to each other, without gaps, so that $\sigma = e/\pi r^2$, then the field energy density w would coincide with the kinetic energy density u . Indeed, in this case, all the energy of the rheon stream is converted into electrical interaction.

So, the potential energy of the electric field is, in reality, the kinetic energy of the movement of rheons. Only a small part of this latter can be converted into electrical action, into work (that's why this part is called potential), as Tesla spoke about, who more than others understood electricity and accepted Ritz's theory [110]. In about the same way, the internal energy of a compressed gas, which is potentially capable of doing work during expansion, is in fact the kinetic energy

of gas atoms. Therefore, with the adiabatic expansion of the gas and the performance of work, say, in the form of raising the piston, the gas cools, the speed of its atoms decreases. But, again, not all the kinetic energy of atoms can be converted into work, but only a part of it (called free energy), as the second law of thermodynamics claims. A similar law holds in electrodynamics. It is it, as shown by Ritz, which introduces the irreversibility of electrodynamic phenomena, like the second law (§ 4.1).

It is quite natural that **electrical and all other types of energy are reduced to the energy of particle motion, just as once thermal, internal energy turned out to be just the kinetic energy of the chaotic movement of atoms and molecules. And the transformation of one type of energy into another means only the transfer of motion, redistribution, transfer of kinetic energy from one part of the system to another. So, the law of conservation of energy is the law of the indestructibility of motion, together with the law of the indestructibility of matter, discovered by Democritus.** And Maxwell's electrodynamics is extremely absurd, where energy, a property of weighty matter, was attributed to empty space, space itself, without weighty particles. Following the Occam's principle, so revered by scientists, according to which it is not worth multiplying entities beyond what is necessary, it is necessary to reject the current electrodynamics, which has taken physics into the rut of quantorelativism, introduced excess forms of energy and matter: an abstract electromagnetic field, weightless photons, various types of interactions. Inevitably, all other types of energy will sooner or later be reduced to kinetic - to purely mechanical energy of motion (§ 3.16).

This is precisely the reason for the conservation of energy. The movement does not disappear, but only changes its character, is transmitted from some bodies, particles to others. So, the law of conservation of energy is, in fact, the law of the indestructibility of motion, for which the first materialist scientists stood up: Leucippus, Democritus, Lucretius. In the same way, the reason for the conservation of mass (or charge) is that mass, matter does not arise and does not disappear, but only passes from one body to another. In fact, this is the law of the indestructibility of matter, which is the basis of materialistic science. The strict law of conservation of mass was discovered and substantiated by Lomonosov and, later, by Lavoisier, using the example of lead oxidation: during oxidation, the mass of lead increased, but - only because it absorbed invisible oxygen: oxygen atoms attached to lead, - passed from air to scale (§ 3.13). And therefore, it is not entirely correct to speak about the transformation of matter or energy from one form to another. Chemical transformations of matter are just the transition of invariable particles from one body to another, while the transformation of energy from one type to another is just the transfer of kinetic energy by particles from one body to another or the transformation of the nature of particle motion.

Take, for example, two oppositely charged metal balls. At first, they are at rest, but then, under the influence of attraction, they begin to approach each other, gradually increasing their speed. They say that in this case the potential energy of the electric field of the balls turns into kinetic. But, since the potential energy of

the electric field is, ultimately, the kinetic energy of the movement of rheons, then only the transfer of motion, kinetic energy from the rheons to the balls occurs due to collisions. When the balls, gaining speed, collide, part of their kinetic energy will be converted into heat, into thermal energy. But even in this case, in reality, there is no transformation of energy: just the ordered movement of the atoms of each ball will partially transform into their disordered, chaotic movement, which is heat. Thus, in all three cases, it was actually the kinetic energy that was retained - the movement of bodies and particles did not disappear, but was transferred from one body to another, manifested in different forms. And, therefore, one should expect that all other forms of energy - gravitational, nuclear, chemical and, in general, any conceivable - are, precisely, kinetic energy, that is, the energy of motion of weighty bodies and particles. That is why the reason for the conservation of energy lies in the indestructibility of motion that is only transmitted from body to body. And, if we do not notice this movement, this does not mean that it does not exist. After all, we do not observe the thermal motion of atoms, although it does take place, as Democritus showed by the example of the Brownian motion of suspended particles and dust particles.

The complete opposite of the materialistic approach of Democritus is Maxwellian electrodynamics, in which energy is attributed to absolutely empty space, to space itself, without any weighty particles. But after all, energy, as the centuries-old course of development of science has shown, is a property of weighty matter, energy $mV^2/2$ is inseparable from matter, mass m . And, in this sense, Ritz's theory has tremendous superiority over Maxwell's electrodynamics, since it reduces electromagnetic phenomena and energy to purely mechanical ones - to the motion of particles. Following the principle of Occam's razor, so revered by scientists, according to which entities should not be multiplied beyond what is necessary, we must reject Maxwell's theory and all modern electrodynamics, coupled with quantum. Indeed, in addition to superfluous forms of energy, they also introduce superfluous forms of matter: an abstract electromagnetic field and weightless photons.

In Ritz's theory, we are also forced from time to time to use the term "electric, electromagnetic field". However, here, as it was said, we put into it a completely different meaning. According to Ritz, a field is not a new form of matter, not a state of physical vacuum, ether or empty space, but only a mathematical characteristic of the distribution of rheons in space, which determines the nature and degree of the impact of rheons on charged bodies. In exactly the same way, in physics, a field of velocities, temperatures of a gas or liquid is introduced, that is, a mathematical law of the distribution of these characteristics in space.

In addition to energy, rheons carry impulse, exerting an electrical effect. But, again, not all of the impulse carried by the rheons is converted into pressure, since the charged body absorbs only a small part of the flow of rheons passing through it. Even less is the light pressure discovered by the Russian scientist Lebedev in his experiments with wings and interpreted as confirmation of Maxwellian electrodynamics [60], although in fact this confirmed the transmission of light from a source to a receiver by a material, weighty carrier (see epigraphs § 1.2, § 1.14). Photons and the field are not suitable for this role, since only particles of

nonzero mass m can transfer momentum mV , pressure. Particles and media with zero mass or density must also have zero momentum with energy.

However, even in the BTR, the light source, emitting equal parts of rheons and arheons, extinguishing each other's impulses, would seem to have no pressure. But, in reality, since the charges (electrons) move in the light source, then the effect from positive and negative charges is different: the movement of electrons changes the speed of the rheons emitted by them in comparison with arheons. Therefore, the flow of rheons and arheons carries a certain impulse, creating a pressure of light. This pressure depends on the speed of oscillation of electrons, and, therefore, on the frequency and intensity of light. It turns out that the flux of the Poynting vector (light energy) through the area has a clear physical meaning: it is the flux of the energy carried by the particles. Equally simple physical interpretation is received by the density of lines of force of the electric field of the charge (Fig. 11, Fig. 45). In fact, this is the rheon flux density k , which characterizes the magnitude of the charge field at a given point.

The pressure exerted by light on a specularly reflecting surface, as Lebedev showed, is twice the pressure on a black, absorbing one. But it is wrong to understand this as if the light-carrying particles in one case bounce elastically from the surface, and in the other they are absorbed by it. After all, rheons, unlike photons, always move in a straight line, without changing the direction of movement from the moment of emission to absorption. In reality, the following happens: both the mirror and the black surface (Lebedev's wings) equally perceive the impulse carried by the flow of rheons exerting the same pressure. In this case, the winglet electrons in both cases vibrate under the action of the incident radiation. However, the mirror surface immediately re-radiates the absorbed light in the opposite direction (reflects it). This secondary directional radiation and the associated rheon flux create an additional reactive impulse equal to the impulse from the pressure of the original light flux. That is why the sailing, lift of mirror wings is twice that of black ones.

As you can see, the flow of energy, impulse of light and electric field is inextricably linked with the flow of particles - rheons and arheons. No wonder, all the same Tesla compared the flow of electromagnetic energy with the flow of matter emitted by the emitter [110]. This is quite consistent with the BTR, the outflow theory, which represents an electromagnetic wave as a stream of particles emitted by a source. And Tesla said that in reality, light and electromagnetic influences represent the longitudinal motion of particles scattering rectilinearly from the source and, like bullets, carrying enormous energy with their stream. We perceive only a small part of it associated with transverse influences. So, in the flow of these particles-carriers of electric impact (rheons), much more energy is contained than could have been thought on the basis of experience.

§ 1.15. Relativistic effect of mass change

Kaufmann's experiments are equally well explained both by assuming absolute motion with varying mass and by considering mass as constant and motions as relative. They are also quite consistent with the assumption that for high speeds the electrodynamic forces are no longer simple linear functions of the speed, as was the case in Lorentz's theory. Their dependence on speed takes on a more complex form.

In the previous section, discussing the conservation of energy, we mentioned another fundamental law - the law of conservation of mass. In addition to other laws of mechanics, the theory of relativity rejected this most important law of nature, which had been approved for centuries. Indeed, Einstein asserts that the mass of a body changes as it moves: as the speed of the body increases, the mass increases and tends to infinity as the speed of the body approaches the speed of light. This relativistic effect of the change in mass seems to be even confirmed by experiments.

And yet, as Ritz showed, all these experiments can be explained classically, without resorting to the dubious effect of changing the mass, and without abandoning the usual law of conservation of mass, it is enough to take into account the effect of the movement of the charge on the magnitude of the electric force acting on it, discovered in the BTR. Of these experiments, the most famous is the experience of Walter Kaufmann [55], where the effect of an increase in the mass of electrons with an increase in their velocity was first discovered. However, Ritz showed that there is no need to consider the mass as a variable to explain the experiment [8]. Recall that in Kaufmann's experiment, the electron was "weighed" by observing how much it deviates, flying between the plates of the capacitor and the poles of the magnet (Fig. 41). Indeed, judging by how much the electron is deflected by the electric and magnetic fields, it is easy to find its mass from the magnitude of these fields.

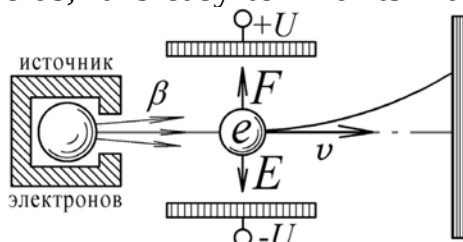


Fig. 41. Kaufmann's experience - a study of the deviations of rapidly flying electrons in electric and magnetic fields.

After all, the deviations, measured by the trace left by the electron beam on the luminescent screen, give the value of the acceleration a , associated according to Newton's second law $a = F/m$ with the mass m of the electron. But it turned out that electrons flying at different speeds have different accelerations a : the higher the speed, the less they are. And, since, following Maxwell's electrodynamics, it was believed that the force F acting on an electron does not depend on its speed, we came to the absurd conclusion that as the electron accelerates, its mass m grows. But, after all, it is much more natural to assume that the mass is constant, but the force F changes.

This assumption is all the more natural because, as we found out earlier, the speed of the charge can indeed affect the magnitude of the electric and magnetic force (§ 1.7). Therefore, according to Ritz, it is much more natural to assume that electrons receive different accelerations from different forces, and not masses. So, for example, if a spring balance shows different weight of a weight depending

on conditions (say, height or acceleration), we can hardly consider that its mass changes. Rather, we will assume that the scales are lying, and, in fact, the force of gravity and the force of weight are changing. The same is true in experiments on weighing an electron with an electromagnetic balance, where the effect of motion on the magnitude of the Coulomb force, in contrast to the effect on mass, seems quite possible. In the BTR, the dependence of force on speed is an obligatory consequence of the model of interaction of charges proposed by Ritz. Indeed, if the repulsion of charges is created by the impacts of particles (rheons) emitted by them at the speed of light, then these particles will not be able to catch up with an electron moving at the same speed c , which means they will not be able to shock it. So, it seems that the mass of an electron is infinite, although the real reason is zero force. Such a seemingly infinite increase in the mass of a charge with its velocity approaching c , long before Kaufmann's experiment, was predicted by W. Weber on the basis of his electrodynamic theory, this prototype of W. Ritz's electrodynamics [106].

Let's consider the question quantitatively. Theoretically, the trace of the electron beam on the screen should have had the shape of a parabola with the equation $y = kx^2Em/H^2$, where k is some constant, E and H are the strengths of the electric and magnetic fields, and m is the mass of the electron. The observed curve differed from this parabola as if the mass m increased proportionally with increasing velocity $(1 + v^2/2c^2)$. But after all, as it was found out, in almost the same way, in proportion to $(1 + v^2/3c^2)$ the electric force and the field E increase with the charge velocity. Taking into account the variability of E at a constant mass will introduce into the parabola equation almost the same changes as taking into account the variability of m at a constant E . The difference in the coefficients (one and a half times) is eliminated by a more accurate calculation presented in the work of Ritz [8]. The reasons for this constant difference in one and a half times downward were mentioned above (§ 1.7).

So, Kaufmann's experiment demonstrated the fallacy of the old physics. But, if Einstein saw a way out in the rejection of classical mechanics, while maintaining Maxwell's electrodynamics (change in mass with a constant electric force), then Ritz considered that it was much more natural to abandon Maxwell's electrodynamics, while maintaining classical mechanics (change in the electric force with a constant mass electron). Ritz's conclusion is all the more natural because it is precisely the rejection of Maxwellian electrodynamics and the creation of a new electrodynamics of BTR on the basis of classical mechanics that makes it easy, without any formal techniques and arbitrary manipulations (which take place in SRT), to obtain the correct law of change in electric force that explains the experience of Kaufmann.

Indeed, the effect of an apparent mass change can easily be explained using classical mechanics - even on the fingers. Since the electrical impact is created by the flow of rheons, then when the electron moves, the speed of the rheons relative to it changes. Rheons have to catch up with the electron escaping from them, respectively, the force and frequency of their impacts on the electron decreases, and, therefore, the electrical effect on the electron caused by the rheons also decreases. Thus, the higher the speed of the electron, the less the force of the

electric impact on it, and, therefore, the less acceleration and deflection of the electron caused by this force. This decrease in acceleration is attributed to the increased mass, while the real reason is the decrease in force.

The effect of a change in mass was also observed for other particles, for example, during their acceleration in a cyclotron. It turned out that the cyclotron cannot fully realize its capabilities and transfer its maximum power to the particles. The fact is that the particles circling in the cyclotron, accelerated by a periodically changing electric field, with an increase in their energy and speed of motion - due to a change in mass, and, therefore, in the frequency of revolution, go out of resonance with oscillations of the electric field. Therefore, the field ceases to transfer energy to the particles. Only by changing the frequency of the accelerating field, as is done in synchrotrons, it is possible to achieve the maximum efficiency of the accelerator. And yet, according to the logic of the BTR, and in this case, there is, in fact, no change in mass. Indeed, in an accelerator, the frequency of revolution of charged particles is determined by their acceleration, that is, again, by the ratio of force (Lorentz) and mass. And again, the reason for the change in the frequency of revolution with increasing speed is not a change in mass, but in a change following the speed - the Lorentz force. The Lorentz force $F = qVB$, indeed, changes with the velocity V of the particle. This linear change is necessary to ensure a constant frequency $\omega = qB/m$, which is extremely important in a cyclotron: $F = qVB = ma = mV\omega$. However, the movement of the charge, as shown by Ritz, also introduces nonlinear corrections to the magnitude of the Lorentz force, which become noticeable at high speeds. Because of this, with an increase in the charge speed, the rotation frequency $\omega = F/mV$ decreases, which, however, is regarded as an increase in mass m , although in reality the mass is constant, but the force changes.

Long before Ritz, scientists figured out that electricity acts differently on moving and resting charges. Strictly speaking, it was on this foundation that the former electrodynamics of Weber and Gauss was built. With the advent of Maxwell's field, aetheric electrodynamics, this fruitful idea was abandoned. When it became clear that the ether is a fiction, and, therefore, the Maxwellian electrodynamics based on it is erroneous, scientists did not want to return to their previous views on the nature of electricity, but preferred to reconcile the inconsistent: Maxwellian electrodynamics and the fact of the absence of ether. This gave rise, according to Einstein, his theory of relativity and all its paradoxes. Thus, rejection of the theory of relativity is impossible without rejection of Maxwell's electrodynamics.

In the BTR, the mass is constant, and therefore acceleration to speeds equal to and greater than the speed of light, which in SRT is hindered by an endless increase in mass, is quite possible. Means, to be faster than light interstellar ships (§ 5.11)! Moreover, superluminal velocities, probably, have long been achieved in laboratories, and only a calculation according to the formulas of the theory of relativity prevents this from being discovered (§ 1.21). Ritz believed that superluminal electrons could already be observed in Kaufmann's experiments. As we can see, being within the framework of classical mechanics, it is quite possible to preserve the law of conservation of mass. Only the one who betrays faith in the

laws of mechanics, disbelieves in them, and therefore in the objective reality of matter, inevitably accepts the absurd idea of a change in mass.

§ 1.16. Annihilation and Equivalence of mass and energy

The body of things is indestructible until it collides with the power that their combination is capable of destroying. So, we see, by no means things turn into nothing, But, everything decomposes into basic bodies back ...

.... In a word, nothing perishes, as if completely perishing, since nature always revives one from the other and does not allow anything to be born without the death of the other.

Titus Lucretius Carus, "On the Nature of Things" [77]

The theory of relativity encroached not only on the law of conservation of mass, but also on the law of conservation of energy, which came at a high price: according to SRT, mass m and energy E can disappear and appear. At the same time, in SRT, mass is equivalent to energy, and although they are not conserved separately, the law of conservation of a certain mass-energy, expressed by the well-known formula $E = mc^2$, works. Thus, the experiments considered above, in which an increase in the masses of particles with an increase in their speed was noted, meant, according to STR, that the energy spent on accelerating a particle was spent not only on increasing its speed, but also on increasing its mass: the mass and energy of the particle grew at the same time. This equivalence of mass and energy also seems to be confirmed in experiments. These are not only experiments on "increasing" the masses of particles with an increase in their speed, but also nuclear experiments. Thus, during the decay of radioactive isotopes, it was found that the total mass of the initial reagents m_1 of a nuclear reaction is not equal to the total mass m_2 of the reaction products. A decrease in the mass $\Delta m = m_1 - m_2$ of reagents (this change in Δm is called a mass defect) is accompanied by the release of energy, the value of which E corresponds to the relation $E = \Delta mc^2$ of the theory of relativity. And, conversely, an increase in the mass of products, in comparison with the mass of reagents, requires the expenditure of the corresponding energy.

This interconversion of mass and energy is cited as one of the most important confirmations of the theory of relativity. From school we are taught that if SRT was wrong, then neither particle accelerators nor nuclear power plants could work, nuclear bombs would not explode. However, supporters of the theory of relativity are misleading. Indeed, in nuclear reactions, in fact, only the latent internal binding energy of particles - nucleons in the nucleus is released. Why this energy corresponds to the change in mass is another question, which we will analyze separately (§ 3.13). But the fact that the released energy is only the internal binding energy of the particles is beyond doubt and, in general, is not even disputed. Therefore, to assert that the discovery of nuclear decay reactions and the release of energy in nuclear reactors and nuclear bombs was impossible without the theory of relativity, this is the same as believing that the release of energy in ordinary chemical reactions and in furnaces, during the explosion of ordinary bombs, is the same as owes something to the theory of relativity. In nuclear and chemical reactions, essentially the same thing happens: the release or

absorption of latent bond energy during the combination or fission of nuclei and molecules. It is no coincidence that Rutherford (the scientist who discovered the atomic nucleus and nuclear reactions), when asked about his opinion on the theory of relativity, replied that it is not needed for nuclear research, and common sense does not allow him to consider this theory seriously.

To substantiate this statement, consider the reaction of annihilation of an electron and a positron, in which the mass of these two particles supposedly disappears without a trace, completely turning into energy. Apparently, annihilation is not just a collision of a positron with an electron, as is usually thought, but a more complex process. A positron can be quite far from the electron, but due to attraction, the two charges will begin to approach each other, gaining speeds that will not allow them to collide, but will force them to spin one next to the other. Due to the tremendous speed of rotation, the orbital loops are rapidly narrowed: the energy of the particles goes into their radiation (Fig. 42).

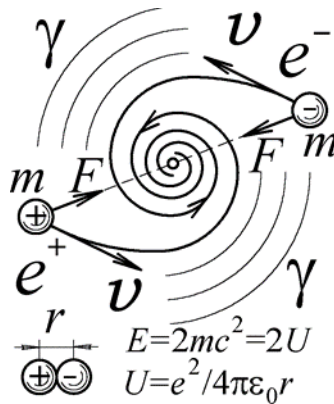


Fig. 42. The process of annihilation of an electron and a positron with their rapid flight in a spiral, up to merging into a neutral particle with the release of field energy in the form of gamma radiation.

This is the annihilation gamma radiation occurring with a huge charge rotation frequency. The radiation lasts until the electron approaches the positron to the distance of the classical radius r of the electron, which happens very soon. Further, the particles do not come closer and do not radiate. Therefore, the annihilation energy $2mc^2$ released by them, as shown by V. Manturov [79], is not the energy of annihilation of their mass m , but the electric energy (potential energy of the field) released when the particles approach the distance r .

It turns out that upon contact (annihilation), the electron with the positron do not disappear, as is sometimes believed, but only form an elusive neutral particle, which is not recorded by the instruments. After all, we do not believe that the electron disappears when it collides with a positive ion. They only constitute a neutral atom in the act of recombination, which is also, sometimes, conventionally called the "death of an electron". The energy $E = 2mc^2$, formed during annihilation, is not the energy of annihilation of the masses of the electron and positron, but the total energy of their electric field $2U = 2e^2/4\pi\epsilon_0 r = 2mc^2$, released in the form of gamma radiation when particles converge along a spiral (Fig. 42): from infinity to the classical electron radius $r = e^2/4\pi\epsilon_0 mc^2$, since the

particles, conventionally depicted by hard balls of radius r , cannot converge closer. If the mass disappeared, then, according to Einstein, the same amount of energy would be released, which is not really observed. This proves the falsity of the thesis about the destruction of mass and its conversion into energy.

Thus, during annihilation, the radiation process, like any oscillatory process, is extended in time, that is, it is continuous and has a classical character. Therefore, annihilation generates a spherical wave, and not a pair of gamma rays flying in opposite directions. However, the maxima of emission of these spherical waves by rotating charges are indeed directed, as in a turnstile antenna, diametrically opposite: along the axis of rotation up and down from the plane of the orbit of the electron and positron (the plane of the turnstile). Similarly, the production of electron-positron pairs, under the influence of gamma radiation, does not at all prove the conversion of energy into mass. There is only the tearing out of already existing electrons and positrons by radiation, their separation from each other and from the nucleus, similar to the phenomenon of the photoelectric effect (§ 4.6). That is why the creation of electron-positron pairs has never been observed in a vacuum, but only occurs when gamma radiation acts on atomic nuclei containing electrons and positrons [19, 139].

A misunderstanding of nuclear processes leads to a false confirmation of the theory of relativity and a refutation of the BTR (§ 3.17). There is a cyclical proof: the mechanism of nuclear reactions, misunderstood on the basis of STR, of course, leads to the confirmation of this very theory. However, if to the end remain on the positions of classical mechanics and the BTR, then within the framework of these theories experiments find a natural explanation. At the same time, it is possible to do without the absurd effects of changing mass and converting it into energy. The law of conservation of mass, discovered by the atomists of antiquity, substantiated by Lomonosov and rediscovered by Lavoisier [84], still remains a solid and indestructible foundation of physics.

So, we see that the released energy is just the released potential energy of the bond between the electron and the positron, the energy of the electric field, and, ultimately, the kinetic energy of the rheons and arheons exchanged between the electron and the positron (§ 1.14). And, therefore, one cannot say that the energy released by this reaction was formed from the mass of particles, since the particles and their mass did not disappear anywhere. They only formed an elusive neutral particle. Therefore, the disappearance of mass in nuclear decay reactions probably only means that during decay, numerous neutral particles-fragments appear, which have not been possible to register until now. A detailed justification of this assumption will be given later (§ 3.13).

It is interesting to note that the formula $E = mc^2$ was originally derived back in the 19th century by J. Thomson, Poincaré, Lorentz and Heaviside long before Einstein, and within the framework of classical electrodynamics, not the theory of relativity [25, 61]. These scientists, in contrast to Einstein, were well aware of the specific meaning of this relationship, applicable exclusively to electrodynamic phenomena. After all, it follows from classical electrodynamics that an electron due to radiation would resist acceleration, even if it did not have a material mass (§1.17, §3.18). So, the charge of an electron leads to the

appearance of additional inertness and mass in it, which was called electromagnetic. It is easy to show that this mass m is related to the electrostatic energy E of the interaction of electron parts by the dependence $E = mc^2$. That is, already from classical physics it followed that the energy contained in a body is related to its mass, especially if it is entirely of an electromagnetic nature, which is natural if all bodies, according to the hypothesis of Thomson and Lorentz, are formed from electrons. It turns out that scientists knew the relation $E = mc^2$ before Einstein, and, unlike him, clearly understood the true meaning of this formula and its applicability only to electromagnetic processes. Ritz, as we will see below, revealed the meaning of this formula even deeper, understanding the mechanism of the creation of electromagnetic mass and establishing that the mass m of an electron, upon its transition into a field, scattered form in the form of a stream of rheons, is related to their kinetic energy (energy of field, radiation) as $E = mc^2$, up to a coefficient. Thus, he mechanically substantiated Poincaré's idea of a material, weighty carrier of electromagnetic radiation (§ 1.2), which carries not only the energy E , but also the mass $m = E/c^2$ [25].

§ 1.17. *The nature of mass and gravity*

Zöllner's explanation, accepted by Lorentz, is, as is known, that the force of attraction of two electric charges of opposite sign slightly exceeds the force of repulsion of two charges of the same sign and the same absolute value. This explanation rejects the opinion about the one-sidedness of the electric field and, therefore, about its exceptional applicability only to elementary influences.

Walter Ritz, "A Critique of General Electrodynamics" [8]

In the previous chapters, the imaginary change in mass in experiments and the law of conservation of mass were discussed. This begs the question: what is mass in general, what is its nature? It must be said that the meaning of the concept of mass is still not clear. Even the theory of relativity, which claims to solve this question, gives only the most general and abstract definitions, and even then more in the form of formulas expressing these concepts quantitatively. An excellent book by F.S. Zavel'skiy about the nature of mass and the history of its research is called: "Mass and its measurement" [55]. Indeed, the path to understanding mass, like any physical phenomenon or concept in general, runs through measure. No wonder, the most famous definition of mass, given by Newton, sounds like this: "Mass is the amount of matter." Therefore, the law of conservation of mass is, in fact, the law of the indestructibility of matter. However, even in the sense of measuring mass, not everything is unambiguous, because if in classical physics the mass is considered constant, everywhere the same, then in the same theory of relativity it is a variable, relative, depending on conditions. The change in mass discovered in experiments, at first glance, testifies in favor of the theory of relativity. But, if we take into account the BTR, then within the framework of classical physics, as has been shown, these apparent changes find a simple interpretation (§ 1.15).

What is mass, and what is the nature of gravity? It is now considered reliably proven that the speed of propagation of gravity is equal to the speed of light. This alone suggests that gravity has an electromagnetic nature, that it, like an electrical

effect, is carried by rheons emitted by charges at the speed of light. It was Ritz who was the first to suggest that the speed of propagation of gravity is equal to the speed of light and substantiated the assumption that it is created by the electrodynamic interactions of all charges of the body [8]. In this case, Ritz relies on the following interesting idea of the physicist I. Zöllner. It is known that in each body there are exactly equal positive and negative charges, and therefore the forces of electric attraction and repulsion between two bodies must balance each other. But what if the force of attraction of two opposite charges slightly exceeds the force of repulsion of two of the same magnitude, but of the same name? Then the total force of interaction between all charges of two bodies will attract, bring them closer. This uncompensated electric force will be the force of gravity [106].

How such an asymmetry is possible is shown by the rheon interaction model. Consider, for a start, two charges of the same name. Let one electron "shoot" rheons at the other, thereby repelling it. Rheon of mass m , hitting an electron of mass M and being absorbed by it, transfers its momentum to the electron mc . After the impact, the electron will acquire velocity V_1 and mass $M + m$, and its momentum $(M + m)v = mc$, whence $V_1 = mc/(M + m)$. If the charges are opposite, then, as has been shown, they must both have masses of different signs and emit the corresponding rheons. After the absorption of a rheon with anti-mass ($-m$), the electron mass will become $M - m$, which means that it will acquire a velocity $V_2 = mc/(M - m)$ exceeding V_1 . In other words, the effect of electrical attraction is indeed slightly larger than the effect of repulsion (Fig. 43).

$$\begin{array}{c}
 \textcircled{e^-} \xrightarrow{R^- \circ \xrightarrow{+m} c} \textcircled{e^-}_M \xrightarrow{V_1 = \frac{mc}{M+m}} \\
 \textcircled{e^+} \xrightarrow{R^+ \circ \xrightarrow{-m} c} \textcircled{e^+}_M \xrightarrow{V_2 = \frac{mc}{M-m}} \\
 v = V_2 - V_1 = 2c \left(\frac{m}{M}\right)^2
 \end{array}$$

Fig. 43. By absorbing rheon and anti-rheon, the electron acquires the speed v .

As a result, two neutral systems, each consisting of an electron and a positron, after the interchange of rheons, will begin to approach each other with the speed $v = V_2 - V_1 = 2cm^2/M^2$ (provided that the rheon is much lighter than the electron). In other words, such neutral systems will attract (Fig. 44). And in the same way, any two bodies consisting of atoms, that is, ultimately, of negative electrons and positive protons (or positrons, § 3.9) must attract. Moreover, the force of attraction will be proportional to the number of elementary charges of the first and second bodies, that is, ultimately, to the masses of these bodies. If the reason for gravitation is this, then it is easy to express the mass of the rheon from here. We found out that one electron gives the other, with each rheon hit, the speed $V = cm/M$ (taking into account the smallness of m). At the same time, in two neutral systems "electron-positron" each rheon on average imparts to the system the velocity $v = cm^2/M^2$. That is, the electrical impact exerted by one rheon is greater than the gravitational one by $V/v = M/m$ times, - the same amount as the electron is heavier than the rheon. Since the electric interaction F of two electrons is 10^{42} times stronger than the gravitational G , then approximately the same number of

rheons should contain one electron. It is interesting that he came to the same conclusion, back in 1991, [V.S. Okolotin](#).

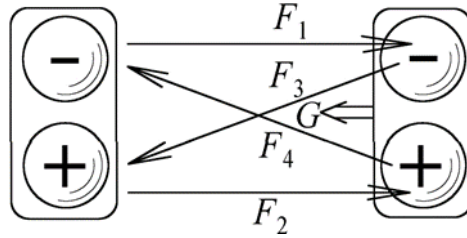


Fig. 44. The sum of the elementary forces F of the electrointeraction of the charges of two bodies gives the gravitational force $G = Fm_R/m_e$, or by another mechanism $G = 4F\Delta^2/r^2$.

However, if we consider that the mass of the rheons is probably even less, then this is not the main reason for gravity. Perhaps the main reason for the asymmetry of the elementary forces of attraction and repulsion of charges is the asymmetry of the properties of the elementary charges themselves - electrons and positrons, of which, as we will see, atoms and bodies are composed (§ 3.9). It is believed that the properties of these particles are completely symmetric: an electron and a positron are similar as twins, one is a mirror image of the other. And, therefore, all their characteristics: radius, mass, charge, spin - are the same, up to a sign. But, apparently, there is still an insignificant difference, which leads to the inequality of electrons and positrons, the essence of which is that the latter are almost absent in a free state (§ 3.15). The easiest way is to admit a slight difference between their radii and the frequencies of their emission of particles (rheons and arheons). Let the radius of the electron be r , and it emits N rheons per unit time. And the positron's radius is slightly larger than $R = r + \Delta$, and it emits n arheons every second. The force F of the impact of the first charge on the second is proportional to the number of particles emitted by the first per section (square of the radius) of the second (Fig. 6 and Fig. 45). There are four different powers in total:

- 1) repulsion force of an electron by another electron $F_1 = kNr^2$;
- 2) the force of repulsion of a positron by another positron $F_2 = knR^2$;
- 3) the force of attraction of an electron by a positron $F_3 = knr^2$;
- 4) the force of attraction of a positron by an electron $F_4 = kNR^2$.

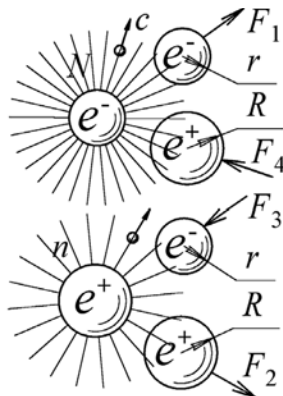


Fig. 45. A slight difference in the forces of interaction of charges is caused by the difference in their sizes and the number of emitted particles.

Obviously, the repulsive forces of like charges $F_1 = F_2 = F$. This is necessary for an approximate balance of forces in the macrocosm and for the equality of the inertial masses of the electron and positron. Indeed, according to Ritz's hypothesis, the force of inertia is, as we will show below, the force of the impact of the charge on itself. Then $Nr^2 = nR^2$ and $N = n(R/r)^2 = n(1 + 2\Delta/r + \Delta^2/r^2)$. As a result, taking into account the smallness of $\Delta \ll r$, we obtain: $F_1 = F_2 = knr^2 (1 + 2\Delta/r + \Delta^2/r^2)$, $F_3 = knr^2$, $F_4 = knr^2 (1 + 4\Delta/r + 6\Delta^2/r^2)$. This means that two neutral systems, each of an electron and a positron, are attracted with the force $G = F_3 + F_4 - F_1 - F_2 = 4kn\Delta^2$ (Fig. 44). That is, the forces of attraction, on average, really slightly exceed the forces of repulsion. Since $\Delta \ll r$, the gravitational force G is much less than the force F of the interaction of elementary charges: $G/F = 4kn\Delta^2/knr^2 = 4\Delta^2/r^2$. It is known that $G/F = 10^{-42}$. This means that the required gravitational force will arise already at $\Delta/r = 10^{-21}$, that is, with an insignificant difference in the sizes of an electron and a positron. Of course, other mechanisms of gravitational action from the inequality of elementary forces of electric attraction and repulsion are possible, including those that allow ideal symmetry of particles and antiparticles, exact equivalence of the characteristics and sizes of electrons and positrons (§ 3.20).

In any case, it is clear that the reason for the inequality of forces lies in the interaction of particles of matter and antimatter, which have opposite charges. This makes it possible to explain on the basis of the BTR magnetic and gravitational effects as particular manifestations of electrical ones. Both magnetism and gravity boil down to electricity. One has only to accept Zöllner's hypothesis, according to which the electric interaction of elementary charges of two bodies (electrons and nuclei) generates gravitational interaction if the attraction of two opposite charges is negligible higher than the repulsion of the same charges [106]. The reason for the equality of the propagation speed of gravity and light becomes clear, if both are transferred by rheons. Also, Zöllner's hypothesis explains the decrease in the gravitational force with distance R , as in the Coulomb's law $F \sim 1/R^2$, and the increase in the force with mass. After all, the heavier the body, the more atoms, charges and elementary forces in it, giving in total the force of gravity. Finally, it is clear why the gravitational forces are much less than the electrical ones: the gravitational effect, like the magnetic one, arises as an insignificant excess of the electrical force. On the basis of the BTR, it is already possible to build a unified field theory, which during the last 30 years of his life A. Einstein fruitlessly tried to create (§ 3.16). In his 1908 work, Ritz, coming close to the idea of such a unification, was able to explain some relativistic gravitational effects. Indeed, if gravity is electrical in nature, then the laws of electrodynamics apply to it. And Ritz applied them successfully, long before Einstein explaining the secular displacement of the perihelion of Mercury and predicting in 1908 the magnitude of the displacement for other planets according to the formula he derived, only seven years later, in 1915, found by A. Einstein (§ 2.3).

Note that Ritz himself, claiming the electrical nature of gravity, believed that the difference between the elementary forces of attraction and repulsion is associated with the inequality of the speed V of the movements of positive and

negative charges in the atom. Taking into account the dependence of the force on the velocity, this will create corrections of the order of $(V/c)^k$ to the force of interaction of individual atomic charges (here k is some integer greater than two). These unbalanced corrections manifest themselves, according to Ritz, in the form of gravitational forces. That is, Ritz adopted a dynamic mechanism for creating a gravitational force, admitted by some modern physicists [44, p. 178], and by the thinkers of antiquity, for example, Kepler, who considered gravity to be a force of electromagnetic nature, arising as the difference between the forces of attraction and repulsion due to the rotation of bodies ([Bely Yu.A. Johannes Kepler. M., 1971](#)). Such a mechanism for the emergence of gravity is also possible, if only because electrons, unlike nuclei, are believed to be in an atom in constant rotation. But, even if there is no such movement, there is a chaotic movement of electrons and nuclei, reminiscent of thermal, Brownian, associated with impacts and recoil during emission-absorption of rheons (§ 3.14). Moreover, the speeds of these Brownian oscillations no longer depend on the charge of the nucleus and on the kind of atom. Electrons, being smaller in mass than nuclei, should move noticeably faster, which would create an asymmetry of the forces of attraction and repulsion, which is taken into account in the higher orders of expansion of the force in powers of V/c . It is interesting that Kepler also explained the laws of planetary motion discovered by him by solar gravity, decreasing with distance and having a common nature with magnetism, which he associated with the rotation of bodies, and considered gravity to be the difference between the forces of attraction and repulsion, anticipating Ritz's discovery.

As you can see, Ritz discovered the nature of gravity and gravitational mass. But, after all, there is still inertial mass - that is, the degree of resistance of the body to acceleration. Indeed, why does the body resist impact, acceleration? Why is it necessary to apply a force proportional to the acceleration to accelerate an object? Ritz, like Lorentz, admitted that the inertial mass of a body could, in principle, be of an electromagnetic nature. He considered the following mechanism of the birth of inertia. Let two connected charges shower each other with rheon "fire" (Fig. 46). In such a system, the forces F of mutual repulsion of the charges balance each other. But, accelerating the system, we upset this balance. The impact on the front charge that rheons have to catch up with is reduced. The rear charge, on the contrary, itself moves towards the rheons - their impact on the charge is increased. Forces, like frequencies in the Ritz effect, change proportionally $(1 \pm aL/c^2)$.

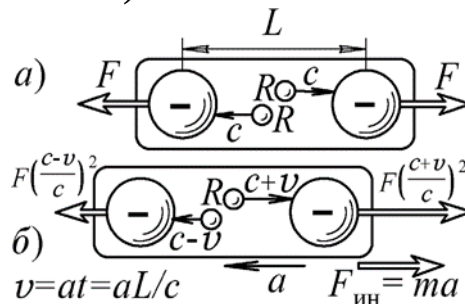


Fig. 46. Equality of forces of interaction of charges (or parts of one charged particle) at rest (a) and violation of their balance during acceleration of the system (b).

The resulting force $\Delta F = 2FaL/c^2$ is directed against the motion and is proportional to the magnitude of the acceleration a . That is, a kind of electrical inertial force arises. So, maybe the fictitious force of inertia F_{in} , introduced sometimes for convenience in mechanics, is real? The acceleration of the body will increase until the inertial force balances all other forces - the situation is the same as in static. Such a braking force will act on each charge of an accelerated body. Any charge, say an electron, acts on itself. Its front (in the course of acceleration) pushes back more strongly than the rear front. This is why the electron resists acceleration. And, since all bodies are made up of charged particles - electrons and nuclei, the inertial mass of a body is made up of the inertial masses of all its charges. If the gravitational and inertial masses are of a purely electrical nature, then it is clear why they are equal: both are proportional to the number of charged particles of the body. Interestingly, when an electron joins with a positron, their attraction, on the contrary, will make the system instantly accelerate and go to infinity. Perhaps this is how the electron and the positron disappear, "annihilate" on contact (§ 3.18).

Thus, so far two types of mass are known: inertial and gravitational. For all bodies and particles, they are positive, since any bodies and particles resist acceleration and are subject to gravity. And in no case can it be considered, like Einstein in general relativity, that these types of masses are equivalent to each other, since, as we have seen, they have a different nature. We can only talk about the proportionality or equality of inertial and gravitational masses in a suitably selected system of units. But what about Newton's definition of mass as an amount of matter? Apparently, this third type of mass also exists. It is the one that has a fundamental meaning, and the inertial and gravitational mass arise only as particular manifestations of the material mass. The material mass can be, as we found out, negative, if we are talking about antimatter (minus-matter), say, about a positron. At the same time, the inertial and gravitational mass of the positron is positive and equal to the electron mass, since the positron also resists acceleration and is attracted by the Earth, like an electron.

As for the rheons and arheons, they have no gravitational mass at all, just as there is no charge, because only the impacts of these particles create a gravitational and electrical effect. The gravitational mass M , like the electric charge Q , is a measure of the productivity of the field source, that is, the amount of matter (rheons and arheons) emitted by the body every second (§ 1.6). But, if the total charge Q is the difference between the flows of matter and antimatter (the total flow of rheons and arheons, taking into account the sign of their mass), then gravmass is the sum of these flows in absolute value. That is why rheon itself, not being a source of rheons, has no electric charge or gravitational mass. So, in total there are three types of mass: material, inertial and gravitational, due to different reasons. And we must clearly distinguish which of the masses we are talking about in each case. In general, one should be very careful about the nature of the mass. Ritz himself called for this. Assuming the electromagnetic nature of mass, he did not rule out that inertia is an independent property of bodies. In other words, perhaps inertial mass is determined by the amount of matter, and the concept of mass is not reducible to anything else. Therefore, the models proposed

here do not solve the problem of mass, but only pose it edge-on, give a view from the standpoint of the BTR at what this solution can be.

§ 1.18. Changing the course of time in a gravitational field

The pendulum is in exactly the same conditions as if would he be transferred to another planet, where the acceleration of gravity weaker. From the formula $T = 2\pi\sqrt{l/g}$, it follows that with a decrease in the acceleration of gravity g , the oscillation time T should increase: the pendulum will oscillate more slowly.

Ya. I. Perelman, "Entertaining mechanics"

Having touched upon the problem of gravity and mass, one cannot but touch upon the problem of time. According to the general theory of relativity (GR), gravity can influence the course of time [160]. Moreover, in experiments, it would seem, it was possible to detect this influence. So, for example, the following experiment was performed. The same synchronized atomic clock was installed on the ground and on board the aircraft. The plane took off and, after spending some time in flight, landed, after which the clock was checked (§ 1.18). At the same time, it turned out that the clock, which had been in the sky, went forward [57]. It turned out that at an altitude of several kilometers, time flows a little faster than near the surface of the Earth. This result, it would seem, both qualitatively and quantitatively confirmed the theory of relativity.

And yet, these experiments do not at all indicate that the gravitational field is capable of influencing the course of time. It is more logical to assume that the course of time is the same everywhere, and the reason is only in the clock, in its structure. It is the clock, not the time itself, that is affected by gravity. So, if we used in the experiment not atomic, but simple pendulum clocks, then clocks that have been at an altitude (where gravity and acceleration g of free fall are less than on the ground), on the contrary, would lag behind, and noticeably. And, too, the reason would be in gravity, because the smaller the acceleration g , the lower the oscillation frequency and the higher the swing period of the pendulum. However, no one concludes from this that time flows faster near the earth than far from it. The reason for the change in the speed of the watch is purely mechanical.

The question is, is it possible to believe in the infallibility of the atomic clock? Can we guarantee that their readings are not affected by gravity? On the contrary, there is every reason to believe that gravity affects the course of the atomic clock. The atom, or rather the frequency of oscillations of the electron in it, acts as a standard of time in such a clock. But it is proved, say, by the Zeeman and Stark effect, that external fields (magnetic and electric), acting on an electron, are able to influence this frequency (§ 3.5). So, gravity, especially if, as has been shown, of an electromagnetic nature, should also control the course of such a clock (this influence can even be calculated) - precisely the course of clocks, processes, but not time itself. Such a gravispectral effect was predicted in his book "A New Look at the Theory of Relativity" by L. Brillouin, a well-known supporter of Ritz's ideas and critic of relativistic concepts. There are no clocks more accurate than atomic ones yet, but when clocks that work on a different principle and are not subject to gravity appear, they will show that atomic clocks at altitude lie like pendulum clocks, albeit smaller. In the same way, people once unconditionally

believed in the stability and infallibility of another single standard of time, which was the Earth itself, its rotation, which sets the length of the day. But later, more accurate clocks made it possible to discover that the speed of the Earth's rotation barely noticeably changes, changing the number of seconds in a day, again, under the influence of gravitational influence, first of all, of the Moon [28]. In the same way, under the influence of gravity, the frequency of rotation of electrons in atoms also changes, and the atomic clock cannot be considered stable. In all the cases considered, a purely mechanical classical effect takes place, which has nothing to do with the theory of relativity and the imaginary distortion of space-time by the gravitational field.

Thus, no time standards can be absolutized, for there can always be watches that are more accurate, free from the influence of external factors that affect the stability of the clock. It must be remembered that absolute time does not exist by itself, as Democritus and Lucretius understood: the flow of time we observe only due to the movement of bodies (§ 5.6). However, time is absolute, independent of anything, in the sense that the movements of bodies are interconnected, they can be measured by finding an arbitrarily accurate clock, free from extraneous influences and allowing you to control these movements, detecting their uniformity (stability) or unevenness, measure from their using the relative speed of the processes. In the same way, according to Ritz's theory, which adopts Galileo's classical principle of relativity, there is no absolute speed of bodies, no absolute space. But, at the same time, according to Newton's first law, we can always find such bodies that, not being subject to the action of forces, external influence, move uniformly. And, already with respect to these bodies and the frames of reference associated with them, one can arbitrarily accurately determine the relative speeds of motion of other bodies, as well as whether they are moving uniformly or accelerated, undergoing external influences. It is in this sense that Newton introduced absolute space and time: by absoluteness, he understood their immutability, the inability of bodies and external conditions to change space and the rate of flow of time. But not because space and time are absolutely rigid and fixed, but because they do not exist and there is simply nothing to influence, since space is an emptiness without properties, in which coordinates express only the mutual position of bodies, and time is a quantitative measure, invented to match the movements of bodies in this void. Space and time are abstract mathematical concepts that physicists, at the suggestion of Einstein, like a field, endowed, through thoughtlessness, with physical reality and properties, including the ability to change under the action of bodies.

As Ritz noted and, two millennia before him, Democritus with Lucretius, space and time on their own simply cannot exist, since this would mean the existence of an absurd center, beginning, boundaries of the Universe and time (§ 2.6), as well as the materiality of empty space and time, which really do not have their own physical properties (§ 5.6). There are only spatio-temporal connections and relationships, and, therefore, all processes are manifested in our world only in the form of relative, not absolute movements of bodies. This classical kinematic principle of relativity, introduced by Democritus, Copernicus and Galileo, has nothing to do with the Aristotle-Einstein principle of relativity. Indeed, according

to Einstein, reality itself each time changes to please the observer, and not only kinematic characteristics, but also matter itself become relative: its quantity (mass), its length (length), the time scale of its internal processes (period), which, according to the BTR, it can be reliably fixed by a sufficiently accurate clock, comparing it with their course.

§ 1.19. Changing the course of time at acceleration and the principle of equivalence

Bömmel gave the source and the receiver the same acceleration and measured the frequency change. The emission theory gives a ready-made prediction of the result. If the acceleration in this experiment is equal to g (assumed constant for simplicity of calculations) and is directed from the source to the receiver separated by a distance h , the relative velocity of the Ritz waves and the receiver at the time of absorption is $c + gh/c = c(1 + gh/c^2)$... This leads to a small frequency shift for the receiver by gh/c^2 , which is in agreement with experiment.

J. Fox, "Evidence Against Emission Theories" [2]

According to the general theory of relativity, the course of clocks, like gravity, is also influenced by their acceleration. But, after all, the course of the pendulum clock depends on acceleration to the same extent as on the force of gravity. During acceleration, in addition to the gravitational force, an additional inertial force acts on the pendulum, forcing the pendulum to swing more or less often. Therefore, one cannot deny a similar effect of acceleration on the frequency of oscillations of an electron in an atom, and, therefore, on the speed of the atomic clock. Thus, in experiments, the course of the clock (pendulum and atomic) always changes, and not the time itself. In addition, it is necessary to remember that the previously considered Ritz effect, according to which the frequency of emission of atoms, in addition to speed, is also influenced by their acceleration (§ 1.10), can also manifest itself. The frequency shift $\Delta f/f = aL/c^2$ predicted by the BTR coincides with that found experimentally. Indeed, it was discovered in Bömmel's experiment, where a gamma-ray source located at a distance $L=d$ from the absorber was given a radial acceleration a . The shift in the frequency of gamma rays, measured using the Mössbauer effect, was $\Delta f/f = ad/c^2$, which confirmed the Ritz formula [153, p. 136].

Another experiment of the same type was performed with rotating cylinders, in which the nuclear source and the gamma-ray absorber were located at different distances R_1 and R_2 from the axis of rotation and, accordingly, had different accelerations a_1 and a_2 . The relative frequency shift, in full agreement with the predictions of general relativity, was $\Delta f/f = (a_1 R_1 - a_2 R_2)/2c^2$ [153]. However, this result, like Bömmel's experiment, can be easily explained, according to the Ritz effect, by the influence of the acceleration of the source on the frequency and wavelength of radiation, as we will show at the end of the section. However, it is possible that the difference between the frequencies of the source and the absorber is caused by the influence on the natural frequency of nuclear acceleration processes, similar to the influence of gravity. In this case, different accelerations cause a different shift in the frequencies of intranuclear oscillations, which is recorded in the experiment. More details about the mechanism of this shift will be discussed below (§ 3.5). As you can see, in this case, the change in the received

vibration frequency arises not from a change in the course of time during acceleration, but from a change in the very frequency of physical processes under the action of acceleration. Acceleration will either not affect the frequency of processes of a different nature, or will affect it to a different extent.

It should be noted that, at times, the frequency shift from acceleration can be perceived as a manifestation of a gravitational frequency shift. Thus, in the well-known experiment of Pound and Rebke, performed in 1960 using the same Mössbauer effect, it was found that the frequencies of nuclear processes f' and f in radioactive isotopes, one of which was located at an altitude of $H = 20$ m above the other, were as $f'/f = 1 - gH/c^2$, in full agreement with the prediction of general relativity. On the other hand, the complete coincidence of the obtained value of the frequency shift with the frequency change according to the Ritz effect is obvious. Indeed, in the experiment, the frequencies were compared in the process of emission from the lower source of gamma radiation to the upper one. In this case, since gravity acts on the lower source, then, even from the slightest vibrations, it will move with acceleration $a = g$ directed downward. Therefore, even if the speed of the source in these oscillations is negligible (for a short period of mechanical vibrations, the source simply does not have time to gain a noticeable speed), this acceleration will affect the frequency f' of the radiation coming from the source to the absorber at height H , according to the Ritz effect $f'/f = 1 - gH/c^2$. However, it is possible that gravitation affects the speed of nuclear processes in the same way as it does atomic, and the addition is caused exclusively by gravity (§ 1.18), while acceleration is completely absent, due to the reliable fixation of the source. But, it is quite possible that the reason lies solely in the acceleration of gravity g and in the Ritz effect, especially if we take into account the re-emission by the atmosphere - atoms and nuclei located in the path of the beam, flying with an acceleration g and, due to the message of their speed to light, leading to a shift frequency even when the source is rigidly attached.

Another well-known effect is a change in the frequency of light in the gravitational field of the Sun and stars, which Einstein in 1911 explained by the absurd slowing down of time near gravitating bodies, increasing the period of light oscillations. The effect of reducing the frequency of light near the Sun (by the shift of its spectral lines to the red region) was discovered as early as 1897 and was widely discussed in print since 1909 [30, p. 98]. However, this phenomenon can be easily explained without the theory of relativity and an imaginary change in the time scale, if we apply classical physics and the Ritz effect discovered in 1908: a change in the period and frequency of light from an accelerating source. Indeed, in the powerful gravitational field of the Sun, the acceleration a of free fall is 30 times greater than that of the Earth ($g = 10 \text{ m/s}^2$): $a = GM_S/R_S^2 = 272 \text{ m/s}^2$, where $G = 6.67 \cdot 10^{-11} \text{ N m}^2/\text{kg}^2$ - gravitational constant, $M_S = 2 \cdot 10^{30} \text{ kg}$ - mass of the Sun, $R_S = 7 \cdot 10^8 \text{ m}$ - its radius. Atoms, emitting characteristic spectral lines, fall in the solar atmosphere with acceleration a . From the Ritz effect, their light of frequency f and wavelength λ is perceived on Earth as light of frequency $f' = f(1 - aL/c^2)$ and length $\lambda' = \lambda(1 + aL/c^2)$, where L is the path on which light. That is, the classical Ritz effect also leads to an increase in the wavelength, reddening of the light of the Sun and other stars under the

influence of their gravity. As we shall see, it also leads to the reddening of distant galaxies, in proportion to the distance L to them (Hubble's law, § 2.4).

But, in the case of reddening of the light of the Sun, the path L , on which the red shift $\Delta\lambda = \lambda' - \lambda = \lambda aL/c^2$ is accumulated, is no longer equal to the distance to the Earth, as it would be in a pure vacuum. After all, the Sun is surrounded by an atmosphere, and the effective path L is much smaller. In fact, the increase in wavelength, according to the Ritz effect, is due to the fact that light rays inherit the speeds of emitting atoms, which is why the crests of light waves emitted later have lower speeds (atoms are slowed down by the gravity of the Sun) and lag more and more behind those emitted earlier. As a result, the wavelengths of light (the distance between the crests) gradually increase due to the difference in speed. But light, following through the atmosphere of the Sun and interacting with its atoms, is re-emitted by them and, according to Ritz's theory, acquires a speed c already relative to these atoms: it is their acceleration $a(R)$ that sets the further stretching of light waves. The atmosphere and corona of the Sun extends for dozens of radii R_s beyond the visible boundaries of the sun, as seen during eclipses. At such distances R , the acceleration $a(R) = GM_s/R^2$ drops to almost zero.

That is, in calculating the shift $\Delta\lambda$, it is necessary to take into account the variability of $a(R)$ and sum up the increments $d\lambda = \lambda adR/c^2$ on each elementary section of the path $dL = dR$, integrating $d\lambda = \lambda GM_s dR/R^2 c^2$ within the range of R change from R_s to R_F , equal to the extreme radius of the crown of the Sun, where $a = 0$. As a result, the total wavelength shift $\Delta\lambda = [1/R_s - 1/R_F] \lambda GM_s/c^2$, or taking into account $R_F \gg R_s$, $\Delta\lambda/\lambda = GM_s/R_s c^2 = 2.12 \cdot 10^{-6}$. This redshift for the Sun, found according to Ritz's theory, coincides with the formula given by Einstein in 1911, three years after Ritz discovered the effect of the spectrum shift with acceleration [30]. It is this shift of lines in the solar spectrum that was recorded in precise measurements [107]. A similar effect of Ritz's change in the wavelength and frequency of light was found in the Earth's gravitational field, moreover, not only by the Mössbauer effect (with an altitude difference of 20 m), but also with the help of a rocket that raised the frequency standard to an altitude of 10,000 km and sent its signals to the Earth [26, p. 67]. Thus, the change in the frequency and wavelength of light in the gravitational field of the Earth, the Sun and other stars is most likely caused not by gravity itself, but by the accelerated motion of emitting and re-emitting atoms in the gravitational field. It is because of the Ritz effect, and not from the notorious principle of equivalence, that acceleration and gravity equally lead to a frequency shift.

To be convinced of this again, let us consider experiments that reveal, by the Mössbauer effect, negligible shifts in the spectrum, when the source and receiver are no longer at different heights, but at different distances R_1 and R_2 from the axis of a disk rotated with an angular velocity ω , creating a frequency shift due to centripetal acceleration $a = \omega^2 R$. The wavelength shift $\Delta\lambda = \lambda' - \lambda$, according to the Ritz effect, is again found by integrating $d\lambda = \lambda adR/c^2 = \lambda \omega^2 R dR/c^2$, within the range of R from R_1 to R_2 . Hence $\Delta\lambda/\lambda = [R_2^2 - R_1^2] \lambda \omega^2 / 2c^2$. The same result, confirmed by experience, is given by general relativity, but it is more complicated with an imaginary time dilation from acceleration [153]. And in Ritz's theory, the

shift of the spectrum is a natural consequence of the ballistic principle and the re-emission of light by the atoms of the intermediate medium, disk and air, carried away by its rotation. When there is no medium (or its influence is small), the spectrum shift is set only by the acceleration of the source and the distance to it, as for the redshift according to Hubble's law (§ 2.4).

So, there are no relativistic effects that cannot be explained by the classical Ritz theory! This theory alone gives everything that was explained by Maxwell's electrodynamics, SRT and GRT, and, moreover, predicts Hubble's law and other effects of the cosmos, incomprehensible within the framework of these theories (Part 2).

The Ritz effect also explains why a number of correct conclusions Einstein received from the erroneous postulate of general relativity about the equivalence of gravitational and inertial mass. According to this postulate, being in an elevator, it is impossible to determine whether it is at rest on the ground or moving away from it with an acceleration g , which is why the wavelength of light equally changes gravity and acceleration, as was confirmed by experiments on the analysis of the spectrum shift in accelerated moving systems. In fact, as we have seen, the principle of equivalence is incorrect, because gravitational and inertial mass have different natures, and we can only talk about their equality, proportionality (§ 1.17). As for the equality of the shifts of the spectrum during acceleration and in a gravitational field, then it should have been expected from the Ritz effect. It is the acceleration of the light source (not gravity itself) that transforms the spectrum. And it does not matter what caused the given acceleration a : rotation, gravity or other force - the shift of the spectrum will be the same in agreement with the experiments. In this case, of course, there is no real change in the time scale during acceleration and in a gravitational field: there is only a shift in the received oscillation frequency of the receiver, as if in the Doppler effect.

Be that as it may, it makes no sense to talk about a change in the tempo of the flow of time, because time is not material, not perceptible, and, therefore, like space, it is not subject to external influence. A change in physical conditions can only change the speed of some processes, and time is just a conditional measure of this speed. It is no coincidence that K.E. Tsiolkovsky said on this occasion: "Slowing down time! Understand what wild nonsense lies in these words." Since time itself serves as a measure of slowness and speed, its deceleration is the same tautology as "oiling the oil". The clock may go astray, the steel ruler may expand from heating, but the generally accepted seconds and centimeters from this will not cease to be the same seconds and centimeters. It is not in vain that Ritz also urged to remember that time is cognized by us only in the processes of motion of bodies, in the form of space-time relationships [8]. It is movement and its observation that gives an idea of time. Comparison of different movements, say, the duration of the fall of the load and the number of swings of the pendulum, gives us the measure of this movement - the measure of time. Note that it was Ritz who for the first time, in 1908, long before Einstein, calculated the effect of the acceleration of a source on the frequency of signals coming from it and the apparent time scale of its internal processes (§ 1.10). And, only a few years later,

the effect of the same magnitude was predicted by Einstein - in his general theory of relativity, without references to Ritz and with the hypothesis of a real (and not imaginary) change in the time scale.

§ 1.20. Slowing down time and the transverse Doppler effect

I want to offer you a problem that is of great importance for the question of the principle of relativity, and, consequently, for the whole of electrodynamics. According to the Lorentz-Einstein theory of relativity, the wavelength emitted by a moving atom should change according to the Doppler principle, not only in the direction of motion; and when observing perpendicular to the direction of the velocity v , there should be a shift towards red in the ratio $\lambda v^2/2c^2$... Could it be done in such a way as to give an exact answer to the question of the existence of the effect?

From a letter from Walter Ritz to F. Paschen, 1908 [153, p.127]

According to the special theory of relativity, the rhythm of time is also influenced by the uniform movement of the source: the faster the clock moves, the slower its hands spin for a stationary observer. This, predicted by Einstein, the effect of time dilation, as if, also matched the experiments. Usually, the change in the rate of passage of time is detected using a pair of atomic clocks, comparing the frequency of the moving clock f' with the frequency f of the same, but stationary. These frequencies, which are the same for a pair of resting clocks ($v = 0$), no longer coincide during their mutual motion, as follows from the SRT formula $f' = f(1 - v^2/c^2)^{1/2}$ and from experiments.

In one such experiment, the following method was used to compare the readings of a moving and stationary clock. The same atomic clock was placed on board two jet aircraft, and the exact same atomic clock was left on the ground. The planes took off and, having flown around the Earth, one from west to east, the other from east to west, returned, making a circle, to the place of departure, where the readings of all three hours were checked. At the same time, it turned out that the clock moving with the plane lagged behind in comparison with those that were on the ground (the clock lifted on the plane also showed the above effect of accelerating the clock rate at altitude, which was also taken into account and superimposed on the superior the largest effect of time dilation from movement). From this it was concluded that the moving clock indeed runs slower. But, in fact, this is an obvious mistake. Indeed, according to the same theory of relativity, it is impossible to distinguish which system is moving and which is at rest. Therefore, with the same success one could say that the clocks on the airplanes were stationary, and the ground clocks were moving. Then they should have lagged behind. It is in this equality that the well-known paradox of twins consists. Of the two twin brothers, one goes on a space journey at near-light speed, and when he returns, he finds his brother very old, although according to the "logic" of the theory of relativity, the opposite could also be observed [37]. As Tsiolkovsky correctly noted: "The slowing down of time in ships flying at subluminal speed in comparison with earthly time is either a fantasy or one of the next mistakes of the non-philosophical mind."

So, even according to SRT, the experience with airplanes cannot confirm the validity of the time dilation effect. Why, then, did the clock run at different speeds if they were equal? The thing is that the clocks on the ground and in the plane

were, nevertheless, in unequal conditions, since the plane, although it flew at a constant speed V , was moving at an accelerated rate, because it flew along an arc of a large circle having the Earth's radius R . At such movement is accompanied by acceleration, since the speed changes in direction. This acceleration is $a = V^2/R$ and introduces asymmetry. It is acceleration, not speed at all, that causes the moving clock to run slower. As shown in the previous section, acceleration does indeed reduce the frequency of atomic processes, but, again, not from a change in the rhythm of time, but from an additional force acting on the electron and changing the frequency of its oscillations. The fact that the matter is precisely in the acceleration, and not in the speed of the clock, is also confirmed by the fact that the clock flying from west to east lagged noticeably more behind than the clock flying from east to west. This should not have happened: if the clocks flew in planes at the same speed, at the same time, then, according to the time dilation formula, they would have lagged behind equally. In reality, this is not the case, since all three clocks also participated in the rotational motion of the Earth around its axis. Let the planes fly at a speed V , and the circumferential speed of the Earth - v . Then, for an airplane flying from west to east, this rotation increased the peripheral speed, and hence the acceleration $a_1 = (V+v)^2/R$, and the associated clock lag, and for an airplane flying in the opposite direction, on the contrary, - reduced $a_2 = (V-v)^2/R$. Therefore, the clocks on airplanes lagged behind in varying degrees.

According to general relativity, the frequency shift during rotation is $\Delta f/f = aR/2c^2$. As a result, the frequency shift will be $\Delta f/f = V^2/2c^2$, - the same shift that is obtained due to the slowing down of time in hours moving at a speed of V . So, it turns out that, according to general relativity, such a frequency shift should be observed - from acceleration, and, according to SRT, from speed. That is, there would be either a two-fold effect of changing the frequency, or the effect would be absent. And, since only a single effect is observed in the experiment, then the theory of relativity is not correct - there is no time dilation in moving systems, but there is only a change in the course of clocks moving with acceleration - an effect that can be explained within the framework of classical physics and the BTR.

In the same experiment, the effect of changing the speed of the clock (again, hours, not time) was measured in parallel - due to a different gravitational field. Clocks in aircraft flying at an altitude of 10 km experienced less gravity - acceleration at this altitude is 0.32% less. Accordingly, in addition to the effect of the usual acceleration, which slows down the clock, its course is influenced by a decrease in gravity, which leads to a faster pace of clocks in an airplane compared to clocks on the ground (§ 1.18). These two effects add up, and we observe their cumulative effect [57].

Another experiment that allegedly confirmed time dilation was the measurement of the transverse Doppler effect. The idea of this experiment was put forward by the same Ritz for testing SRT back in 1908. But the experiment itself was carried out only 30 years later by Ives [153]. Recall that the movement of the source affects the frequency of the light coming from it. In the longitudinal Doppler effect, the change in frequency $f' = f(1 + v\cos(\phi)/c)$ is created by the

longitudinal component of the velocity and is explained classically. On the other hand, in the transverse Doppler effect (Fig. 47), where the source moves across

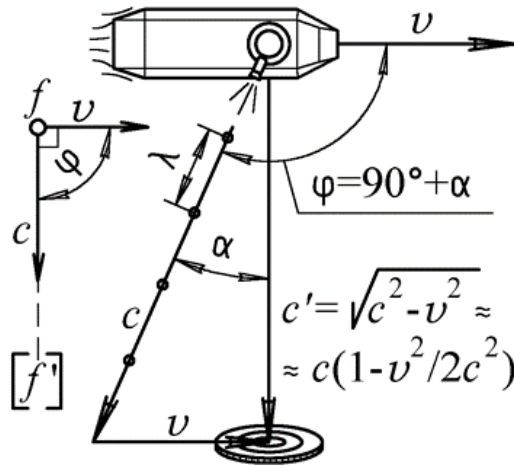


Fig. 47. To the calculation of the transverse Doppler effect. To hit the target on the move, the armored car shoots with an angular lead $\alpha = v/c$.

the line of sight ($\varphi = 90^\circ$), and there is no Doppler effect due to the longitudinal component of the velocity, the frequency change observed in the experiment allegedly speaks of a change in the very course of time, which is possible only in SRT [74]. But, in reality, the same longitudinal Doppler effect changes the frequency and the frequency shift can be fully explained within the framework of the classical Ritz theory, if we apply the ballistic principle. It is only necessary to take into account that in the frame of reference of the source, the angle φ at which the light is emitted to the observer, in reality, will no longer be $\pi/2$, but a little more. Indeed, according to the BTR, the speed of light is added to the speed of the source, and therefore, in order for the light to reach us, it must fly out from the source at an angle α to the line of sight (this is an aberration angle similar to that observed in the effect of stellar aberration, § 1.9). And, although this angle is small, $\cos(\varphi)$ is still not zero: $\cos(\varphi) = \cos(90^\circ + \alpha) = -\sin(\alpha) = -v/c$, from where $f' = f(1 + v\cos(\varphi)/c) = f(1 - v^2/c^2)$. The wavelength, on the contrary, will grow: $\lambda' = c'/f' = c(1 - v^2/2c^2)/f(1 - v^2/c^2) \approx \lambda(1 + v^2/2c^2)$. It is precisely such changes in the radiation wavelength of moving atoms, which are quite explainable from the position of the BTR and were observed in experiments. So, the transverse Doppler effect did not refute, but confirmed classical physics and Ritz's theory, as noted by many authors who revealed the role of the angle of aberration in this experiment [81, 111].

The effect of time dilation was also observed in rapidly moving particles - mu-mesons. It is known that particles have a mean, quite clearly defined decay time. And, so, it turned out that for particles in cosmic rays and particles in accelerators moving at huge speeds, this time is noticeably longer than the average lifetime [54]. This was also explained by the time dilation. For moving particles, time seems to go slower: they "age" more slowly and live longer, as experiments have shown, in accordance with the SRT formulas. But, if we again recall the paradox of twins, we will understand that motionless particles could live longer with the

same reason. And, therefore, the true reason for the "longer" lifetime of moving particles is completely different. More on this in the next chapter.

§ 1.21. Lifetime stretching and superluminal speeds

In our theory, based on the principle of relativity, one might expect that speeds equal to or greater than the speed of light have features as unusual as in Lorentz's theory. For the interaction of β -rays emitted in opposite directions by a grain of radium, relative velocities much larger c must be taken into account. And c can in no way be a critical speed.

Walter Ritz, "A Critique of General Electrodynamics" [8]

Let us consider experiments on measuring the lifetime of rapidly moving particles [54]. In such experiments, time, as well as the mass $m = F/a$ of rapidly moving particles (§ 1.15), is determined indirectly by the formula $t = L/v$. More specifically, they measure how far L a particle moving with a velocity v will have time to cover before decaying. It turned out that the time of motion of a particle found by the formula $t = L/v$, even if we put the particle velocity v equal to the maximum speed of light c according to SRT, often exceeds the known lifetime for it (from birth to decay), moreover, the more noticeable the higher energy, and, hence, the speed of the particle. It is believed that this both qualitatively and quantitatively confirms the conclusion of the STR about a change in the time scale during motion, as if for a moving particle time flows more slowly, and therefore it manages to fly a greater distance L before the moment of disintegration. But, as A.A. Denisov, this is true only if the particle velocity is found correctly and does not exceed the speed of light c [44, 111]. If there is no such restriction, then, from the point of view of classical mechanics, it is more reasonable to assume that the lifetime has not changed, the value $t = L/v$ has remained the same, since the particle velocity v was increased in proportion to the path L . Is it any wonder that faster particles travel a longer path during decay?

Consider an experiment with life extension of particles called mu mesons [54]. In the theory of relativity, the velocity of a meson is found from its kinetic energy E , related to the velocity by the relativistic formula $E = mv^2/2(1 - v^2/c^2)^{1/2}$, where m is the meson mass at rest. Its real speed V should be calculated according to the classical formula $E = mV^2/2$, whence $V = v/(1 - v^2/c^2)^{1/4}$. If in the formula $t = L/V$ the speed V is replaced by its expression in terms of v , we get $L/v = t' = t/(1 - v^2/c^2)^{1/4}$, that is, a formula similar to the SRT formula for transforming the time scale: $t' = t/(1 - v^2/c^2)^{1/2}$. Some inconsistency in the exponent arises only from the method of determining the energy E of particles.

This means that the prolongation of the life of particles is an illusion caused by the erroneousness of the SRT formulas connecting velocity and energy, and disappears if V is defined classically. Thus, here again we are faced with a cyclical proof of the validity of SRT, a proof based on itself. First, according to SRT, it is believed that the speed of particles does not exceed the speed of light, and from its false formulas for energy and mass, an erroneous speed is found, and then from this underestimated speed, the increased lifetime of particles is obtained. But, then, it turns out, and the experience was completely useless - and without it it was clear that the stretching of the life time is a consequence of the second

postulate of the SRT about the constancy of the speed of light and the impossibility of exceeding it. Such a vicious circular method of proof took place in almost all relativistic experiments, which were always interpreted from the standpoint of the theory of relativity. It is clear that nothing, except for its confirmation, will then work. If the theory of relativity is false and superluminal particles are possible, then all this evidence, including the proof of time dilation, is worthless.

And such superluminal particles have indeed been repeatedly observed in experiments. Back in 1908, Ritz believed that among the electrons produced by the decay of radium, there are superluminal ones, judging by the trace they leave on the screen in Kaufmann's experiment [8]. Superluminal velocities have also been recorded more than once in studies of cosmic rays (streams of high-energy particles). By bombarding the nuclei of atoms of the earth's atmosphere, they give rise to showers of secondary particles, some of which, as it turned out, pass their way to the earth's detectors in a time much less than the time required for this light [15, p. 236]. It turns out that some of the particles that form showers fly at superluminal speeds, if they are not measured indirectly, according to the SRT formulas, but directly dividing the path by the travel time.

However, contrary to all the facts, academic science does not recognize these experimentally proven results, explaining them by random experimental errors - only because they contradict the SRT dogma. In this, the "representatives" of science are completely in solidarity with Einstein, who did not put physical experiment into anything (especially if it contradicted his theory of relativity) and argued that it was the theory that should prescribe which facts can be observed in experience and which cannot. Such petty tyranny of the 20th century academics, who do not recognize either the ballistic theory or the fall of superluminal particles from space, is very reminiscent of the denial by the French academicians of the 18th century of fireballs and the witnessed fall from the sky of meteorite stones, which also contradicted dogma. Such dogmatists, who deny the obvious, always end up laughing at everyone.

Nowadays, a number of facts already prove the existence of superluminal particles. In particular, this is the aforementioned ability of some short-lived particles of cosmic showers to reach the earth's surface, which is easier to explain not by the extension of their life, but by the superluminal speed. Yes, and the huge energies E of cosmic radiation particles, the origin of which modern science cannot clearly explain, say, according to the BTR and the classical formula $E = mV^2/2$, about their superluminal velocity V . Such speeds of a particle can gain just in the process of decays, especially, - multistage. As if in a rocket throwing out spent stages, the fission products of particles acquire, in addition to the decay rate, the speed of the parent particle. Then the products are divided, which leads to even more overclocking. Therefore, when superluminal communication and transport appear, they will most likely work on microparticles (§ 5.10, § 5.11). The path to space runs through the microcosm! It was not for nothing that Tsiolkovsky, as the inventor of rockets, allowed flights with superluminal speeds and considered the theory of relativity with time dilation to be absurd.

The velocities of cosmic radiation particles can be measured in two ways: by their energy from the formula $E = Mc^2$, taking into account the relativistic dependence of mass on velocity; or directly, dividing their path through the atmosphere - the travel time. And, if the first method, by definition, cannot give a speed greater than the speed of light, then in direct measurements, particles have more than once recorded a speed that is many times higher than the speed of light. Similarly, in accelerators / synchrotrons, the speed of electrons can be sought by the relativistic formula $E = Mc^2$, or it can be done directly by multiplying the perimeter πD of the accelerator by the frequency f of the accelerating field, which is equal to the frequency of revolution of a particle in the accelerator (Fig. 48). The diameter D of powerful synchrotrons is 100-200 meters, the accelerating field of the HF range, that is, $f = 3-30$ MHz. Hence the speed of electrons $V = \pi Df = 10^9-10^{10}$ m/s, which is several times and tens of times greater than the speed of light. This is in good agreement with the velocity found from the energy E of the electrons, according to the classical formula $E = MV^2/2$. Already for electrons with energies of several MeV, the speed turns out to be noticeably higher than that of light.



Fig. 48. Direct calculation of the speed V of an electron in a synchrotron gives $V > c$.

However, scientists, having discovered this contradiction of STR, resolved it purely formally: they introduced the multiplicity of acceleration q , that is, they arbitrarily assumed that the particles in the accelerator rotate not with the frequency of the accelerating field, but with a frequency that is an integer q times less. Therefore, instead of one bunch of particles in the accelerator, several bunches allegedly appear along the ring - their number is equal to the multiplicity of acceleration, and the frequency of the accelerating field seems to coincide exactly with the frequency of arrival of these bunches. But, in this case, why is it not possible to accelerate electrons to energies in GeVa using lower frequencies of the accelerating field? Why is it always necessary to introduce the acceleration multiplicity $q > 1$ for the most energetic electrons? No answer. More precisely, it exists, but it is not to the liking of the supporters of SRT, because the answer is that high-energy electrons circle with a frequency equal to the frequency of the accelerating field and therefore their speed is tens of times greater than the speed of light (a detailed justification for this is on the website of [A. Mamaev: www.acmephysics.narod.ru](http://www.acmephysics.narod.ru)).

Apparently, superluminal particles arise not only in cyclic, but also in linear and plasma accelerators, where electron energies of tens of MeV and even GeV are also achieved. In a number of such devices, particles are accelerated by the longitudinal field of an electromagnetic wave traveling in a hollow waveguide or in a plasma. But the phase velocity of waves in smooth waveguides and plasma is greater than the speed of light! Therefore, particles driven by this wave must also have superluminal speed. Indeed, only under the condition of synchronism (equality of the speed of particles and waves) the accelerator is effective. It is usually argued that in these accelerators, the waveguides are equipped with diaphragms that reduce the phase velocity in comparison with smooth waveguides, which supposedly ensures the movement of waves and particles with subluminal speed. But where is the guarantee that this decrease in speed is so significant? To check this, it is necessary to directly (by the flight method) measure the speed V of electrons and the waves driving them. This can be easily done according to the school formula $V = L/T$, dividing the path of the particle L by the time of flight T , and in the case of a wave, dividing its length $L = \lambda$ (measured by the method of standing waves in the waveguide) by the period T of electrical oscillations. It is quite possible that these direct measurements will reveal superluminal electron velocities close to those found by the classical formula $E = mV^2/2$, from their energies of tens and hundreds of MeV. Indeed, even with an energy E of electrons of the order of 1 MeV, their velocity V must exceed the speed of light. What an amazing diviner was Ritz, who, back in 1908, believed that superluminal electrons are possible in terrestrial experiments? But even more amazing is the prophecy of Democritus and Lucretius, who more than two millennia ago assumed superluminal velocities for microparticles in space, for cosmic rays (§ 2.15). So, the very fact of the experimental detection of particles flying at a speed greater than light (a fact carefully hidden by the supporters of SRT) proves the fallacy of the theory of relativity and the validity of the BTR. But, most importantly, this fact opens the way for people to Space, to distant stars and galaxies - a path that was previously blocked by a light barrier, without exceeding which, it is impossible to fly to a more or less distant star during a human life. From now on, as J. Bruno said, "The crystal of heaven is no longer an obstacle to me, if I cut them, I will rise to infinity." The road to space is open!

KEY IDEAS OF PART 1

1. The Coulomb interaction of charges is caused by the impact of standard microparticles - rheons, constantly emitted by electrons in all directions at the speed of light c . The streams of these small particles freely, without changing their speed, pass through any bodies and do not interact with each other.
2. Magnetic and inductive forces are the result of changes in the electrical interaction of charges from their movement, due to variations in the speed and flux density of the rheons emitted by them, in addition to their speed c mechanically acquiring the speed of the charge.

3. The gravitational interaction has an electrical nature and arises as a result of the predominance of the elementary forces of attraction of the charges of two bodies over the forces of repulsion of the charges.
4. Light is a variable, oscillatory electromagnetic effect from oscillating charges, carried by the flow of rheons emitted by them, periodically, wavyly distributed in space. The energy of the field and the pressure of light are associated with this material flow of particles that carry energy and momentum.
5. Light acquires, in addition to c , the speed of the light source, for it is mechanically transferred to the rheons that carry light. Therefore, if the source moves with acceleration, then, as the light moves, the distances between its wave fronts, which have received different speeds, change, transforming the wavelength, frequency, period of light oscillations and brightness of light (Ritz effect).
6. Light, passing through media and obstacles, by its variable electromagnetic effect causes oscillations of the electrons of the medium. Oscillating electrons generate new waves of light, which, interfering with the original one, create the effects of shading, diffraction, refraction, dispersion, changing the brightness and speed of light.
7. The apparent change in mass in experiments is explained, according to Ritz's theory, by a change in the electric and magnetic effects from the mutual motion of charges. The very same mass, as the amount of matter, is conserved in all cases, including "annihilation" and decay of particles.
8. The time scale does not depend on the mutual motion of bodies, their acceleration or gravity. All changes are illusory or associated with a direct effect on the time measuring device giving erroneous readings. False methods for measuring time according to SRT formulas lead to incorrect measurements of the speed of microparticles, which in some cases exceeds the speed of light.

PART 2.

SPACE ACCORDING TO RITZ

At every step we see the monotony, or monism of the Universe: everywhere there are quite similar suns, similar galaxies (milky ways) and even their groups; everywhere the same substance (its ancestor is hydrogen or a simpler body); everywhere the same sunlight, cooled or uncooled spherical bodies; everywhere there is movement, gravity and so on.

K.E. Tsiolkovsky, early XX century [159]

At present, the Cosmos has ceased to be for mankind what it was considered before - a model of stability and order (among the Greeks, the very word "cosmos" meant "order"). Nowadays, astrophysics teaches about a non-stationary, expanding Universe, which is inhabited by strange objects: quasars, supernovae, neutron stars, pulsars, black holes, dark matter and other mythical bodies. And they no longer emit the usual sunlight (optical radiation), but "dark" radiation of the radio, X-ray and gamma ranges. From year to year, the picture of the Universe, drawn by scientists, does not become clear, but only becomes more and more dark, foggy and confusing. Science cannot explain much in space at all, which testifies to a deep crisis in physics, this support of astronomy. And the source of all problems is in the theory of relativity. It was with its arrival in the XX century that our ideas about the Universe began to distort, get confused and move away from the visual classical images. Therefore, the key to the mysteries of space should be sought in classical physics, the development of which is the Ballistic Theory of Ritz. We will turn to it for help. An analysis of cosmic phenomena is also necessary for Ritz's theory itself, which finds the first confirmation, like Copernicus's theory, not in terrestrial experiments, but in cosmic observations.

Recall that the most powerful proof of Copernicus's correctness was Galileo's observations made through a telescope invented by him in 1609 - 400 years ago. In this regard, 2009 was declared the International Year of Astronomy. This year, thanks to books and scientific conferences specially devoted to the BTR, became fateful for the recognition of Ritz's theory, which had been held back for a hundred years, as well as Copernicus's theory, created 500 years ago, in 1508 [41]. Galileo's first telescopes have now been transformed into giant telescopes, like long-range anti-aircraft guns aimed at the sky. Likewise, the BTR can eventually become a powerful tool for the knowledge of space. It is no coincidence that space is historically associated with ballistics, filled with objects emitting fire and permeated with ballistic terminology [10, 113]: "ballistic missiles" and "ballistic trajectories", "ballistic launch", etc. (§ 5.11). It was ballistics that helped the conquest of space [68], it is the BTR that is the most cosmically ordering theory, opening up truly cosmic perspectives. It is no coincidence that the people who paved the way into space are such scientists and ballistic engineers as K.E. Tsiolkovsky, S.P. Korolev, M.V. Keldysh, M.I. Duplishchev [47], - did not believe in the theory of relativity and believed that

the classical laws of mechanics and ballistics are true for matter and light (Demin V.N. "Tsiolkovsky". M.: MG, 2005).

Since we cannot cognize the phenomena of the Cosmos directly, flying between the stars, we have to judge them only by the radiation and light coming from cosmic objects. Therefore, in the study of the Cosmos, an important role is played by the study of the spectrum of stars and the determination of their motion using it using the Doppler effect. But, if the effect is only one side of the more general Doppler-Ritz effect (EDR, § 1.10), then how blind we were in astronomy, ignoring its other side! If we take into account the enormous cosmic distances L , it turns out that the Ritz effect $f'/f = 1 - La/c^2$ can play a much more important role than the Doppler effect $f'/f = 1 - v/c$. In addition, since the effects are equally capable of influencing the frequency, do we sometimes take the manifestation of the Ritz effect for Doppler shifts in the frequency? If so, then the latter will become the key that will reveal all the mysteries of the Cosmos.

We will apply this key to one of the greatest mysteries of the universe - the cosmological redshift. As we will show below, if the ballistic theory is correct, we will have to take a fresh look at many cosmic phenomena, rethinking them on the basis of the Ritz effect. The redshift, Cepheids, pulsars, quasars and other cosmic "miracles" not only receive a natural explanation, but are predicted by Ritz's theory, which, from the point of view of BTR and Earth observers, turns out to be just optical illusions, cosmic mirages. Here it is just right to remember earthly illusions: mirages, rainbows, halos. In ancient times, the opinion about their reality gave rise to explanations as fantastic (remember "The Flying Dutchman"), as are now accepted in relation to cosmic "miracles". And in the BTR, even those observations of recent years that contradict modern cosmology and make scientists talk about the inevitability of its revision, about a crisis and an imminent revolution in physics, look natural. It is very likely that it is the BTR that will make this revolution. Indeed, by adopting the BTR, scientists can easily solve all the existing conflict issues of space at once. The ease of calculations within the framework of Ritz's theory, its sufficiency and clarity, even for a non-specialist, allows naturally explaining the complex phenomena of space, before which modern science succumbs.

Therefore, it is possible that astrophysics will be freed from the dictates of dark superstitions not by scientists themselves, but by ordinary people. Likewise in life, in the course of the people's liberation guerrilla war, detachments of lightly armed novice fighters turn out to be stronger than a large and well-armed regular army thanks to the ideas. It is such a powerful ideological instrument of space cognition that gives us the BTR. In Russia, the people more than once assumed the functions of leadership when it could not cope with internal and external enemies. That is exactly how, 400 years ago, when Galileo was just liberating science from the dominance of evil spirits, the people's militia liberated Russia from foreign invaders. Likewise, in science, where managers do not want or cannot fulfill their duty with dignity, their functions are taken on by ordinary people, non-specialists, like the Roman poet Titus Lucretius Carus, or the school teacher Konstantin Eduardovich Tsiolkovsky. It is these selfless people who at all times have brought humanity closer to freedom and truth.

§ 2.1. Radar measurements in space

As it comes around, it will respond.

Russian folk wisdom

So, the main instrument for cognition of the Cosmos and solving its mysteries in the future can become the Ballistic Theory of Ritz and the ballistic principle. It turns out that it is space that has recently brought new evidence of the validity of this principle. One of the most convincing evidences comes from space radar distance measurements, which prove that the speed of a radio pulse source is added to the light speed of the radio signals it emits. Recall that the radar method consists in the emission of a radio beam from the antenna, which, reflected from the object under study, like an echo, returns to the radar station with a certain delay. Multiplying the measured delay time T by the known speed of the radio beam c , one finds twice the distance to the object $2L = cT$. However, it does not take into account that the speed of light of the radio beam depends, according to the ballistic principle, on the speed of the source and it is considered that the speed of the radio beam is always equal to the speed $c = 300,000$ km/s. Contrary to the Russian proverb, relativists believe that no matter how the sounding radio emitter moves, the object always responds in the same way, after the same delay time. As a result, when scientists use the second SRT postulate about the constancy of the speed of light in their calculations, inconsistencies and inconsistencies between measurements and theory invariably arise.

So, in the 1960s. in radar measurements of the position of Venus, the distances simultaneously found by different observatories differed markedly, and the distance was systematically larger for stations located on the side of the Earth that was moving away from Venus, and less - on the one that was approaching (Fig. 49). And this is natural: if the rotation of the Earth imparts an additional speed to the radio beam directed towards Venus, the radio beam arrives faster, giving an

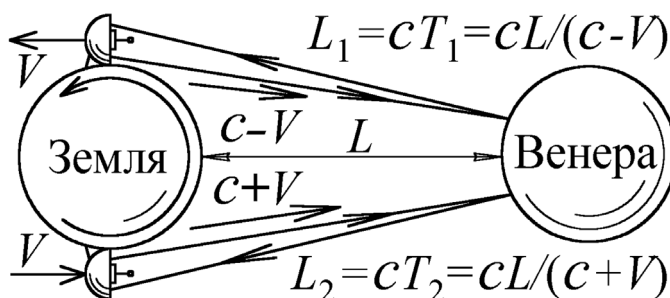


Fig. 49. Radar measurements of the position of Venus by two stations give its different distances L_1 and L_2 due to the different speed of the radio beams.

underestimated distance. Noticing this discrepancy, greater measurement error, scientists hastily forgot about it. But these measurements, which reject the SRT postulate of the constancy of the speed of light, as shown by B. Wallace, are in excellent agreement with the ballistic principle (Fig. 50) and with the BTR [149].

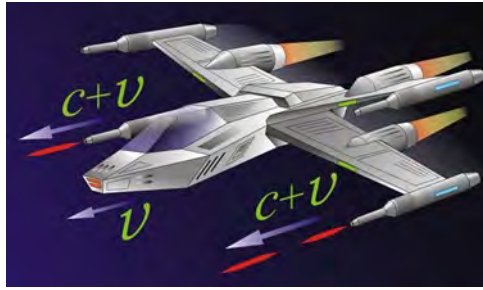


Fig. 50. According to the ballistic principle, the light speed c of electromagnetic laser pulses must add up with the speed v of the source (spacecraft).

Another experimental discrepancy, also revealed during the radar of Venus, is that at those moments when Venus, moving in its orbit, approached the Earth, the distance measured to it, taking into account the SRT, turned out to be less than the real one, and at the distance, on the contrary, it was greater than the real one. known from astronomical observations. And they eliminated this discrepancy purely formally, arbitrarily moving Venus forward in orbit by several hundred kilometers, without any explanation as to why astronomical observations of the planet's positions turned out to be completely different. And, meanwhile, as shown by V. Demin and V. Seleznev [44], the real reason was that they mistakenly used the principle of constancy of the speed of light - from SRT. Whereas according to the BTR, after the radio beam reaches Venus, it will be re-emitted when reflected by this planet and will additionally acquire its speed V (§ 1.12). Therefore, when Venus moves towards the Earth, the radio beam moving from Venus to the Earth has a speed of $c+V$ and arrives earlier, giving an underestimated distance. Whereas, when the planet recedes, the ray comes to us with an additional delay, because it flies at a speed of $c-V$, giving an overestimated distance to the planet. The effect is exactly the same as for two radar stations on Earth, of which one recedes and the other approaches Venus. It is also worth noting that the radar data on measuring the positions of Venus, after revealing inconsistencies, were classified and were not discussed. This gave Wallace a reason to talk about the deliberate concealment of data by persons wishing to conceal the truth about the dependence of the speed of light on the speed of the source [111].

There is also a mass of other cosmic evidence proving the validity of the BTR and the fallacy of the SRT. But here we will mention one sensational phenomenon, which, due to its blatant contradiction to the principles of modern physics, could not be hidden. We are talking about measuring the positions and speeds of the "Pioneer" vehicles, launched in the 70s. to the outskirts of the solar system [97]. With the help of radar, the speed and distance to the Pioneers were measured along the entire route. It turned out that this distance differs markedly from the calculated one, as if there is a slight excess acceleration directed towards the Sun. It is quite probable that, in this case, too, the error is caused by the failure to take into account the dependence of the speed of light on the speed of the radiation source. After all, the radio signal sent by the "Pioneer" acquires the speed of the apparatus and therefore is registered a fraction of a millisecond later than it should be according to the SRT (Fig. 51). That is, we fix the speed of the

apparatus not in its true position, but at the moment when it was a little closer, and its acceleration directed towards the Sun was slightly higher.

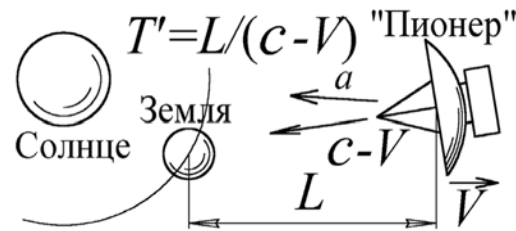


Fig. 51. Considering the delay time of the signal from the Pioneer AMS equal to $T = L/c$ instead of T' , the incorrect acceleration of the vehicles is found.

The erroneous use of SRT and the principle of the constancy of the speed of light in space radar measurements not only introduces errors into our ideas about the structure of the Cosmos and the solar system, but also causes, possibly, gigantic material damage, being one of the causes of spacecraft accidents. For example, some authors [44] blame the accidents of spacecraft sent to Mars and its satellite Phobos (including the domestic Phobos-I, II), navigation errors, which are so important in space. Indeed, if the ballistic principle is correct, then the radar methods for determining distances in space that miss it are deeply flawed. And, if before the mistake from the use of SRT led only to accidents in space, now it may also affect our earthly life, leading to accidents of ships and cars, in which nowadays GPS satellite navigation systems are being built in, ignoring the ballistic principle.

The GPS (Global Positioning System) system also works by the method of radar from ground tracking stations and a group of artificial satellites, the orbits of which form a satellite navigation tangle that entangles the entire Earth. A GPS module built into a mobile device (say, a phone) picks up radio signals sent by several satellites. These signals encoded information about the position of each satellite (found by the stations), as well as the time of signal emission, set by an ultra-precise clock. Subtracting this time from the time of signal reception, the GPS receiver finds the time T of the radio pulse movement, and from it, the distance $L = cT$ to the satellite. Having measured the distances L_1, L_2, L_3, L_4 to three or four satellites, and positioning their coordinates, the microcomputer calculates the position of the GPS receiver on the earth's surface from trigonometry.

It would seem that the formula $L = cT$ is correct, since GPS navigators are working, which allegedly confirms the postulate of the theory of relativity that the speed of a radio signal is independent of the movement of emitting satellites. However, the exact calculation is more likely in favor of the BTR. The satellites of the navigation system are put into orbits with a radius of R of about 26,000 km, that is, they fly at an altitude of about 20,000 km above the Earth, which has a radius of $r = 6,400$ km. In such an orbit, the speed V of the satellites is about 4 km/s, increasing the speed of the sent signal to the value $c' = c + V$. Since the distance to the Earth is $L \sim 20,000$ km, it is believed that the correction introduced by the BTR is $\Delta = LV/c \approx 270$ m, which is an order of magnitude higher than the errors of GPS navigators.

However, in fact, in the BTR, the velocities of the source and the light are added not arithmetically, but vectorially, according to classical kinematics. That is, for the speed of arrival of the radio signal $c' = c - V_r$, sent by the satellite to the receiver, only the component V_r of the velocity V of the source along the line of sight is important (the radial velocity of the satellite relative to the receiver). Then the distance correction is $\Delta = LV_r/c$. And since the satellite is flying in a high circular orbit, its orbital velocity is directed across the line of sight, so that $V_r \ll V$. If the satellite is at its zenith, then $V_r = 0$, but it grows with decreasing satellite height h above the horizon according to the law $V_r = V \sin \alpha \cosh$, where $\sin \alpha = r/R \approx 0.2$. That is, according to the BTR, the maximum correction to the distance to the satellite is $\Delta = LV_r/c = 67$ m, and it occurs only in the extreme case when the satellite is visible near the horizon (the receiver usually "catches" satellites with $h > 10-15^\circ$). Also, the receiver rarely lies in the plane of the satellite's orbit, being located at an angle θ to it, and the radial velocity is even lower: $V_r = V \sin \alpha \cosh \cos \theta$. Hence, $\Delta = LV_r/c = LV \sin \alpha \cosh \cos \theta / c$. Since $\cosh \leq 1$ and $\cos \theta \leq 1$, and the average value of the modulus of the cosine is 0.63, the average error is $\Delta = 27$ m.

But even this average error of 27 m refers only to the distance to one satellite, and to calculate the coordinates, data from three or four satellites are needed. If we take into account that they give errors of different signs, randomly summed in different directions, then their mutual compensation during averaging will further reduce the error. But this result also takes into account the general correction of coordinates, that is, the sum of errors in height and horizontal, so that the error in finding the projection of a point on the earth will decrease by another 1.5 times. As a result, the average correction to the horizontal coordinates made by the BTR will be only 5-10 m. But this is the order of the horizontal error and is stated by the GPS manufacturers. In addition, a number of correcting programs are used in order to reduce this error, including averaging methods, differential methods with reference to control base stations. After all, such errors in the early stages of GPS development often led to accidents - ships flew into reefs, people died in the mountains. And the probable cause of such accidents on Earth and in space is the failure to take into account the ballistic principle.

Unable to eliminate the error introduced by the influence of speed, they are struggling with it by roundabout ways, for example, by increasing the number of satellites and channels received in parallel. So, if 6-10 satellites are visible at once above the horizon, the position of the receiver can be determined much more accurately by calculating for different groups of satellites, combining them by three in different combinations and finding the position of the receiver for each group. Since the radial velocities of the satellites have different magnitudes and signs, the errors caused by them compensate each other, and the average calculated position is close to the real one. Radio beams, like darts, accidentally deviated from the center of the target, after averaging the coordinates of their hits, give an average position close to the desired one.

In addition, the ballistic correction may be imperceptibly neutralized, as in the case of Venus [44], by mistakenly finding the positions of the satellites, which are also determined by the radar method. By conventionally shifting the satellite

forward in its orbit, one obtains the same signal delay from it, as in the case of taking into account the ballistic principle. Such inconsistencies and errors in radar methods, which speak of the illegality of the theory of relativity, have long been noted by specialists in space navigation and GPS, for example, [R. Hatch](#). Similar errors (components for near-earth orbits of the order of 100 m) were also detected by laser radars (lidars), which measure the distance by the delay time not of a radio, but of a light signal emitted by a laser and reflected by space bodies or vehicles. But all these data, which reject SRT, are usually hushed up, regarding them as random errors.

Brian Wallace, the first to notice the theory's contradiction relativity radar data, confirming the ballistic theory, even suggested that the United States about the dependence of the speed of light the speed of the source has long been known, using ballistic principle, but keep it a closely guarded secret to gain benefits in space [111, p. 54], including for the upcoming "Star Wars". After all, the accuracy of hitting a laser beam from a moving at high speed on the satellite's orbit depends on whether the satellite's speed is added to the speed the laser pulse emitted by it. In this regard, it is interesting to note that the GPS system was originally developed by the American military specifically for the purposes of "Star Wars", and the change in precise and approximate positioning modes introduced by them may speak of a change in the calculation methods for BTR and SRT. Perhaps, due to the conscious or unconscious application of the ballistic principle, only US vehicles in the main and successfully reach the surface of Mars. And therefore, Russia should seriously think about the validity of the SRT, especially in connection with the planned re-launch of the AMS to the satellite of the Red Planet, and, in the near future, the launch of the world's first manned spacecraft to Mars! At this point, the theory of relativity will need absolute certainty and reliability, which it lacked before, and, in the light of the accumulated experimental data, it did not. Such confidence could only be given by direct measurements of the speed of light from a moving source in space. Perhaps they will finally point out where to look for the key to the mysteries of the Cosmos, so that instead of chaos, primordial order reigns there, and folk wisdom triumphs again.

§ 2.2. Curvature of rays of light near the Sun and A. Eddington

You will pass the crooked light, but you will not turn back.

Russian folk wisdom

As you can see, the Cosmos presents a lot of evidence of the fallacy of the special theory of relativity and the justice of the BTR. But, on the other hand, the same Cosmos seems to provide evidence of the validity of the general theory of relativity, this generalization of SRT for the case of systems moving rapidly or in a gravitational field. Let's see if this is really so. One of the first proofs of the theory of relativity was the observation of the deflection of light rays passing near the Sun, caused by the curvature of space by the giant gravitational field of our star. Indeed, this effect was observed during a solar eclipse, when the sun's radiance did not overshadow the brilliance of the stars visible near it. At the same time, it turned out that the positions of the stars near the Sun, indeed, underwent

small angular displacements in comparison with their usual mutual position at the moments when the sun was in another part of the sky. The displacements measured by A. Eddington seemed to be in agreement with the predictions of general relativity [26].

And, nevertheless, many later reproached A. Eddington with fraud. The fact is that the English astronomer Arthur Eddington was a very biased observer and an ardent supporter of the theory of relativity. He not only developed the general theory of relativity by publishing a book about it, but also built on its basis the theory of the expanding Universe. He promoted, popularized, and disseminated the theory of relativity in every possible way. It is to Eddington that the theory of relativity is perhaps most indebted for its resounding fame and rapid acceptance. It was only after his observations that the theory of relativity began to gain worldwide recognition. However, as many researchers note, the resolution of the tools that Eddington had at his disposal did not allow drawing a conclusion about the validity or fallibility of general relativity [37]. In addition, independent observations of another group, which conducted studies of the eclipse at the same time, contradicted the observations of the Eddington group and general relativity, which was later attributed to instrumental errors [73, p. 223]. And most importantly, the extremely favorable conditions of the 1919 eclipse could not be repeated for a long time. And Eddington's result could not be accurately verified for decades - you had to take his word for it. Therefore, Eddington is often accused of manipulating facts in favor of general relativity and a biased conclusion. It is clear that an observer who is eager to obtain a given result will definitely get it in one way or another. And Eddington was precisely the SRT fanatic, fixated on this theory. It was not for nothing that the staff accompanying him on the expedition joked that Eddington would go mad if the experiment failed and proved the falsehood of general relativity [37]. The bending of light rays near the Sun became a tool for distorting the truth, for the triumph of falsehood in the hands of Eddington and Einstein. Attracting the curvature of outer space, they, like the crooks from the "Kingdom of Crooked Mirrors" by V. Gubarev, distorted facts and truth.

It is worth noting that Eddington was later more than once caught by his colleagues in scientific fraud and manipulation, fitting facts to fit theory (Sherlock Holmes warned against such methods). This concerns, for example, Eddington's anecdotal derivation of the fine structure constant and the ratio of proton mass to electron mass through π and e - by the method of gradual fitting [19, p. 308], or his theory of pulsating stars (Cepheids), which, as we shall see, also played an extremely negative role in the fate of the BTR (§ 2.12). So, in general, Eddington's activities can be described as dishonest, harmful to science. And, although decades later, the result of Eddington's expedition was confirmed by more accurate observations, this does not remove the accusations: the recognition of the theory of relativity and the rejection of the BTR was premature [2, 6]. Of course, the winners are not judged, but only if they won the victory in an honest way. And victories won fraudulently (with a false start, with doping) are canceled with a long-term suspension from participation in the competition. Due to the doping given by Eddington and the premature start, the theory of relativity by

deception received an advantage and early undeserved recognition, starting to develop at an accelerated rate, while all other, alternative theories, on the contrary, were abandoned and suspended in development. And, meanwhile, such theories also provide an explanation for the deflection of light rays near the Sun.

To begin with, the deflection of light rays in the sun's gravitational field was predicted long before Einstein - based on classical theories. Back at the beginning of the 19th century, I. Zoldner, applying Newton's corpuscular theory of light, representing light in the form of a stream of particles flying at a speed c (as in the BTR), showed that the trajectory of a light beam will bend near the Sun, like the trajectories of comets. Light particles move along a hyperbola in the gravitational field of the Sun, deviating by them at a small angle from the initial direction of flight. According to Zoldner's calculations, this angle was about $0.84''$, which, in order of magnitude, agrees with the measured value of the deflection of light from stars near the Sun. At first, Einstein received the same meaning, repeating one in one Zoldner's calculation and even the mistake he made ($0.84''$ instead of $0.88''$, which was assumed by the calculation), which many considered proof of Einstein's plagiarism (see [O. Akimov. Criticism of the theory of relativity](#)). So, the movement of light particles in a gravitational field along a ballistic trajectory already gives the required order of deflection. If we take into account the dependence of the gravitational force on the velocity predicted by the ballistic theory (§ 2.3), then we obtain the value of the deflection of the light beams, which agrees even better with the measured value [107]. However, in fact, as we will show below, such a purely mechanical explanation of the deflection of light by the Sun does not fully correspond to the BTR, and, therefore, the real reason and magnitude of the deflection lies in the combined action of the mechanical and optical effects predicted by Ritz.

Many authors, including Tesla [110], agree that the true reason for the deflection of rays near the Sun lies not in the curvature of space, but in the force field of the Sun and in the solar corona, layers of gas extending far beyond the surface of the Sun, interacting with which, the rays of light bend their path. Indeed, if we take into account that the density of coronal gases should decrease with distance from the Sun, refraction should lead to a weak bending of the rays [111]. However, as calculations show, the density of the corona is too low to cause appreciable refraction, and the reason for the effect is somewhat different. Namely: according to the BTR, light, passing through the coronal layers of the solar atmosphere, is re-emitted by its atoms, acquiring their additional speed. However, it is not the speed itself that is important, but its change during the movement of the light beam in the element of the gas volume, in other words, the acceleration of the gas. The volume of gas imparts to the light passing through it the motion acquired by the gas atoms in the gravitational field of the Sun. Gas, or rather, plasma, as it were, entrains light in the direction of the Sun and, thereby, bends the light beam, as if attracted by our luminary.

To find the deflection of the rays of the stars caused by the attraction of the Sun, it is enough to calculate the change in their speed depending on the distance R to the center of the star. Indeed, it is the change in the phase velocity and wavelength of light that leads in the atmosphere and in other refractive media to

the bending of light rays. Earlier it was calculated (§ 1.19) that with distance from the Sun from the initial distance R , the wavelength of light λ re-emitted by accelerated moving atoms increases due to the Ritz effect by the value $\Delta\lambda = \lambda GM_S/Rc^2$, where G is the gravitational constant, M_S is the mass of the Sun. And, conversely, with the approach of a ray of light from a distant star to the Sun at a distance R , the length of the light wave λ is compressed, according to the Ritz effect, to the value $\lambda' = \lambda - \Delta\lambda = \lambda(1 - GM_S/Rc^2)$. This is equivalent to a negative phase incursion and a reduction in wavelengths when a ray is incident on a medium with a refractive index $n = \lambda/\lambda'$, with a corresponding decrease in the phase velocity of light to $c' = c/n = c(1 - GM_S/Rc^2)$. That is, according to the ballistic theory, with the approach to the Sun, the speed and length of light waves decreases, and with distance, it increases again. A beam, going from a source to a receiver near the Sun, slows down and lags behind, in comparison with a beam going far from the sun. It is this effect of slowing down the radio beam that was actually recorded during radar [26, p. 82]. However, this effect was interpreted as confirmation of the theory of relativity, which gives the same prediction as the BTR, but from the effect of time dilation near the Sun (§ 1.18), although only the classical effect of slowing down electromagnetic waves in a moving plasma was discovered.

It is this, caused by the Ritz effect, variability of the speed of light, as it approaches the Sun, leads to the bending of light rays near it, like the bending of rays in environments with variable n , say, in mirages. And, exactly, the rays of the stars, walking near the Sun, bend, which is why the stars are seen slightly displaced from their real positions (by 1.75"), just as in the mirage areas of the sky are visible on the asphalt heated by the sun, creating the illusion of puddles. The curvature of the light of the stars corresponded to the formulas of general relativity and was considered a confirmation of the curvature of space - the gravitation of the Sun. But, the same deviations of 1.75" are predicted by the Ritz theory, because it gives the same changes in the speed and wavelength of light in the field of the Sun. So, according to Occam's principle, one should give preference to the simpler and more natural Ritz theory, created earlier than Einstein's theory of gravity and interpreting the curvature of light rays in a classical way, without new complex hypotheses. It is in Ritz's theory that a change in the speed of light is obtained as a natural consequence of its ballistic principle, due to the movement of emitting atoms in a gravitational field, with the resulting bending of the rays. Whereas, in the general theory of relativity, Einstein had to introduce additional complex hypotheses about the curvature of space and allow a change in the speed of light in the gravitational potential, contrary to the postulate of the constancy of the speed of light - from his own special theory of relativity. The famous physicist L. Brillouin drew attention to this, noting that Ritz's theory in this matter is much more consistent than Einstein's.

Once again, we note that the correspondence of the measured deflection of light rays near the Sun to the calculated deviation found on the basis of the BTR does not mean that the Sun attracts the light ray. Of course, light is carried by weighty particles - rheons. However, these particles cannot be influenced by gravity. Rheons, according to Ritz's definition, always propagate in a straight line and

move uniformly, with a speed constant in magnitude and direction. In addition, gravity, according to the BTR, has an electromagnetic nature, which means that it is carried and caused by the same rheons and arheons that do not interact with each other and with other rheons. Therefore, gravitation is not capable of itself, in a pure vacuum, to deflect rays of light. There is only re-emission of light in a new direction by the atoms of the mobile medium near the Sun. In this radiation, a direct, primordial light ray, just like a ray that has fallen into the refracting atmosphere of the Earth, is extinguished due to interference, and the newborn ray simply goes in a different direction (§ 1.12). In this case, the irreversibility of radiative phenomena takes place, to which Ritz (and after him Brillouin) assigned an enormous role in electrodynamics.

Thus, deviation, or rather, re-radiation in a new direction, takes place only in a moving medium that carries light in the direction of the gravitating body. And, therefore, only near massive cosmic bodies that hold an extended atmosphere near them with a powerful gravitational field, it is possible to deflect light rays. Of course, these atmospheres are very rarefied, however, firstly, they are plasma - a highly ionized gas that interacts much better with radiation, and secondly, the length of these atmospheres is large enough to cause a noticeable effect on the speed of light and the deflection of its rays. So, the deflection of light rays near gravitating bodies receives a simple explanation within the framework of classical physics, one has only to accept Ritz's ballistic theory. But can the BTR explain other relativistic effects associated with gravity?

§ 2.3. *Perihelion offset of Mercury*

Are the previous (electromagnetic) theories applicable to gravitation, and can we assume that gravity propagates at the speed of light, and also obeys the laws that we have made? The answer is positive: the perturbations, as in the Lorentz theory, are of the second order. *But in addition, with the help of these new formulas, it may be possible to eliminate the noticeable discrepancy between calculations and observations in astronomy, namely, the slow rotation of the ellipse described by Mercury, a rotation that is 41" arcs per century greater than expected from planetary disturbances.*

Walter Ritz, "A Critical Analysis of General Electrodynamics", 1908 [8]

Another important "success" of general relativity was in explaining the secular shift of the perihelion of Mercury. As shown by astronomical observations, the ellipse of Mercury's orbit slowly turns in the direction of the planet's rotation. That is, the perihelion of Mercury (the closest point of the orbit P to the Sun) is shifted along with the orbit counterclockwise (Fig. 52). This effect was partially explained by the influence of other planets of the solar system. However, there was still an unexplained part of the shift. This is what Einstein explained in 1915, within the framework of the general theory of relativity. And the correction he found exactly corresponded to the observed displacement of the perihelion of Mercury. This result of general relativity, together with the detected deflection of a ray of light near the Sun, were strong arguments in favor of the general theory of relativity, and, therefore, its particular case, the special theory of relativity.

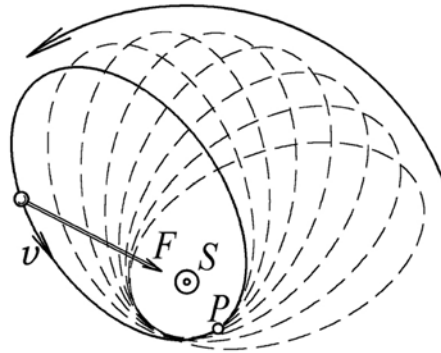


Fig. 52. Slow rotation of the orbit of Mercury.

But the displacement of the perihelion of Mercury finds a simple explanation in the framework of the BTR. Moreover, this explanation was proposed by Ritz long before Einstein [107], back in 1908. According to Ritz, the rotation of the orbit of Mercury is fully explainable classically. It is known that Mercury moves around the Sun S at a tremendous speed (v about 50 km/s). If the gravitational force, according to Ritz's assumption, is of an electrical nature and propagates at the speed of light, then the motion of Mercury changes the magnitude of this force, just as in the case of an electric effect (§ 1.7). Due to the small change in the gravitational force of the Sun, the motion of Mercury is slightly distorted, which leads, according to Ritz, to a slow displacement of the perihelion P . If at rest the gravitational force is equal to F , then for a planet moving with speed v (Fig. 53), it will grow in proportion to the square of the speed of opposite rheons: $F' = F(c'/c)^2 = F(1 + v^2/c^2)$. The square of the speed of Mercury can be easily expressed through the radius of its orbit r , the mass of the Sun M and the gravitational constant G : $v^2 = GM/r$, whence $F' = F(1 + GM/rc^2)$. Einstein [26; 66, p. 87]. It is from this expression that the correct value of the secular shift follows.

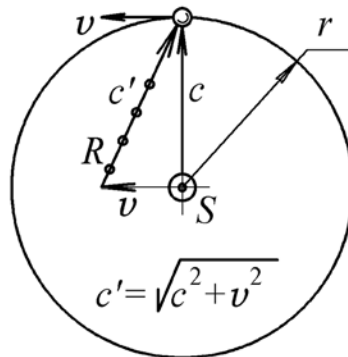


Fig. 53. Change in the force of gravity of the Sun S due to the motion of Mercury. Its speed v , subtracted from the speed c , changes the speed of oncoming rheons R .

Since gravity is reduced, again, to the movement of rheons and arheons, then gravitational energy, just like electromagnetic, is the kinetic energy of the movement of these particles. An oscillating body gradually decelerates, spending its kinetic energy on the radiation of gravitational waves, similar to how it happens with an oscillating or accelerated charge. Thus, we can visualize and calculate not only the energy of the electric, but also the energy of the gravitational field. The existence of gravitational friction was also confirmed by observations [26]. Pointing to the applicability of the laws of electrodynamics to

gravity, it was Ritz and Zöllner who were the first to predict the gravitational analog of the magnetic field, gravitational waves and friction. Indeed, just as a rotating electron emits electromagnetic waves - a periodically changing electrical effect, so a planet or another cosmic body flying in a circular or elliptical orbit must create a periodically changing gravitational effect - gravitational waves, while losing their energy. And just as a rotating charge creates a magnetic effect (also called vortex), so the rotating mass, due to the change in the force of gravity during movement, creates a small addition to the gravitational effect. This addition is due to the vortex gravitational field. Sometimes it is also called the "torsion field of a rotating body", but this is all the same unnecessary augmentation of entities against which Occam warned. All influences: magnetic, gravitational, vortex gravitational - these are only partial manifestations of the electric, acting along straight lines (§ 3.16).

In general, the electromagnetic nature of gravity was guessed for a very long time, starting with the scientists of antiquity: Democritus, Epicurus and Lucretius, who believed that all influences (light, electric, magnetic and gravitational) are transmitted through the impacts of particles emitted by bodies. This point of view was also developed by scientists of the Renaissance: Leonardo da Vinci, Giordano Bruno, Galileo Galilei and Pierre Gassendi, who revived ancient science with the Democritical theory of light and atoms. Likewise, Kepler, assuming the force of gravity in the planets and the law of its change, considered this force of an electromagnetic nature, saying the following words: "I define gravity as a force similar to magnetism - mutual attraction. The force of attraction is the greater, the closer both bodies are to one another. ". Finally, back in the 19th century. I. Zellner and, independently of him, P. Gerber proposed to account for the secular displacement of the perihelion of Mercury to account for the fact that gravity does not propagate instantaneously, and therefore the gravitational force depends on the speed according to a law similar to Weber's law for electric force [106, 107]. It was Zöllner who put forward a hypothesis explaining gravity as an uncompensated difference in the forces of attraction and repulsion of the elementary charges that make up the body. And already in 1908, Walter Ritz substantiated these ideas from the standpoint of his ballistic theory and found a rigorous formula (found seven years later by Einstein) to describe the displacement of the perihelion of Mercury, which corresponded to observations ([Vizgin V.P. Relativistic theory of gravitation. M.: Science, 1981](#)). Moreover, Ritz, on the basis of this formula, again long before Einstein, predicted secular perihelion displacements for other planets - Earth and Venus, subsequently confirmed by measurements [107].

And again, the undoubted advantage of the BTR over the theory of relativity was that all these effects were explained without attracting additional absurd postulates about the equivalence of gravitational and inertial mass or about the curvature of space by gravitating bodies, but, exclusively, as direct consequences of the original mechanical model of the interaction of charges. through particle exchange. So, the explanation of the shift of the perihelion of Mercury from the standpoint of the theory of relativity, not only is not the only possible, but even - not the first, not the second, and, moreover, is not the most consistent or natural.

Indeed, if we explain gravitational forces by the curvature of space, then how can we explain all other forces: are they really also curvature of space? Why should the gravitational influence be distinguished in comparison, for example, with the electric one, which obeys the same laws? It is no coincidence, as Einstein himself admitted, that until the end of his life he could not explain the nature of the repulsion of two electrons [58, p. 144], in contrast to Ritz.

Among other things, Ritz eliminated the main flaw in Newton's theory of gravitation by showing that there is no long-range action here either. Gravity is carried by a material mediator (rheons) with a finite speed equal to the speed of light. It is this delay that leads to a change in gravitational forces during motion - instead of gravistatics, gravidynamics works, which, as shown by Zöllner, Gerber and Ritz - long before Einstein, explains the secular shift of the perihelion of Mercury [106]. So, **Ritz in a unified way, on the basis of one simple model and without any abstract hypotheses, explained all electrical, electrodynamic, relativistic and gravitational effects, for which four theories are needed in modern physics - QED, electrodynamics, SRT, GRT, each with a bunch of far-fetched unnatural hypotheses and postulates.** And, since all of them were accepted without due grounds, only on the basis of blind faith, rejecting the rigorous and logical theories of Newton, Ampere, Weber, Gauss, then quantorelativistic physics generally loses all confidence. However, when scientists finally discover gravitational waves, they will be presented to us as a triumph of the theory of relativity, although such waves were predicted long before Einstein by many physicists, including Ritz, who clearly stated the analogy of electrodynamics and gravidynamics, as well as the equality of the velocities of propagation of gravity and light.

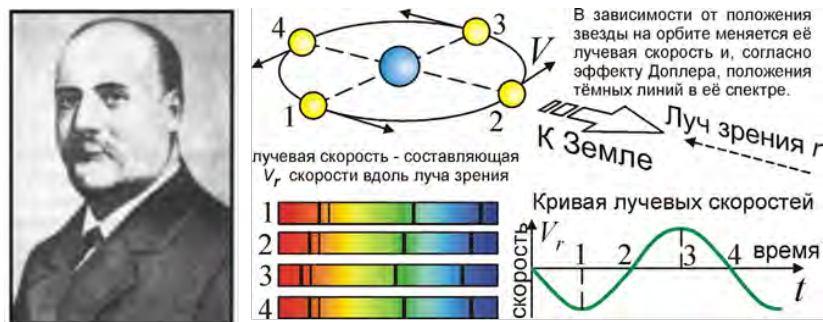


Fig. 54. Aristarkh Apollonovich Belopolsky (1854 - 1934) and the main topic of his research: spectral analysis of the motion of stars.

§ 2.4. The nature of redshift and Hubble's law

Usually, the shift of spectral lines is considered as a consequence of the movement of the star along the line of sight. But, generally speaking, there may be other reasons for such a displacement, and we can consider any displacement of lines as a consequence of two reasons: 1) the speed of motion (Doppler's principle) and 2) as a consequence of an unknown factor ... Hence, a general expression for the displacement of spectral lines is obtained: $\Delta\lambda = \Delta_1\lambda + f(r) \Delta_2\lambda$, where $f(r)$ is a still unknown function of distance. So, the distance of the luminous source has some effect on the light wave, increasing its length; in other words, a certain number of vibrations are lost at a distance.

A.A. Belopolsky, "New studies of spiral nebulae" [17, p. 271]

The two considered applications of the general theory of relativity to the Cosmos are nothing compared to what it has created with our concept of the Universe. It was the theory of relativity that led scientists to the idea that our Universe is unsteady, unstable, and, once bursting, exploding, it swells like a soap bubble, which, allegedly, is confirmed by redshifts in the spectra of galaxies. It was by inflating the Universe that Einstein, Friedman, De Sitter and other supporters of the theory of relativity explained the redshifts discovered by Hubble in the spectra of galaxies that grow with their remoteness. Recall that in the XX century, astronomers revealed a strange feature in the light of distant galaxies, decomposed into a spectrum: all spectral lines were shifted to the red end of the spectrum: the wavelength λ of the emitted light was increased to λ' . Moreover, this shift $z = (\lambda' - \lambda)/\lambda$, called "redshift", was the greater, the further away from us the corresponding galaxy was. The "reddening" of light, that is, - a decrease in its apparent frequency $f' = c/\lambda'$ in comparison with the real $f = c/\lambda$, is given by the Hubble law $f'/f = 1 - LH/c$, or $\lambda'/\lambda = 1 + LH/c$, that is, $z = LH/c$, where L is the distance to the galaxy, H is the Hubble constant, equal to about 55 (km/s)/Mpc, and c is the speed of light [142]. By this time, our remarkable astrophysicist A. Belopolsky (Fig. 54) had already experimentally proved the applicability of the Doppler effect to light, including stellar light. As Belopolsky showed, the motion of stars with radial velocity v shifts their spectral lines, reducing the frequency f of their radiation to the value f' , in accordance with the Doppler formula $f'/f = 1 - v/c$ (Fig. 55). Therefore, some believed that the redshift is Doppler and is caused by the scattering of galaxies with a velocity $v = LH$. In their opinion, the value of H shows that the galaxy receding velocity is increasing by 55 km/s for each megaparsec (Mpc).



Fig. 55. Study of the spectra of stars using a spectrograph that decomposes light into a rainbow strip with dark absorption lines. The velocity of objects is found from the displacement of the spectral lines.

True, many disagreed with this explanation for the bias. By the way, Hubble himself, as a remarkable astronomer-observer, having discovered the law of the same name, spoke in it initially not about the scattering of galaxies with a speed that increases with distance, but only about the proportionality of the redshift to the distance to galaxies $z = LH/c$. But then, without any reason and contrary to the opinion of Hubble himself, his law began to be formulated in the form $v = LH$ [151]. However, from such a Doppler interpretation of the redshift, it was unclear what caused the scattering of galaxies and the proportionality of their velocities to distance. Therefore, an alternative explanation of the redshift arose, proposed

in 1929 by the same Aristarkh Apollonovich Belopolsky. He suggested that the frequency shift (redshift) is caused not by the Doppler effect from the hypothetical recession of galaxies (expansion of the Universe), but by the assumed effect of the gradual aging of light, which loses energy as it moves [87]. Then, the further the galaxy is, and the longer its light reached us, the lower its energy and frequency f (or ν), and the greater the redshift [17]. This hypothesis in 1929 was supported by Hubble himself (for which he was criticized and, despite his outstanding discoveries, was deprived of the Nobel Prize), who was a colleague of Belopolsky and also denied the Big Bang with the recession of galaxies.

Tsiolkovsky also believed: "If they [galaxies] move, then it is wrong, in a wide variety of directions and with ordinary astronomical speeds - tens and hundreds of kilometers. How can this be reconciled with the undoubted indication of spectral lines? Their movement indicates an increase in length light waves coming from distant, almost invisible suns. But why can this increase occur? It can occur not only from the movement of celestial bodies, but also from other reasons." Tsiolkovsky saw the inconstancy of the speed of light as a probable cause of this effect [159, p. 286]. However, soon this theory, which at first met with active support from many scientists (including Hubble himself), was forgotten, partly under pressure from relativistic physicists who denied the variability of the speed of light and believed in the expansion of the Universe and the Big Bang, and partly because of the imminent death of the main defenders of the theory of aging of light. So, Belopolsky died in 1934, and Tsiolkovsky - in 1935, immediately after the publication in the same year of his work "The Bible and Scientific Trends of the West", where the father of astronautics and rocket science criticized the theory of the expansion of the Universe, the Big Bang and defended the hypothesis of aging light - lengthening of light waves by changing the speed of light.

And, although the supporters of the theory of relativity dealt with this hypothesis, forcing it to go underground, thanks to the BTR, it again finds powerful fire support and comes into operation. Indeed, what if the redshift is associated not with the Doppler effect, but with the aforementioned Ritz effect (§ 1.10)? Indeed, the Ritz effect $f'/f = 1 - La_r/c^2$, in contrast to the Doppler one, just gives a dependence on the distance L , as in the Hubble law $f'/f = 1 - LH/c$ and in the light aging hypothesis. That is, with the same acceleration a_r of galaxies, their redshift would be the greater the further away they are. Moreover, obviously, this acceleration should be directed away from us (the radial acceleration is positive) and have the value $a_r = cH$. Then the Ritz formula will automatically transform into Hubble's law (Fig. 56). Similarly, for the wavelength of light, if the speed of light c is not constant, but, contrary to Einstein, depends on the speed of the light source - according to the classical law of addition of velocities, then the rotation of galaxies will lead to a gradual increase in the wavelength λ of light, proportional to the path traveled by the light L . After all, the acceleration of a_r stars gradually changes their radial velocity. Accordingly, the speed of the light emitted by them will be at each subsequent moment of time slightly less than at the previous one, by the amount of the decrease in the speed of the stars.

Therefore, wave fronts emitted at different moments and having different velocities will diverge more and more, increasing, according to the Ritz effect, the wavelength $\lambda' = \lambda(1 + La_r/c^2)$, which, under the condition $a_r = cH$, again turns into the Hubble law redshift $\lambda' = \lambda(1 + LH/c)$.

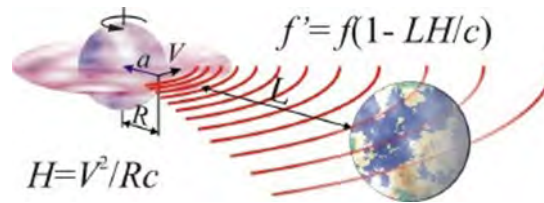


Fig. 56. The redshift in the spectra of galaxies as a result of the rotation of their nuclei and the aging of light.

At first glance, it didn't get any better: it's just that instead of velocities, accelerations appeared in galaxies, and the "spreading" of the Universe seemed to remain. But in reality, the "universal confusion" has disappeared: to create a redshift, galaxies do not need to move away from the Earth, but just rotate in place. Indeed, let's take a closer look at some galaxy: it consists of billions of stars orbiting the galactic center O , as it was discovered by the same Hubble and long before him predicted by Democritus in his concept of cosmic vortices [31]. And, where there is rotation, there is always a centripetal acceleration $a = v^2/r$ (where v is the circumferential speed at a distance r from the center), directed in the visible part of the galaxies just from us (Fig. 57). So, if the redshift is caused by the Ritz effect, then it is created not by the scattering of galaxies, but by their rotation, and the rotational acceleration $a = v^2/r$ should be equal to cH .

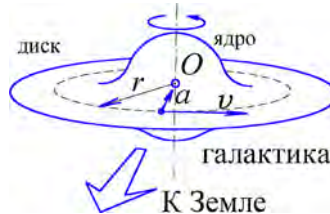


Fig. 57. Rotation of the galaxy.

It turns out, according to the BTR, the Hubble constant should have the value $H = v^2/rc$. Let's check it out. We will not carry out a statistical analysis of the data on the rotation of galaxies, but use the usual approximation in astronomy, assuming that, on average, the parameters of most galaxies are similar. Therefore, the values of v and r known for our Galaxy will be considered common for all other galaxies. The brightest part of the Galaxy, its core, has a radius of $r = 2000$ pc = 0.002 Mpc, the velocity v at this distance is about 180 km/s [142, p. 91], the speed of light $c = 300000$ km/s. Substituting everything into the formula $H = v^2/rc$, we have $H = 54$ (km/s)/Mpc, which is close to the accepted value of the Hubble constant $H = 55$ (km/s)/Mpc [142, p. 83]. The H values calculated for other v and r are given below (Table 1). All of them lie within the admissible values of the Hubble constant.

radius R , pc	speed V , km/s	H , (km/s)/Mpc
1000	200	133
2000	180	54
10000	250	21
Table 1. Compare the values of the Hubble constant calculated by the formula $H = V^2/Rc$, found depending on V and R , with the accepted in astronomy $H = 55$ (km/s)/Mpc (the values of H , V , R are from [142]).		

So maybe there really is no need to assume that galaxies are scattering? After all, the law of redshift turns out to be a natural and even necessary consequence of the ballistic principle, and not of an imaginary expansion, as was previously thought. But something else is much more important: for the first time, the formula $H = v^2/rc$ was found, which sets the Hubble constant in terms of known parameters and gives values that are very close to the observed ones. This simple formula was derived by the author in 2003 and was first presented in article [117], sent to the press two years later and showing that the redshift naturally follows from the Belopolsky hypothesis and the Ritz effect.

It is clear why the shift is precisely red and not blue: we always see the near part of galactic nuclei, and the acceleration there is directed away from us. We cannot see the back side of the core, where the acceleration is directed towards us (and the shift is blue), because of the opaque core of the core filled with interstellar clouds of gas and dust (even through the core of our Galaxy in the optical range, nothing is visible). Therefore, we do not observe the blue shift, although it does exist. And, since the nuclei of galaxies are usually spherical and the acceleration at any point (even at the poles of the core) is directed to the center of gravity, then, regardless of the inclination of the galaxy to the line of sight, the acceleration in the nearest to us (and therefore the brightest, not darkened) part of the core will always sent from us. So, the redshift of galaxies is almost independent of their inclination, being the same for galaxies seen "edge-on" and "in plan", from the side of the galactic pole.

So, the BTR in its own way confirms the hypothesis of aging of light and removes all objections to it. Thus, it was believed that with aging of light, the value of f'/f would depend not only on distance, but also on frequency f . In addition, observations of distant galaxies have shown that the duration of the processes is also changed in proportion to the frequency in them. The aging of light, as it was believed, should change only the frequency without affecting the time scale T'/T . In fact, the Ritz effect, as follows from its formula, should manifest itself in exactly the same way as the Doppler one, - the same at all frequencies, and - with the corresponding transformation of the time scale $T' = T(1 + La_r/c^2)$. And, therefore, it is more logical to assume that the redshift is caused not at all by the insane race of galaxies, but only by their smooth spinning in the classical "waltz" (Fig. 58).

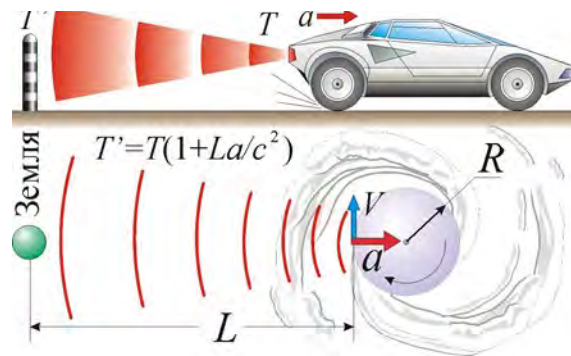


Fig. 58. The redshift in the spectra of the nuclei of distant galaxies as a consequence of the Ritz effect caused by their rotational acceleration.

If there is no "runaway", then Hubble's law will be true only for galaxies, and even then not all. It is not applicable to other objects of the Universe, or, at least, for their different types their values $H = v^2/rc$ should be taken: after all, the sizes and rotation of different groups of objects differ significantly. Although, on average, the accelerations in different galaxies are close, they still do not coincide and therefore the value $H = a/c$ is different for them, and astronomers use the average value of H . Apparently, this is the reason for scientists' hesitation in choosing the Hubble constant: different assessments give very dissimilar values. And until now, we can assume that H is concluded somewhere between 50 and 100 km/s/Mpc. And the value $H = 75$ km/s/Mpc now accepted in astronomy is, for the most part, the result of an agreement, and not an exact measurement. Considering all this, the Ritz effect will solve many paradoxes and redshift inconsistencies, for example, different redshifts for equally distant objects. Thus, Halton Arp revealed many paired, physically connected galaxies, the components of which should be at the same distance from us and have the same redshifts according to the Hubble law, which in fact are very different [52, 87, 155]. Modern cosmology cannot explain this, whereas from the standpoint of the Ritz effect this was expected: redshifts depend not only on the distance L , but also on the type of object, on its rotational acceleration a_r .

Equally simple, the Ritz effect explains other redshift paradoxes. However, there were objections to the interpretation of the redshift from the standpoint of the Ritz effect. So, the stars revolve not only around the center of the galaxy, but also around their axis and along their orbits, while possessing accelerations much greater than galactic ones. Accordingly, the redshifts and the Hubble constant would have come out more. But we must take into account that all galaxies are immersed in clouds of very rarefied interstellar gas, spinning with the galaxies. The re-emission of light by gas leads to the fact that only the general motion of the stars along with the galaxy is significant (affecting the speed of the light coming to us), while their individual speeds transmitted to the light are extinguished, leveled by the gas and become insignificant.

However, to all appearances, insignificant traces of these speeds remain. After all, extinction is never complete, absolute, it only obscures, weakens the influence of the speed of the source on the speed of light in a very large, but still a finite number of times b . Perhaps this is the reason for the effect similar to the reddening

of the spectra of distant galaxies, but found already in the stars inside our Galaxy. This phenomenon was discovered by the same A. Belopolsky and associated by him with the redshift of galaxies [17, p. 268]. Belopolsky discovered that the stars of our Galaxy also tend to shift their spectral lines to the red side, the stronger the farther from us these stars are located. That is, there is also a kind of redshift law, but with a noticeably larger Hubble constant, exceeding the known one by about 50 times. This is due to the fact that the acceleration of stars, as mentioned, is much greater than the galactic one. If the acceleration a_r caused by the rotation of stars around the centers of galaxies is on the order of 10^{-9} m/s^2 , then the acceleration due to the proper rotation of stars and the movement of their atoms in the gravitational field of the star is already on the order of 1 m/s^2 , that is, by 9 orders of magnitude more.

As mentioned, a noticeable part of these motions transmitted to light is extinguished by the atmospheres of stars and the interstellar medium, and, therefore, the difference in the coefficients in the laws of redshift for stars and galaxies is only two orders of magnitude. Therefore, if light moves in a medium, in the Ritz effect it is necessary to take into account the coefficient b of damping by the medium of deviations from the speed of light. Then the Ritz formula will be written already in the form $f'/f = 1 - La/bc^2$, where the coefficient b sometimes also contains a dependence on L , as Fox showed, - exponential. Therefore, the influence of individual motions and distances of stars on their redshift, according to the Ritz effect, can be detected only inside our Galaxy, and even then - in a strongly weakened form. This weakening must be taken into account in other manifestations of the Ritz effect for stars (say, when explaining variable stars, Cepheids, where the Ritz effect is often manifested to a much lesser extent than one would expect, § 2.12). Only when the light has left more or less dense layers of interstellar gas and propagates in an almost ideal vacuum of intergalactic space, does the original Ritz formula $f'/f = 1 - La/c^2$ become valid, and the redshift increases, in accordance with Hubble's law.

Thus, due to the re-emission of galactic clouds of gas, in other galaxies we observe phenomena (motion of stars, outbursts of Cepheids, supernovae) in the same form as if they occurred in ours, with the only difference that all spectra are shifted towards the red, due to the general, galactic motion of the stars. Likewise, in stellar atmospheres, the chaotic movements of individual atoms turn out to be insignificant (§ 2.9). The atmosphere of a star smooths out the differences in the speed of light emitted by different emitters. In all cases, only the general movement of the light sources is essential. This is due to the fact that light, passing through gaseous media and atmospheres, is gradually re-emitted, scattered by their atoms with a speed equal to c already relative to the medium. The speed of light from a moving source is gradually reduced by the medium to the speed c relative to the medium (§ 1.13). As J. Fox showed in 1965, this happens the more efficiently, the denser the medium and the thicker the layer of matter passed through by the light [2]. And, although the interstellar gas in galaxies is extremely rare, the vast extent of galaxies and clouds of gas still brings the speed of light to c . For electromagnetic waves of different ranges, the thickness of the re-emitting layer is different. This is probably the reason for the differences in redshifts found

for the same galaxy in the optical and radio ranges, which is impossible based on the interpretation of the redshift according to the theory of galaxy recession from the expansion of the Universe [87].

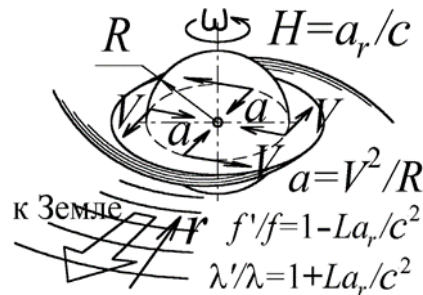


Fig. 59. The rotation of the galaxy creates the acceleration of stars a , directed along the line-of-sight r , leading to the reddening of light according to the Ritz effect.

The presence of gaseous atmospheres surrounding galaxies can also explain the fact that the Ritz effect does not lead to a noticeable broadening of the spectral lines of distant galaxies. But the Ritz effect of the frequency shift is proportional to the radial acceleration, and if we consider the bright spherical nucleus of the galaxy, then the radial component of the centripetal acceleration will be maximum in the center, and zero at the edges (Fig. 59). Accordingly, some stars will give a strong red shift, others - almost zero, and still others - intermediate. This would lead to a strong erosion, broadening of spectral lines, which is absent in galaxies. But remember that the individual motions of stars in galaxies have little effect on the speed of light coming from them: light is re-emitted by clouds of gas circling near galaxies, and it is relative to the gas that has a speed c , which means that it is its acceleration that gives the frequency shift according to the Ritz effect. If we take into account that the radius R of such clouds is several times greater than the radius r of galactic nuclei, then in the part of the cloud onto which the image of the galaxy and its nucleus is projected (shaded in Fig. 60), the difference in radial accelerations will be negligible, which means that the red shifts will almost coincide. If the ratio of the radii $R/r = n$, then the relative difference in radial accelerations will be $1/2n^2$. For the ratio $n = 3$, the difference in radial accelerations will be only 6% of their value, and for $n = 10$, it will be 0.5% in general. Accordingly, the broadening of the lines is negligible. Even for galaxies escaping from us, it is believed, with a speed of $c/5 = 60,000$ km/s, this line broadening by 0.5% will correspond to a spread of stellar velocities of 300 km/s, which is comparable to the actually observed Doppler line broadening from the circulation of the stars. And for galaxies that are not so distant, this broadening will be completely invisible.



Fig. 60. Re-emission of the light of the nuclei by a rotating cloud of gas gives a shift of the lines without their broadening.

The presence of gas clouds surrounding the galaxies and circling with them, it is easy to explain why the shift is precisely red and does not depend on the inclination of the galaxy to the line of sight. Light from the galaxy goes and re-emitted through the central part of the cloud closest to us, in which the accelerations are directed strictly from us, which leads to a decrease in the frequency of light. Gas clouds extend quite far from galaxies, but they are becoming more and more rarefied, and therefore only the near part of a cloud of a certain radius R is capable of actually re-emitting. That is, re-radiation comes from the surface of the sphere, outside of which the cloud density can be conditionally neglected.

However, traces of unequal accelerations of stars still remain. For example, in other galaxies, some emission and absorption lines give different redshifts that have not been explained by cosmology [87]. They can be explained by the presence of gaps in the interstellar clouds and by the fact that parts of galaxies and their satellites lie outside the cloud, and the Ritz effect is caused by their own accelerations. Note that gas clouds affect the frequency shift only from the Ritz effect, but not the Doppler effect, since the Doppler effect depends only on the radial velocity of the source, and re-emission does not change the frequency shift. And the Ritz effect depends on both the radial acceleration a_r and the distance L . This also manifests itself in the absorption of light. So, if the absorption line is not given by the galaxy, but a gas cloud somewhere on the way to it, then the redshift of the line will be proportional to the distance to the cloud, because only from this distance the absorption line shift will begin to grow. Such absorption lines of intergalactic gas with intermediate displacements have indeed been found. Also, intergalactic gas, despite being rarefied, can partially extinguish changes in the speed of light, reducing the Hubble constant found for ultra-distant galaxies. Such an effect, which baffled cosmology, has indeed been identified. But cosmologists have not come up with anything better to explain it, except to consider the Universe not just expanding, but also accelerated, due to the dark energy they invented.

It is noteworthy that the effect discovered by Ritz already in 1908 made it possible to predict the existence and magnitude of the redshift in space long before it was discovered by Hubble. This means that it was Belopolsky and Tsiolkovsky who were right, and not the armies of theoretical astronomers. In general, it is surprising that many people still ignore Tsiolkovsky's scientific ideas, although it was he who paved the way into space, laid the foundation for cosmonautics and rocket technology. The original ideas developed by Tsiolkovsky about the structure of matter, light, hierarchy and the development of the Cosmos [159] are still rejected and hushed up, due to their discrepancy with the accepted model of the world. And yet, it is they, as we see, that are now finding confirmation on the basis of space observations of recent years and ballistic theory. Tsiolkovsky's views are interesting already because in real, practical terms, he did immeasurably more for humanity than the army of theoreticians who came up with an abstract model of the world.

In the same way, Belopolsky, more than anyone else who made for the practical development of spectroscopic research methods in astronomy, who made a huge number of important astronomical discoveries, was not understood by his contemporaries and many of his astrophysical theories, including those concerning redshift and Cepheids (§ 2.12), were undeservedly rejected and forgotten. Only now, after almost a century, these ideas are gradually gaining recognition, finding a strict justification on the basis of the BTR. These forgotten ideas of Belopolsky get a new life if we accept the effect discovered by Ritz and the principle of adding the speed of light and a source. Like his ancient Greek namesake, Aristarchus of Samos, who understood that the Earth revolves around the Sun (and not vice versa), Aristarkh Apollonovich Belopolsky, on the basis of observations, came to his own, very different from the generally accepted vision of the cosmos, which also found justification only much later. If Aristarchus of Samos stopped the insane race of stars with inconceivable speeds relative to the observer, attributing their apparent motion to the kinematic effect of the Earth's rotation, then Aristarchus Belopolsky stopped the insane run of galaxies, also explaining their apparent motion by the kinematic effect (lengthening of light waves from the Ritz effect, due to rotation and principle of relativity). This characterizes Belopolsky as a brilliant visionary and pioneer of astrophysics, who at one time was able to see not only the great importance of spectral methods in astronomy, but also the remarkable future of this science. Likewise, Ritz, having discovered the effect of the same name, in fact, predicted the redshift of distant space objects proportional to the distance long before it was discovered by E. Hubble. But the bright thoughts of these scientists (Belopolsky, Ritz, Hubble), like their forerunners (Aristarchus, Bruno, Galileo), were persecuted by official science and the church, wishing to prolong the rule of obscurantism.

§ 2.5. Relic radiation and the absurdity of the Big Bang

Let's turn to the ridiculous assumptions about the continuously expanding Universe, which they also want to imperceptibly or noticeably use to protect biblical legends.

K.E. Tsiolkovsky, "The Bible and Scientific Trends of the West" [159]

The theory of the expanding Universe is not only complicated and far-fetched, but also contradicts many observational data, and, most importantly, leads to an absurd conclusion about the limitation of the world in space and time. After all, if the Universe is expanding, then by the rate of "expansion" found from the Hubble constant, it is easy to calculate when it began: when the world was collected at one point. This is how the theory of the Big Bang appeared, which supposedly happened 20 billion years ago, laying the foundation for our world. All cosmology is now based on the hypothesis of the Big Bang, which supposedly began the expansion of the once bursting Universe, now swelling like a soap bubble. As Tsiolkovsky noted in his article "The Bible and Scientific Trends of the West" [159, p. 284], this theory returns us to the dark superstitions about the beginning of the world and the act of its creation from nothing (from the singularity), returns to the Universe, limited, as in the idealists of Plato and Aristotle, by a crystal sphere [105, p. 91]. It is no coincidence that G. Gamow, developing and promoting the Big Bang theory, used Aristotle's terminology in his works. Another supporter of the theory of the expanding Universe and the Big Bang, A. Eddington, also tried to develop non-materialistic ideas within the framework of science, for which S.I. Vavilov, who, as a true materialist, was against the Big Bang theory [29, pp. 20, 76]. All this speaks of the falsity, unscientific nature of the Big Bang theory and the expanding Universe. It is not for nothing that they say that the Vatican's ears peep out of the Big Bang hypothesis - after all, the priest Lemaitre was the first to suggest this theory. And, not by chance, this theory found its justification in the theory of relativity, which is as abstract and unscientific as religion. Therefore, there is an urgent need for a new materialistic cosmology that explains all the facts on the basis of classical physics and the BTR.

And such an explanation is quite possible. Not only the redshift in the spectra of galaxies, but also, say, the relic radiation, often cited in support of the Big Bang hypothesis, can be easily interpreted from the classical standpoint. After all, what is relic radiation? It is simply the microwave background radiation from outer space, with a spectrum exactly like that of a 2.7 Kelvin blackbody. Cosmologists consider this radiation as proof that the Universe was once compressed and very hot, but during the expansion it began to cool down and by the current moment has cooled down just to the same 3 K - the pitiful traces of the once hot Universe. But the existence of background radiation could well have been predicted without the Big Bang hypothesis. After all, outer space is filled with extremely rarefied interstellar gas. What is strange about the fact that this gas, from time immemorial heated by the radiation of stars passing through it, now has a certain equilibrium temperature of the same 3 K, on which it now radiates absorbed heat, like all heated bodies?

Cosmologists especially emphasize that the temperature of this radiation in all directions is the same with great accuracy and is exactly 2.7 K, having only insignificant fluctuations, which is supposedly possible only if the Universe was previously collected at one point, and when expanding uniformly cooled down. But, with the same reason, they could be surprised that the air temperature is the same (also with slight deviations) in all points of one room, although from this no

one concludes that all the air in the room was collected in one cylinder. The equality of gas temperatures at all points of the universe (or room) is a natural consequence of the fact that the gas is in thermodynamic equilibrium: its temperature has leveled off. It is also natural that galaxies are distributed in the Universe on average - evenly, as they say: the Universe is homogeneous and isotropic. And, therefore, at any point in the Universe, gas receives and gives off on average the same amount of heat.

If the background radiation of the interstellar gas is in equilibrium, then it is easy to calculate its temperature. Equilibrium means that any volume of gas emits just as much heat as it receives from stars and galaxies. If, as is customary in astronomy, we consider the radiating volume of gas to be an absolutely black body, then, according to the Stefan-Boltzmann law, it will radiate per unit time from a unit surface energy σT^4 , where the constant $\sigma = 5.67 \cdot 10^{-8} \text{ W/m}^2\text{K}^4$, and T is the gas temperature to be found. As it was said, this radiated energy should be equal to the energy absorbed by the gas, that is, the energy coming into a given volume from all the stars and galaxies scattered across the endless Universe. Let's find this energy.

It is known that a typical galaxy emits on average the same power $W = 10^{37} \text{ J/s}$ [142]. If a spherical layer of thickness d and radius r is selected in space around the volume of gas, then it will contain $k4\pi r^2 d$ galaxies (where k is the average concentration of galaxies in the Universe) and will radiate the total power $P = kW4\pi r^2 d$. From all this power, the power $SP/4\pi r^2 = SkWd$ will come to a gas ball

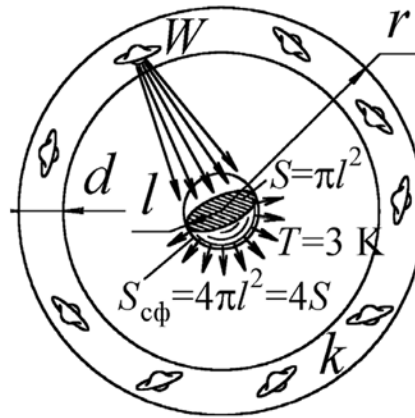


Fig. 61. A spherical volume of gas heated by the light of stars emits at an equilibrium temperature T .

with a cross section S (Fig. 61). That is, the power supplied to the gas volume from the spherical layer does not depend on the layer radius. Therefore, the total radiation power supplied to the gas from all layers can be found as $SkWR$ by simply summing up the thickness of the layers: putting d equal to the radius of the observable Universe $R = 12 \times 10^9$ light years (approximately $12 \times 10^{25} \text{ m}$), that is, the distance to the farthest observable object. Now it remains to find the concentration of k galaxies: $k = n/(4\pi R^3/3)$, where $n = 10^{11}$ is the number of galaxies in the observed part of the Universe, and $4\pi R^3/3$ is its volume [142].

As a result, we find that the total power emitted by a spherical volume of gas, $4S\sigma T^4$, should be equal to the power absorbed by it, - $3SWn/4\pi R^2$. Whence for the equilibrium temperature of this volume of gas we find $T^4 = 3Wn/16\sigma\pi R^2$. And

after substitution of all values, we get $T = 2.9$ K, which is very close to the real temperature of the relict, or, more correctly, the background radiation: $T = 2.7$ K. energy coming to him in the form of light from the stars. So, background radiation is the usual equilibrium radiation of interstellar gas, re-emitting energy coming to it in the form of light from the stars. And there is no need to accept the hypothesis of the Big Bang and the expanding Universe: redshift and relic radiation not only turn out to be a necessary consequence of the classical laws of mechanics and thermodynamics, but also give exact values of the Hubble constant and the temperature of the "relic" background, which are in full agreement with the observed ones.

But the theory of the expanding Universe is unable to predict the value of the Hubble constant, and the temperature of the relict background calculated on the basis of the Big Bang hypothesis differed from the real one several times, amounting to 6–10 kelvin. Sometimes the supporters of the theory of relativity ascribe to themselves the prediction of the very fact of the redshift of galaxies (Friedman's model of the expanding Universe) and the relict background (Gamow's model of the hot Universe). However, even in the 19th century, astronomers and classical physicists (including Belopolsky, Vernadsky, Mendeleev [99]) knew that most nebula-galaxies have a redshift, and argued that space filled with a rarefied medium is characterized by some extremely low temperature. It turns out that there is no need to stutter that the Big Bang theory was the first to predict these effects, since they naturally arose within the framework of the classical concept of an eternal and infinite universe.

It is only necessary to clarify what we mean by the observable Universe and its radius R . If the Universe is infinite, then, of course, it cannot have a limited radius. However, the redshift and absorption by interstellar gas proportional to the distance lead to the fact that we practically cannot see objects at a distance greater than R : their radiation is too attenuated by absorption and frequency shift towards the red side (therefore, R can also be defined as the distance L at which the value of LH/c in the Hubble redshift law $f'/f = (1 - LH/c)$ becomes comparable to unity, leading to a noticeable decrease in the frequency f and light energy, ie $R = c/H = 3 \cdot 10^5 / 75 = 4,000$ Mpc = $12 \cdot 10^{25}$ m). That is why only the energy that comes to a given point from the visible part of the Universe is essential. The well-known Olbers paradox is also solved, according to which, if the radiation coming from a spherical layer does not depend on its radius (as shown above), then countless such layers would give infinite brightness, and even at night any part of the sky would shine just as brightly like the sun during the day. But, in fact, we see the light of only the observable part of the Universe, while the light of its distant parts reaches us in a strongly weakened form.

The above hypothesis explains the fluctuations, that is, small inhomogeneities of the relic radiation: in some directions its temperature is slightly higher, and in some - slightly below average. The reason for this is the same as for small fluctuations in temperature at different points in the room: in its entire volume, the temperature is on average the same, but near lamps, lighting and heating devices, it is slightly increased. It is the same in the Universe: in some regions, the concentration of light sources (stars, galaxies), due to their random

distribution, is slightly higher than the average, clusters of galaxies are denser and therefore the interstellar gas near them is heated more strongly. And where clusters of galaxies are sparse, the temperature is slightly lower. However, these fluctuations are small, since, when averaged over large scales, the distribution of galaxies, as astronomers found, is very uniform. And just as there is always a small temperature gradient in a room, say, in the direction of heat sources, there is a temperature gradient in the relict background in the Universe as well: in one direction this temperature is slightly higher than in the opposite direction. However, such a directed increase in the CMB temperature may also be apparent, caused by the shift of the spectral maximum due to the Doppler effect during the motion of the Earth and our Galaxy relative to the surrounding interstellar gas. After all, all galaxies have, like gas molecules, different randomly oriented velocities of hundreds of kilometers per second. It is not excluded that the velocities of galaxies of the same type, as well as the velocities of molecules of the same type in a uniformly heated room, are subject to the Maxwellian distribution.

Thus, all the features of the relict, or, more correctly, the microwave background, are naturally explainable outside the hypothesis of an expanding Universe, but within the framework of the classical cosmology of a stationary Universe. And let the supporters of the theory of the Big Bang and the expanding Universe insist that there is no reason for its revision, introducing more and more artificial hypotheses about dark energy and mass, but only everyone is already aware of the darkness of the theory itself, which, as Tsiolkovsky noted, returns to dark superstitions and geocentrism [159, p. 285]. And, like the system of the world of Copernicus, which at one time defeated the system of the world of Ptolemy, the new, or, more precisely, the well-forgotten old cosmology of Democritus, Tsiolkovsky and Giordano Bruno, affirming the infinity and eternity of the Universe, beats the current dark cosmology at every step.

On the whole, cosmology based on the hypothesis of the Big Bang and the expanding Universe is completely artificial, irrational and non-physical. It throws back to the prejudice about the universe limited in space and time, which was opposed by Democritus and Giordano Bruno. It is not for nothing that Tsiolkovsky wrote: "An indication of the limits of the Universe is as strange as if someone proved that it has one millimeter in diameter. The essence is the same. Is it not the same six days of creation (only brought up in a different image). We do not know the limitation in time. But since time is infinite, then how can space be limited!" [69, p. 187]. The growth of the theory of expansion with ever new groundless hypotheses about dark mass and energy, without which it contradicts observations, It is not for nothing that in 2004 the *New Scientist* magazine published an open letter signed by hundreds of researchers exposing the machinations of supporters of the current cosmology, based on the theory of the Big Bang and galaxy recession [1]. In the letter, scientists called for the search for alternative explanations for red displacement, of which the simplest, most natural and accurate give the BTR and the Ritz effect.

The theory of relativity, as before, stands on a very shaky foundation, because its second postulate, absolutizing the movement of light, remains only a postulate,

a hypothesis, moreover, irrational, contrary to common sense and the materialistic spirit of science. Tsiolkovsky writes about this further in the same place: "His (Einstein's) second conclusion: the speed cannot exceed the speed of light, that is, 300 thousand kilometers per second. These are the same six days, allegedly used to create the world" [69, p. 188]. And precisely, there is really no reason to impose restrictions on the speed of light, size and time of the existence of the Universe. Only a limited mind could impose such restrictions, plunging science into the darkness of medieval obscurantism. But the worst thing is that these restrictions (light barrier, quantum prohibitions) - fettered minds, became a mental barrier on the way to space and the microcosm. Were it not for these shackles of thought, we might not only have long since unraveled many secrets of the universe, but also mastered the distant stellar worlds.

§ 2.6. *Countless worlds and the infinity of the universe*

The abyss of stars is full; the stars are innumerable, the abyss is bottomless.

M.V. Lomonosov [84]

If we want to stay within the framework of common sense and avoid the deviation of science towards religion, it is simply necessary to recognize the Universe as infinite and eternal, filled with countless stars and matter. It is difficult for many to imagine such an infinity of the world in breadth, in the distance, in depth, since we are used to dealing with finite, limited objects. However, in reality, it is even more difficult to imagine a finite world that has some kind of boundaries. If the universe had a beginning in time, then the question immediately arises: what was before the beginning of the world? What led to its creation? And if there was nothing at all, then what in general could have given an impetus to the birth of the Universe? Thus, we come to the conclusion that there was something even before the creation of the present Universe, which means that the beginning of the world is pushed even further into the past. And so on ad infinitum!

It is the same with the boundaries in space. If the Universe is finite, has boundaries, then it is not clear what they are and what lies behind them. And even if there is nothing at all - one void - then it can be filled, thereby expanding these boundaries. Thus, the spatial boundaries expand to infinity. It can be assumed that, although space is infinite, it is filled with a finite number of stars, galaxies, matter, collected in a finite volume of the Universe. But this is also unlikely. First, if the Universe exists indefinitely, then matter should have spread infinitely far. Secondly, even Newton gave proof that the amount of matter in the Universe cannot be limited, of course. After all, then all matter would be placed in a limited volume, and there would be a certain asymmetry, inequality of different points and anisotropy of space. There would be a clearly defined center of gravity, and, thanks to the acting forces of gravity, matter sooner or later would gather into a single mass in this center [15].

Surprisingly, this proof was given by Lucretius in the poem "On the Nature of Things", with which Newton was well acquainted and according to which he deeply perceived the views of Democritus. It is to this poem that Newton and

Lomonosov owe much of their successes. This is how Lucretius formulates this proof [77]:

In addition, if the whole of the immense Universe was closed in a circle and, having limiting facets, It would have been finite, long ago all matter under the pressure of the Dense principles of the main would have settled in a heap from everywhere, And nothing could be created under the cover of heaven.

Lucretius also gives this reasoning about the homogeneity and isotropy of the universe:

There is no end on either side of the universe; For, otherwise it would certainly have an edge; Obviously, nothing can have an edge, unless there is nothing outside of it that separates it, so that it can be seen It was, as long as our senses were able to follow him. If we must admit that there is nothing beyond the universe, It has no edges and there is no end or limit. And no matter what part of the universe you are in: Wherever you are, everywhere from the place that you occupy Everything is infinite, it remains in all directions.

So, space and emptiness are infinite, but partially filled with matter. At the same time, there should be an infinite amount of matter, and it should fill the entire space on average, with approximately the same density. There is an infinite set of matter, atoms, particles in the Universe (but this set is countable, in the language of the mathematical theory of sets). In addition, the universe is, on average, homogeneous and isotropic. There are no dedicated areas and centers. Therefore, the forces of gravity acting on a point from the side of the parts of the Universe lying in different directions, mutually neutralize each other. Therefore, the Universe is in an equilibrium, stationary state, not expanding or contracting. There are only local regions where matter under the action of gravitational forces is collected into stars, galaxies, their clusters, on average, evenly scattered over space. So, even the ancient materialists Democritus and Lucretius considered the Universe to be infinite, while their eternal opponent, Aristotle, considered the infinite to be absurd.

We see how laconic and logical reasoning the ancient authors came to deep conclusions about the structure of the Universe, which for some reason cannot be made by many modern scientists who consider the Universe to be limited, finite and closed. It seems to be a simple elegant reasoning of Lucretius, but to what important conclusions it leads: 1) the space of the Universe is infinite; 2) contains an infinite amount of matter; 3) The Universe is homogeneous - all its points are equal (there is no center); 4) The universe is isotropic (all directions are equal). This is exactly what should be done from the standpoint of logic and common sense. Modern cosmology contradicts, in fact, each of these conclusions. From the Big Bang hypothesis, it follows that the Universe has a center of expansion (inhomogeneous), has selected directions, say to the same center (anisotropic); has limited dimensions (finite); contains a limited amount of matter contained in this finite volume. Therefore, modern cosmology is unscientific, fundamentally erroneous, it was created by ignoramuses and obscurantists who, it seems, were not at all familiar with the work of Lucretius and who rejected everything that

materialist scientists, atomists fought for: Democritus, Lucretius, Giordano Bruno, Newton, Lomonosov, Tsiolkovsky. It is no coincidence that Tsiolkovsky, together with other sane physicists, denied the new relativistic cosmology, rightly considered it to have more relation to religion than to science.

Such scientists as De Sitter, Friedman, Einstein, Eddington, Lemaitre, Gamow [142, p. 82], attributing to the Universe finite dimensions and the ability to expand, in fact, they return mankind to the dark Middle Ages, to geocentrism, when, blindly following Aristotle, the Universe was considered a limited sphere, which had a center (in the place of the Earth) and began in time. Even the creators of such a cosmology themselves do not hide its connection with non-materialistic biblical legends, with the teachings of Aristotle, in all respects the rational and rational teaching of Democritus. This darkness in scientific views, a return to the darkness of medieval scholasticism is reflected even in the popular "scientific" terms of modern astrophysics and cosmology: "black hole", "dark matter", "dark energy".

True, scientists, using the same theory of relativity, found a clever way out of the situation. They decided that our Universe, although not infinite, is still infinite. Our three-dimensional space is closed on itself, rolled up, as it were, into a four-dimensional sphere. And, just as there is no edge for the spherical Earth, there is also no edge for the Universe, closed in a sphere. We can fly forward on a rocket for a very long time, but in the end we will return to the point from which we flew, as if bypassing the Universe in an arc of a large circle. In the same way, moving along the surface of a Mobius strip or a Klein bottle, we never get to the other side - these are one-sided surfaces. This ingenious trick is, however, nevertheless - a purely formal way out. Space, in principle, cannot be curved. Space, vacuum is, by definition, emptiness, nothing, it is immaterial, has no properties, and therefore is not subject to influence, bending under the influence of gravity or anything else. And so far there is no reason to consider space as curved. And, until the curvature of space is proved by direct experiments, all reasoning about such a curvature is nothing more than an empty game of the mind. Therefore, following Occam's principle, it is much easier and more natural to consider our world, space, as infinite and Euclidean, until no one has strictly proved the opposite.

However, only a finite part of this world is available to us. In particular, there is a radius of the observable Universe, beyond which the radiation of stars and galaxies is greatly weakened by the effect of redshift and light absorption. It is this, as shown above, that allows us to solve the well-known Olbers paradox (§ 2.5). In addition, since we are investigating distant objects on the basis of their radiation carried along the BTR by rheons and arheons, there is a certain radius of the sphere R , within which the electrons shield from us with their diameters the entire celestial sphere, the entire solid angle 4π (§ 1.5). Thus, they screen the entire flow of rheons and radiations coming from the outer space of this sphere. However, this does not mean that the Universe is finite, and there is nothing beyond this sphere. We simply have access to a certain horizon of the observable Universe, unlike the terrestrial horizon, in no way connected with the limitations, isolation, curvature of the world. If we move to another point, we will open up

new, unexplored areas of space, which will not end as we move, as E. Wichert noted (§ 3.20).

According to the correct remark of this scientist, who was mentioned more than once in the work of Ritz [8], in the same way there is no limit to the divisibility of matter. When people discovered that all bodies are made of atoms, the question arose: what are the atoms made of, what holds them together? It turned out they are made up of electrons and nuclei. Then the question arose: what are the nuclei, electrons (discovered by the same Wichert and Thomson) made of, what keeps their parts together? BTR claims that electrons are composed of rheons, which are emitted by an electron. But then a new question arises: what are the rheons made of, what causes their adhesion in the electron and the ejection from them? So, there is something even less. And so on, ad infinitum. Therefore, our world can have neither beginning nor end - in all directions. It is endless. This was clearly realized and confirmed by all progressive thinkers: Democritus, Lucretius, Bruno, Kepler, Newton, Lomonosov, Tsiolkovsky, Tesla. And only limited scientists begin to invent such boundaries, beginnings and ends of the world. But the universe has no end, no edge, and it contains an unlimited amount of matter. This is not only a logical, sane, but also an optimistic conclusion. This means that there is no limit to the knowledge of the world, we are not threatened with a crisis of overpopulation and pollution of the Universe. In addition, as we will substantiate in more detail in the next section, the Universe, in addition to infinite length, also has an infinite lifetime. So, our world is eternal!

§ 2.7. Stationary and eternally young Universe or its heat death?

There is a theory that the universe and time are infinite, which means that theoretically any, even the most incredible, event is possible.

From the movie "Route 60"

It was shown above how the ballistic theory allows one to give a simple and natural explanation of redshift and relic radiation. In addition, it is within the framework of this classical concept that it is possible to theoretically calculate the values of the Hubble constant and the temperature of the relic radiation. Thus, we see that the Universe should be considered stationary, existing eternally and having unlimited extent. The limitedness of the universe in space and time, as Tsiolkovsky justly noted, inevitably leads to religious, pseudoscientific models of the world, such as the Big Bang hypothesis. But, as they say, there is no prophet in his own country. And, even in the USSR, where Tsiolkovsky's rocket merits were recognized and highly valued, they did not pay attention to his physical and cosmological views, preferring the absurd cosmology and physics of Einstein. The model of an eternal, stationary Universe was supported by many progressive scientists: Democritus, I. Kepler, Giordano Bruno, A. Belopolsky, S. Arrhenius. At present, the support and development of the theory of the stationary Universe is usually associated with the name of the famous American astrophysicist Fred Hoyle [67].

However, the theory of the Big Bang, with the active support of the church and academia, practically completely supplanted the theory of a stationary universe. And, meanwhile, it is this theory of a stable universe that looks the most

optimistic and rational, since it affirms the eternal life and eternal youth of the Universe, as Tsiolkovsky figuratively put it. Indeed, if we accept the Big Bang theory, then it turns out that our world had a birth, a beginning in time, and, therefore, there will be the end of the world. This pessimistic hypothesis is called the thermal death of the Universe - the same end of the world from the extinction of stars and uniform distribution of heat. For if the entropy of the world only grows, then sooner or later the world will come to a maximally averaged and disordered state with a maximum of entropy, when all the energy of the Universe and stars is finally converted into heat. The reverse transformation, as the second law of thermodynamics says, is impossible. This is the heat death of the Universe - the biblical "end of the world."

In reality, everything could have ended with the thermal death of the world only in the case of the Universe limited in space and time. After all, the second law of thermodynamics, as it is assumed, is fulfilled only for closed, limited systems, to which, according to the theory of relativity and the Big Bang, our Universe also belongs. If the Universe is limitless, infinite in space and time, then death does not necessarily await it at all, because for open systems the law of entropy increase, as it is assumed, does not hold. Therefore, our world should live forever and, moreover, not to age with time, but, more precisely, to grow old and at the same time to rejuvenate. It was in this vein that Democritus, Bruno and Tsiolkovsky understood the eternal youth of the Universe. And their point of view was confirmed in the fact of birth, the formation of fresh stars, which occurs simultaneously with the inevitable burnout and extinction, the withering away of old stars, discovered by V. Ambartsumyan. And since the stars and galaxies continue to appear, it is foolish to think that they were all born at the same time in a single act of creation and all will one day die. Another fact rejecting the birth and thermal death of the world is the discovery of stars and clusters that appeared, judging by their age estimates, many billions of years before the calculated moment of the Big Bang [87].

To explain the anti-entropy mechanism of the creation of stars, the restoration of order from chaos, let us consider the well-known illustration of entropic disordering. Take two communicating vessels with water, the pipe between which is blocked by a tap. Let's dissolve in the right vessel a pinch of copper sulfate, which will give the solution a blue color. Then we turn on the tap and observe how, over time, the water in the left vessel gradually turns blue due to the diffusion of copper atoms into it. As a result, the blue color will be evenly distributed over both vessels. This is the process of entropy growth: the system from an organized inhomogeneous, nonequilibrium state has come to an averaged, extremely disordered, equilibrium state. From the point of view of mechanics, nothing prevents the system from returning to its original ordered state. If we write a microfilm about the motion of atoms during diffusion, then, scrolling it in the opposite direction, we will not find any contradiction with the laws of mechanics. The movement and collision of particles are processes symmetric in time. However, in life it is impossible to see that the color evenly distributed over the liquid gathers again in one vessel, and all the copper atoms return to the right vessel. This is due to the fact that the irreversible growth of

entropy has a probabilistic nature: the system passes from a less probable to a more probable state more often than back. And the probability that all vitriol molecules will end up in the right vessel is much less than the probability of their presence in both vessels in almost equal proportion. That is why we observe the growth of entropy in life.

But, precisely because of the probabilistic nature of the law of entropy growth, as L. Boltzmann first showed for this example, it is theoretically quite possible that one day the system will return to its original ordered state. Of course, this is unlikely to happen over the course of a person's life. But, if we have unlimited time, then, nevertheless, sooner or later, we may find the system in its original state. As stated in the epigraph, even the most incredible event must happen sooner or later. Such deviations, surges from the state of equilibrium, from a uniform distribution, are called fluctuations. The larger the fluctuation, the less likely it is to observe it. But, as the Boltzmann fluctuation theorem says, which cancels the thermal death of the Universe, even the largest fluctuation will come sooner or later. And there is such a hypothesis that our Universe, or at least its closest visible part, is precisely a giant fluctuation. In the Universe, a significant part is occupied by areas in which entropy dominates, but at the same time, due to the infinity of the Universe in space and time, there are countless areas of the Universe where matter is structured, organized, where there is no thermal death, but there is life, dynamics. We live in one of these areas. Gradually, this region of a nonequilibrium state relaxes, dissolves, returning to a disordered state with high entropy. But, in parallel in this and other areas of the Universe, the processes of the origin of new fluctuations, zones of ordering, structuring of matter are going on. It is in such fluctuations that matter is reorganized, the world is reborn from chaos, like the legendary Phoenix bird from the ashes.

Perhaps that is why the Universe, as astronomers have found out, has a cellular structure, representing a kind of soap foam: giant regions of empty space, where matter is disordered, dissociated, surrounded by "thin" films - walls of "soap bubbles" where matter is organized into stars, galaxies and their clusters due to fluctuations. The universe is constantly changing - in some areas, where fluctuations arise, life, matter, order arise, in others, after going a long way of development, aging and destruction, they die. There is a certain dynamic balance - the balance of entropy and free energy. Entropy is, as it were, a predator that devours free energy and grows due to this. But, if the predator eats too much, its population will decline, since there will be nothing to eat. Therefore, almost the same balance is maintained between entropy and free energy as in systems of the "predator-prey" type (say, the balance of populations of wolves and hares). Their populations fluctuate but, on average, do not change. And, in about the same way, in general, the entropy of the Universe does not change. This is precisely the violation of the second law of thermodynamics for open, eternal systems.

There is a kind of balance between Order and Chaos, the forces of Creation and Destruction, otherwise called Good and Evil. After all, good and evil are not special moral or abstract philosophical, but are completely physical categories. Their simplest definition is as follows: Good is constructive, constructive, and Evil is destructive, destructive, entropic. Goodness implies an increase in free

energy, ordering, structuring, creation, and is always associated with overcoming resistance and difficulties. That is why Good is associated with everyone's striving upward, toward the stars, toward the Sun, and is always given by hard work, say, through overcoming the force of gravity, the light barrier. Evil, on the other hand, implies disordering, a decrease in free energy and an increase in entropy. Therefore, evil is done spontaneously in the world, when weak people succumb to the pressure of circumstances, "go with the flow", are sold, betray ideals and each other. That is why everyone associates evil with falling, laziness, striving into the abyss, downward under the pressure of external circumstances, gravity and chthonic forces. Just as objects strive to descend, to occupy an energetically more favorable position, so people striving for profit, neglecting duty, honor and high ideals, are lowered, sold and become evil, destroyers. Therefore, evil is not done by volitional effort, but, on the contrary, out of weakness and laziness, as the saying goes, "to break is not to build." All criminals, traitors, bandits and robbers (with rare exceptions, like Robin Hood, but this is, rather, partisan, popular resistance) are weak, weak-willed, lazy people, poor in spirit, merchants of honor. At the same time, usually hardworking people with a strong will, a high goal, who resist external destructive factors, and despite them, are creative, going up, against the current, are kind. It is in the weakness, laziness of Evil that the main reason for its inevitable defeat by the forces of Good lies. Meanwhile, the idealistic hypothesis of the thermal death of the Universe (the biblical "end of the world"), refuted by Boltzmann [156], asserted, in fact, the inevitable victory of the forces of Evil (chaos, entropy) over Good (order).

Often, to illustrate the difference between Good and Evil, the example of two roads is cited: one is straight, but thorny, leading uphill (path of truth), and the other winding, but even, leading down (path of falsehood). The strong in spirit go up, and the poor in spirit, submitting to the pressure of destructive forces, go down. Each of us chooses one of the tracks, not only in wartime, but almost every minute of peaceful life. So, in science, some are given to the general stream, are sold for degrees and support false, absurd ideas, while others find the courage to fight them, although this is fraught with deprivation of office, earnings, and, at times, death. A person who goes against the general stream, protests the chorus, sang along with non-classical dogmatic science, usually loses the respect of others, colleagues. But it is much more terrible to lose self-esteem, abandoning dreams, betraying common sense, ideals, not fulfilling your duty, assignment, destiny. After all, the highest happiness for a Man is to follow his vocation, a dream. This is the main meaning of his life. Such a physical approach to explaining the forces of Good and Evil, their eternal struggle and balance, was developed quite a long time ago and was most fully disclosed in works on the cosmic philosophy of Tsiolkovsky [159].

If it were not for the eternal balance of creation and decay, the Universe would have died long ago. We, however, are more familiar with the processes of decay, destruction, and a decrease in the free energy of systems. But there is no doubt that in the Universe there are also reverse processes - the processes of creation. Like entropy processes, they have a probabilistic nature, representing fluctuations, outliers, deviations from the mean. Entropy, chaos grows almost like

a child's disorder in a room - steadily and gradually. However, all of a sudden, smarter adults come along. And there comes the "end of the world", a reboot, a revolution: the previous state of affairs fades into oblivion, withers away, and a new era opens. Major order is very quickly established - everything is restored, after which the invariable process of chaos and destruction begins again. It is such a periodic change of eras that Indian mythology draws, where the era of greatest decline and chaos is called Kaliuga, after which an era of prosperity and renewal begins. In about the same way, suddenly and incomprehensibly out of chaos, due to gigantic fluctuations, order arises, as if as a result of creative, but, in fact, random processes. It is not excluded that these creative processes are associated with the accidental emergence in the Universe - Reason - of intelligent life. After all, there is nothing more organizing than Reason, which, together with Truth, Information, constitutes a group of the strongest anti-entropic (reducing entropy and disorder) factors. Perhaps the emergence of a developed Reason and brings order to the Universe.

In about the same way, after a sharp flourishing, there follows a gradual degradation of civilizations from random entropic factors: wars, epidemics, cataclysms, and, most of all, from alien, destructive processes introduced with the flow of emigrants and barbarians, leading to the decline of culture, traditions, customs. But, in parallel, there is a creative process: sometimes geniuses, "avatars" appear among people, who bring new knowledge, teach crafts, spread culture, lay the foundation for new civilizations, contributing to their sudden flourishing. Ancient mythical legends contain many references to such sowers of culture, for example, the legend of Prometheus. Such giants of thought, such as Democritus, Leonardo da Vinci, Copernicus, Bruno, Galileo, Newton, Lomonosov, Mendeleev, Ritz, Tsiolkovsky, Tesla, also belong to a similar category - also a kind of giant fluctuations, emissions that, in contrast to destruction, created new knowledge, information, reducing entropy and significantly advancing Humanity forward.

If the Reason acted constantly, then the entropy would only decrease. Therefore, there are processes that prevent this, mechanisms of pressure that limit, as history shows, the life or opportunities of such people. In addition, there is some kind of barrier, possibly associated with the discovery of nuclear or other energy, which limits the development of Reason and leads to the death of civilizations. Therefore, the accumulated knowledge is periodically lost, civilizations collapse and die. They are being replaced by new civilizations, and, therefore, humanity does not degenerate, but is constantly renewed, remaining on average at approximately the same level of development. In the history of Mankind, it is believed, there were a lot of such cycles, moreover, not only on Earth. Civilization, as discovered back in 1920 by A.D. Toynbees, like living beings, are constantly born and die, replacing one another. So, there is a constant cycle of civilizations going through similar stages of development, the driving force of which, according to Toynbee, is the "creative elite", which carries the "inert majority" with it. Therefore, Toynbee believed that the progress of mankind consists primarily not in material and technical, but in spiritual improvement.

However, it is possible that in terms of reducing entropy, technology will also play an important role if one day people create machines that can process heat back into free energy (§ 5.8). This will be the so-called "perpetual motion machine of the second kind," operating in spite of the second law of thermodynamics, which just speaks of a constant increase in entropy. After all, the second law of thermodynamics, as it is now more and more realized, is not fulfilled, perhaps not only for open systems, but also for microsystems: the fewer particles the system includes, the higher the relative level of fluctuations. Indeed, if we consider again communicating vessels and begin to reduce their size, we will find that with the number N of copper sulfate molecules of the order of ten, the probability that all molecules (more precisely, copper ions) will be collected in the right vessel is not so small and will be $(1/2)^N = 0.001 = 0.1\%$. Multiplying this probability by the characteristic time of the change in the state of the system due to the random walk of molecules (diffusion), we find that the system is quite often in such an ordered state with increased energy. If you observe the system for an hour, then in total about 4 seconds it will be in such an ordered state. But the most interesting thing is that for another 4 seconds per hour the system itself creates a new spontaneously arisen ordered state, in which all molecules are collected in the left vessel.

Thus, we are convinced that Tsiolkovsky is right: the Universe is constantly living and renewing itself. This is also confirmed by the processes of star formation that are still ongoing, while, according to the Big Bang theory, all stars should have appeared at about the same time, long past, and now they should only die. In fact, we see that stars and galaxies not only die, but are still being born. In this sense, Konstantin Eduardovich spoke about the eternal life and youth of the Universe. After all, the cells of our body die off, deteriorate in the course of entropic processes, but new ones are born to replace them, tissues regenerate, and therefore we live much longer, without aging for a long time. Approximately the same can be said about the life of some kind of living organisms. Some individuals of the species die, but they are replaced by others who were born to replace them, therefore, in general, the species thrives, does not die and remains young. If we take larger scales of time and space, we will see that the species, nevertheless, degenerate, age and die, but instead of them new species appear. Therefore, in general, the biosphere remains unchanged, young. Taking even larger scales of time and distances, we will see that one day earthly life will also perish, however, in parallel, the birth and development of life on other planets in the systems of the galaxy will take place. So, in general, life in the galaxy is stable. And so on ad infinitum.

The same is in the physical world: physical bodies, systems, atoms are like living ones - they are born, live and die, providing constant renewal, dynamic balance of processes. Only the scales of time and space differ. Let us recall the constant decay and restoration, the renewal of the electron (§ 1.5). You can also observe how other elementary particles, atoms, molecules, substances, geological formations, planets, planetary systems, stars, galaxies, clusters of galaxies, etc. disintegrate and are created. ad infinitum in all directions. Our world, conventionally speaking, is infinite not only in breadth (in space) and in the

distance (in time), but also in depth (into the microcosm) and upward (into the megaworld, space). If we take into account the infinity of space, we can talk about the comparability of the galaxy, atom and electron. As V.I. Lenin, they all have a complex structure stretching infinitely deep. It was precisely this kind of cosmic philosophy that K.E. Tsiolkovsky [159]. And, although now few people know about this, the most scientific and global of philosophical ideas, let's see what Tsiolkovsky's descendants will appreciate higher - his space ideas or the development of rockets.

It should be noted that in the ancient, pre-biblical beliefs there was no talk about the birth of the world in the act of creation, now called the "Big Bang", and about the end of the world from the thermal death of the Universe. So, according to the ancient Indian Vedic philosophy, nothing is born out of nothing, the Universe exists eternally and is constantly renewed, periodically going through stages of decline and rebirth (§ 5.3). Such a natural, spontaneous, not requiring the intervention of external forces, the birth and death of worlds: planets, stars, galaxies and their clusters, does not contradict the infinity of the Universe in time, but, just, provides. It is no coincidence that the "Cosmogonic Hymn" of the Rig Veda simultaneously asserts eternity, the inconceivability of the Universe and the spontaneous development of the local world we see from the "golden cosmic egg" (which the Russian fairy tale about the Ryaba chicken also speaks of), which can be understood as either a spherical protoplanetary cloud that formed solar system with the Earth and the yolk-Sun in the center. It is possible that we mean a larger formation-fluctuation, such as a galaxy in the form of an omelet (a broken egg with a central yolk-core), or the type of bubbles, cells, the circulation and seething of which, as said, forms the Universe. Finally, by this golden egg, called by the ancient Indians "the egg of Brahma", and by the ancient Slavs "the egg of Dazhdbog" ("Veles's book"), one can also understand the visible part of the Universe, enclosed within a sphere of radius R , given by the redshift, or electron screening sphere (§ 1.5, § 2.5). Perhaps this mirror sphere of the electron or the electron itself, which amber served as a model in ancient times, was denoted by the term "golden egg", from which the Universe is formed, actually composed of electrons and the rheon streams emitted by them (§ 3.21).

As you can see, there is nothing to do with the Big Bang and the biblical creation of the whole Universe. Indeed, according to the Vedas, matter does not arise and does not annihilate, but only passes from one state to another: there is a constant circulation of matter, a cyclical renewal of objects and worlds, which, in particular, the ancient Indian atomist Kanada spoke about. Such a scientist as Tesla adhered to these views of the Indians [110]. The Chinese sages also borrowed a lot from India. Therefore, the Chinese philosophical doctrine of Taoism speaks of constant rebirth, self-renewal of the Universe, of the eternal struggle and balance of the forces of good and evil, creation and destruction. Unlike abstract biblical dogmas and myths, these ancient philosophical teachings were not religious tales and parables, but concrete scientific knowledge. This knowledge was not imposed by fire and sword, as, say, Christianity in Russia, or as non-classical physics in the modern world, but voluntarily accepted by people who saw rational seeds in these teachings. This is how more and more scientists

are now convinced that Tsiolkovsky is right, defending the theory of a stationary Universe and against the imposed theory of the Big Bang [1], which speaks of the birth and inevitable death of the Universe. For there is no beginning without end.

§ 2.8. Cosmic dispersion

Suppose that in this case there was an explosion, that is, a short-term event, the display of which for a distant observer in different ranges of the electromagnetic spectrum was stretched in time as a result of the velocity dispersion independent of the optical density of the medium. X-rays will always outstrip lower-frequency optical and radio emissions ... From the above, it becomes clear that the radio band is by no means the fastest communication channel (recall the SETI program to search for signals from extraterrestrial civilizations) ...

S.P. Maslikov, [81]

Now that the structure of the Universe is more or less clarified, let's move on to considering the main effects of the Cosmos, which should be taken into account when observing the objects inhabiting it. Since we receive all data about them through the light emitted by them, the ballistic principle of adding the speed of light to the speed of a source should become the key to understanding space. One of the consequences of this principle - the Ritz effect, as we will see, is really of great importance. But there is another, less pronounced, but quite noticeable effect called "cosmic dispersion".

The fact is that light and rheons have a constant speed only relative to the sources that emitted them - electrons. But electrons in radiation sources (in antennas or in atoms) themselves move, oscillate, and, according to the ballistic principle, their speed is added to the light speed of the rheons firing. Consider rheons emitted in the direction perpendicular to the plane of the electron orbit of the atom (Fig. 62). So they will fly if an electron orbiting with a speed v shoots rheons not exactly in a given direction OA , but at a small aberration angle to the side opposite to its motion in order to compensate for its speed (as in the case of starlight aberration, § 1.9). The resulting speed of reons (and light) $c' = (c^2 - v^2)^{1/2}$ is always slightly less than the speed of their firing c .

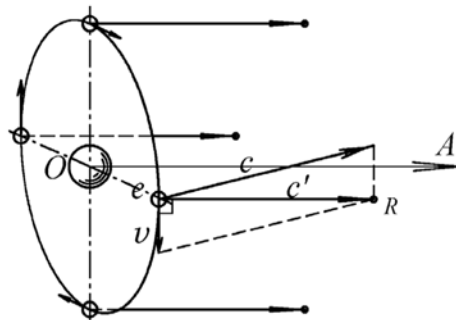


Fig. 62. The orbital speed v of the electron, adding up with the speed c of the rheons it fires, gives the speed c' directed along OA .

This will lead to the following curious effect: since, as at least the photoeffect (§ 4.3) shows, the velocity v of the electron in the atom is the greater, the higher the frequency of its oscillations (equal to the frequency of the light emitted by the atom § 3.1), then with an increase in the frequency of light, its velocity decreases spread $c' = (c^2 - v^2)^{1/2}$. It is believed that this kind of phenomenon of the dependence

of the speed of light on its frequency, called "dispersion" (it is it who is responsible for the decomposition of light into a colored strip of the spectrum), is possible only in a medium. But if this is true, then dispersion is inherent in light from the beginning and should be observed even in a vacuum.

It is this phenomenon, based on the ballistic theory, but from other considerations, predicted by S.P. Maslikov (see the journal "Physical Thought of Russia", 1998, No. 1 and [81]). True, the speed v of electrons is usually much less than the speed of light c , and for different rays the speeds c' will differ very little from c and from each other. That is, the dispersion in a vacuum will be negligible. But, as Maslikov correctly noted, the effect should clearly manifest itself at huge cosmic distances, where even an insignificant difference in the speed of red and blue rays will lead to a noticeable time delay of the latter. This Maslikov explains some cosmic mysteries, for example, the discrepancy between the moments of optical, X-ray and radio flares of the same space objects. The phenomenon of cosmic dispersion (advancing in space by red rays of blue), as follows from the biography of P.N. Lebedev [133, p. 157], has been known for over a century. This phenomenon was also investigated by the already mentioned A.A. Belopolsky [17]: cosmic dispersion was discovered by one of his students, who was inclined to think that the effect was nevertheless caused by the difference in velocities. However, scientists refused to recognize this effect and either diligently keep silent about it, since they cannot explain it, or find very dubious explanations. And from the standpoint of the BTR, it is easy to explain the effect of space dispersion and, moreover, to apply this effect, at the suggestion of S.P. Maslikov, - to determine distances in Space (§ 2.13).

Indeed, according to S. Maslikov, by measuring the delay between the arrival of blue and red rays from a flared object and knowing the difference in the velocities of these rays in space, one can easily determine at what distance this path difference has accumulated, that is, to determine the distance to the object. However, when light is scattered by gaseous media, if they meet on the way, information about the speed of the source should be lost, as shown by J. Fox (§ 1.13). And, therefore, the speeds of blue and red rays will gradually equalize. Thus, the cosmic dispersion would either disappear altogether or noticeably weaken. However, it is possible that scattering will not affect the magnitude of the effect at all, since scattering atoms also emit light of different frequencies at different speeds. Apart from this possible flaw, this method of determining distances would be much simpler and more accurate than all known at the moment. As we can see, the ballistic theory not only easily and beautifully explains many phenomena of space, but also gives astronomers a lot of new tools for understanding and measuring it.

However, it should be noted that the effect of cosmic dispersion is still too poorly studied to be able to use it to determine distances. So, there are numerous cases when low-frequency radio emission lags behind high-frequency and optical. This is observed in, say, supernovae. Apparently, their nature of the effect is completely different, since in these flare objects, as we will see (§ 2.18), the brightness variability is associated not with a physical flare or explosion of a star, but with the Ritz effect. The effect converts optical thermal radiation, as it moves

in orbit, into other electromagnetic ranges - into radio, X-ray and gamma ranges, giving these emissions a different speed. Therefore, the delay of some rays in relation to others can be caused both by the successive transition of the spectral maximum as the star moves into different ranges, and by the fact that the star, in the course of such a successive transformation, imparts different speeds to the emissions of different ranges and, therefore, they come with different delays. This can also explain why, in such flaring objects (say, in bursters), the bursts of neutrino, gamma and X-ray radiation are ahead of optical ones, and the last comes radio emission [81]. This is confirmed by the fact that the radio images of the arms of spiral galaxies lag behind their optical images, being rotated by a certain angle. So, the problem of cosmic dispersion remains to be thoroughly understood.

§ 2.9. Testing the ballistic principle in space

- Oh, ballistics, ballistics!

Jules Verne "From the Cannon to the Moon"

It was shown above (§ 2.1) that radar measurements in Space contradict the second postulate of the theory of relativity and confirm the ballistic principle. However, these confirmations were accidental, unexpected for scientists. Perhaps this is the only reason why the results of such measurements became known. They simply did not have time to immediately realize and hide. At the same time, many targeted measurements of the speed of light from cosmic sources have been made. And such experiments, already initially intended to refute the ballistic theory, in full accordance with the idea of the experimenters, rejected the BTR and proved the SRT.

Known, for example, the experience delivered in 1956 by A.M. Bonch-Bruevich. He compared the speeds of light emitted by the left *A* and right *B* edges of the Sun (Fig. 63). Since the Sun rotates, one edge of it approaches the Earth, and the other moves away with a speed of $v = 2.3$ km/s, and the speed of the rays emitted by them should differ in the BTR by 4.6 km/s. Found the same speed values almost did not differ, which supposedly spoke against the BTR. In the experiment, the speed of light was measured by the time it took for the light to travel back and forth to the base length L (Fig. 63.b). It was believed that the first

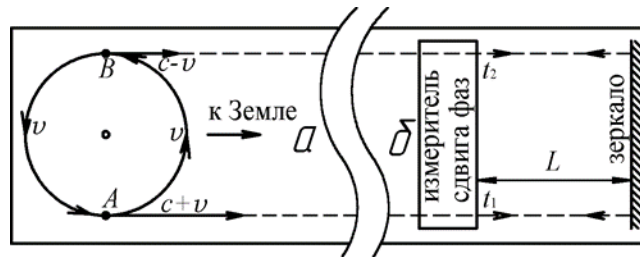


Fig. 63. a) according to the BTR, the speed of light c emitted by double stars or the edges of the Sun is added to their radial velocity $\pm v$; b) Bonch-Bruevich setup for comparing the speed of two beams.

ray traveling at a speed $(c + v)$, having flown through the base, is reflected by the mirror back at the same speed, passing all the way in the time $t_1 = 2L/(c + v)$, and the second ray, having a speed $(c - v)$, - respectively, for the time $t_2 = 2L/(c - v)$. The difference in times $t_2 - t_1$, which creates a phase shift (which turned out to be

zero in the experiment), was used to search for the difference in velocities [74]. Moreover, the difference should have appeared already in the first order of smallness of v/c and therefore it should be easy to register.

At the same time, it was tacitly believed that after reflection, the speed of light does not change, like a ball, which, after rebounding from a wall, has the same speed as before impact. But if, upon reflection, as stated by the BTR (§ 1.13), the light changes the value of the phase velocity ($c + v$) to $(c - v)$ and vice versa, then the total time of motion of the beam is found already as $t_1 = L/(c + v) + L/(c - v)$, and the light emitted from the other end has $t_2 = L/(c - v) + L/(c + v)$. In other words, due to the fact that the phase velocity of light during reflection does not change relative to the source, according to the BTR the time of movement of the rays in such a system is the same, and the experiment does not in any way harm the ballistic principle. In addition, even Bonch-Bruevich himself points out in his article [93] that his experience does not contradict Ritz's theory, although for some reason all textbooks say that he refutes the BTR [74, 136]. Also, most other (including proposed) experiments using mirrors and a closed beam path for the same reason can neither prove nor disprove the BTR (recall the experience of Sagnac, § 1.13).

However, in the experiment, it seems, it was not the phase, but the group speed of light that was measured, with which it is not the phase of the wave that moves, but the rheon stream carrying the light. After all, the experience is based on modulating a beam of light in intensity and comparing the phase of modulation of the beam that has passed through the base and the original one. And the speed of transfer of fluctuations of brightness and energy of light is the group speed, which, as we saw, after the light passes through lenses and mirrors, becomes equal to c relative to them, since they act as new sources of light (§ 1.13). Therefore, the light in the Bonch-Bruevich installation, even before it had time to pass the base at least once, lost all information about the source velocity during the passage of the lenses and when the whole was reflected by the mirror. Thus, the experiment loses all meaning, without saying anything about the influence of the speed of the source on the speed of light.

In addition to the role of mirrors re-emitting light, it should be taken into account that the light entering the Earth's atmosphere loses the excess speed given to it by the source, due to re-radiation by the atoms of the atmosphere (§ 1.13). Thus, no matter how fast the light moves in space, in the atmosphere it will acquire the speed c . Therefore, it is fundamentally impossible to detect the difference in velocities from the right and left edges of the Sun in the Earth's atmosphere. To detect the difference, it is necessary to place the measuring device in a vacuum, in space, so that there are no lenses, mirrors and other re-emitting media between the source and the receiver, otherwise all information about the source speed, embedded in the speed of light, will be lost. And in Bonch-Bruevich's experiment there was an atmosphere, and mirrors, and telescope lenses through which light from the Sun passed before entering the installation. Therefore, it is not surprising that experience could not confirm the BTR, as it could not, however, refute this theory.

It is interesting that the idea of the experiment was proposed as early as 1950 by S.I. Vavilov, who was keenly interested in the history of science and, especially, in the corpuscular theory of the outflow of light by Newton, Democritus. He was also familiar with the ballistic theory, which he sought to test, as well as the second postulate of the SRT. And Vavilov proposed a completely different experimental scheme: he was going to measure the speed of light emitted by channel beams - rapidly moving hydrogen atoms in a tube with a high degree of rarefaction. Such an experiment, indeed, would make it possible to check and confirm the BTR, since hydrogen atoms in the channel beams fly at speeds of the order of $v = 10^6$ m/s, and the light from them would go in an extremely rarefied gas, which would not have time to take the source's speed away from the light. However, Vavilov, shortly after he became interested in this problem and proposed this experimental scheme, died in 1951, not having reached his 60th birthday. As a result, the scheme of the experiment proposed by him was modified at the suggestion of G.C. Landsberg in such a way that the experiment did not allow testing the BTR and was even interpreted by the same Landsberg as contradicting the ballistic theory [74], although Bonch-Bruевич himself did not say anything about this [24, 111]. On the contrary, he later admitted with bitterness and shame that, having changed the scheme of the installation, he had not justified the trust and hopes of S.I. Vavilov, because he understood that measurements according to the new scheme would yield nothing ([UFN, Vol. 171, No. 10, 2001](#)). Channel beams, as a key to the dispute between BTR and SRT, are also interesting in that they owe their discovery and study to J. Thomson and J. Stark, opponents of the theory of relativity and supporters of the ballistic approach.

And the most interesting thing is that the experiment according to the Vavilov scheme, it seems, was once carried out in the laboratory of the US Navy (remember that A. Michelson, § 1.9, and W. Kantor, § 1.13, also came from there with his key experience for the BTR) [4]). Its results were published, so that Einstein also learned about them [58, p. 213]. It turned out that the speed of light rays up to 322,000 km/s was recorded in the cathode tube, which serves to obtain channel beams, which is 22,000 km/s higher than the speed of light c from a source at rest and is comparable to the speed of light ($c + v$) from channel particles if you follow the BTR (Fig. 20). However, to the scientific community and Einstein, these results were ignored or deliberately hushed up by the US military department, as B. Wallace believes (§ 2.1). That is why testing the ballistic principle using channel beams remains the simplest and most promising experiment for confirming a BTR. It is only necessary to eliminate the influence of intermediate reflecting and re-emitting media (§ 1.13).

For the same reason, other experiments on measuring the speed of light from moving cosmic sources, carried out in the earth's atmosphere, can neither confirm nor refute the ballistic theory. So, on the proposal of La Rosa [93], they tried to use the scheme of Michelson's experiment to test the BTR, using the Sun moving or rotating at high speed (D. Miller's experiment), planets, stars (R. Tomaschek's experiment) as light sources [6, 152]. Since the experiment measured the values of the second order of smallness in v/c , then even taking into account the change

in the speed of light, when reflected from the mirror, would not hurt to detect the difference in the speed of the rays. Then the experiment would really turn out exactly analogous to that of Michelson, only the role of a stationary medium, relative to which the light would have a constant speed, would be played not by the ether, but by the frame of reference associated with the source. However, all these experiments also did not reveal any dependence of the interference pattern on the speed of the light source and the position of the installation. However, the reason for this, again, was not the fallacy of the BTR, asserted by the authors of the experiments, but the fact that the light studied in the experiment was no longer emitted by moving sources, but by resting re-emitting atoms of the atmosphere, mirrors of the optical system and lenses of telescopes. Before the speed of light was measured, it had time to be re-emitted hundreds of times and transformed along the path of the beam. It was not the light of cosmic sources that was investigated, but the light of motionless earthly ones. Already one atmospheric refraction (the curvature of the stellar light rays by the atmosphere) suggests that we are not observing the original light of a cosmic source, but the secondary radiation of the atmosphere going in a completely different direction.

However, measurements of light in the earth's atmosphere were not always used to test the BTR. Sometimes, the path along which the path difference was gained by the rays emitted by different cosmic sources was also in space. So, to test the ballistic principle, E. B. Aleksandrov suggested using Cepheids [14]. If these stars pulsate (periodically inflate and contract), then from the difference in radial velocities in different parts of the surface, light rays will also acquire unequal velocities, which will not be perceived simultaneously from this. This would lead to the "washout" of the Cepheid outbursts, making them invisible to us. But, according to the BTR, the brightness fluctuations of Cepheids are caused not by pulsation, but by the Ritz effect from the rotation of stars in binary systems (§ 2.12), and therefore there can be no velocity spread. Ironically, right after the article by E. Aleksandrov, who criticizes the BTR, the *Astronomical Journal* contains an article by E.F. Brazhnikova and S.V. Babinchuk, which describes, in fact, the Barr effect (§ 2.10), just confirming the validity of the BTR in space for binary stars. According to E.B. Aleksandrov, the brightness fluctuations of the Cepheids could also be blurred due to the thermal spread of the velocities of elementary atomic emitters, which impart different velocities to the light emitted by them [14]. In fact, the light scattering medium should emit as a whole. The speed of the entire medium is important, not its individual emitters. Scattering by atoms re-emitting light according to Fox's principle smooths out the initial spread of the speed of light, to which Fox himself drew attention, responding to Aleksandrov's arguments [2]. So, if the radiation of one atom is scattered by two others, then the light re-emitted by the approaching atom will increase the speed by V , and by the receding atom, it will decrease it.

From different velocities, waves come to new atoms already in antiphase and quench each other (Fig. 64). This will happen at such a distance S , at which the path difference $S(c + V)/c - S(c - V)/c$ reaches half the wavelength λ . That is, $2SV/c = \lambda/2$, whence $S = \lambda c/4V$. With an average velocity of atoms in stellar atmospheres $V \sim 1000$ m/s and a wavelength of $\lambda \sim 1$ μm , this will give $S = 75$

cm. This means that already gas volumes with dimensions of more than 1 m should radiate as a whole. Waves emitted at different speeds will be gradually damped by interference, but waves emitted by similarly moving atoms will mutually amplify. As a result, only the speed of atoms with which they move with the medium is transmitted to light, and there is no thermal spread in the speed of light. It is possible only for rarefied media and small volumes of gas.

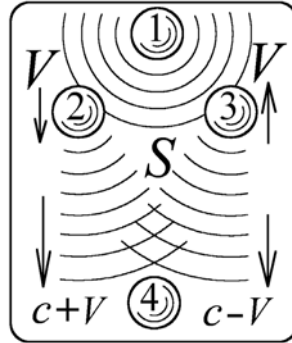


Fig. 64. In the area of the medium, the radiation of atoms for which $V = 0$ is enhanced.

Some astronomers, say O. Hackman, R. Dickens and S. Malin, tried to refute the BTR using stellar aberration (§ 1.9). It is known that the orbital motion of the Earth with $V = 30$ km/s changes the direction of arrival of starlight by the angle $\alpha = V/c$. This is a direct consequence of the classical law of addition of the vectors of the speed of light and the source. But, if the speed of light depended on the line-of-sight velocity v of the source, then the deviation of α would be different for different objects: instead of $\alpha = V/c$, they would find $\alpha = V/(c - v)$. It is interesting that this inequality of aberration angles was predicted and searched in vain by Laplace and Arago, who supported the corpuscular theory of light and applied the ballistic principle to it (see "[Einstein's collection-1977](#)"). However, with the available stellar velocities, the difference in the angles α would turn out to be so small that they would not be able to notice it. Indeed, even for the fastest stars flying at a speed of $v \sim 300$ km/s, that is, $0.001c$, the change in α would be one thousandth. And since the angle of aberration α is itself extremely small - only 20 arc seconds - then its change by $0.02''$ will be completely invisible, even when observing through the best telescopes with a resolution of $1'' - 0.1''$.

However, it was believed that a change in α can be detected in distant galaxies, which, as judged by the Doppler effect, move away with tremendous speeds v , comparable to the speed of light c . And yet, for them the angle $\alpha = V/(c - v)$ turned out to be the same as for stars, as if the speed v did not change the speed of light, thus speaking as if against the BTR [153]. again from misconceptions about space. Indeed, according to the BTR, galaxies do not scatter, but have relatively small random velocities, such that $v/c \ll 1$, while the redshift is caused not by the Doppler effect from galaxies moving away, but by the Ritz effect from their rotation (§ 2.4). Therefore, the real speed v of galaxies is negligible in comparison with light and has very little effect on the speed of light coming from galaxies. That is why the aberration angle differs little from the standard $\alpha = V/c$. By the way, this was also noted by the author of the "refutation", Dickens, who understood that it loses its meaning (the aberration of the light of galaxies does

not contradict the BTR) if the redshift of galaxies is of a non-Doppler nature, according to Belopolsky and other astronomers [87].

So, the phenomena of space do not contradict, but rather confirm the theory of Ritz. For the most part, the formulation and interpretation of such experiments is simply not correct and does not allow establishing either the justice or the erroneousess of the BTR. So, new observations and experiments are needed, say, a comparison of the aberration angles of stars by interferometric methods with their resolution of $0.001'' - 0.0001''$, which will finally prove the BTR. And then, just like in the novel by Jules Verne, all doubts about the power of ballistics will disappear.

§ 2.10. Ballistic principle, binary stars and the Barr effect

This principle could not take root in science for a long time and was subjected to harsh criticism from pure mathematicians and physicists. However, some force forced another part of scientists to continue research in this direction empirically, and half a century after Doppler, the principle finally established itself as a solid method.

A.A. Belopolsky, "Distances and Motions of Stars" [153]

As you can see, the above attempts to refute the ballistic principle have no evidentiary force - they are all incorrect. However, it was not they that led to the rejection of Ritz's ballistic theory, but completely different observations, but, more specifically, the analysis of the motion of binary stars performed by De Sitter. In fact, this was the first weighty argument against the ballistic theory, which stopped its development and led to the oblivion of Ritz's ideas. Recall that a "double star" is a pair of stars M and N revolving around a common center O in circular or elliptical orbits (Fig. 65).

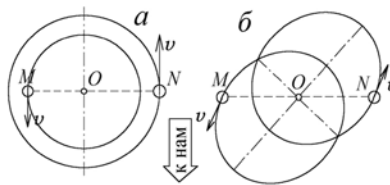


Fig. 65. Binary stars with circular (a) and elliptical (b) orbits.

If the speed of the light emitted by the stars c is added to their orbital speed v , then the ray from the approaching star A should have a higher speed and pass the distance L to the terrestrial observer faster than the ray from the receding B (Fig. 63.a). Therefore, according to the BTR, we would see the light of the approaching star M at a time $\Delta t = L/(c-v) - L/(c+v)$ earlier than the light of the receding N . That is, at some points of the orbit we will observe stars a little earlier, and , in others - a little later than it should.

As a result, the apparent motion of stars will be distorted, having received deviations from Kepler's laws, which no one actually observed [26, 152]. This was the main argument by which Ritz's theory was once rejected. But, later, it was shown that in binary stars, distinguishable through a telescope, such deviations could not have been detected with the existing parameters of binary stellar systems and the resolution of astronomical instruments [111]. Due to their

relatively small distance, distortions proportional to L are obtained as small (less than the resolving power of telescopes).

Therefore, only observations of spectroscopic binary stars, far from us at much greater distances than visual binaries, and having proportionally large distortions, can testify against Ritz's theory. However, such stars are already indistinguishable separately, and, even when observed through the strongest telescopes, merge into one luminous point. Therefore, their motion is judged only on the basis of observations of the spectrum of stars: the shift of spectral lines gives, according to the Doppler effect formula, the radial velocity of stars at each moment of time. And from the radial-velocity curve it is easy to find the main parameters of stellar orbits, including their eccentricity - the degree of elongation of the orbit. So, if for a circular orbit the radial velocity curve has the shape of a sinusoid (Fig. 66.a), then for an elliptical orbit it is already less symmetric (Fig. 66.b, c).

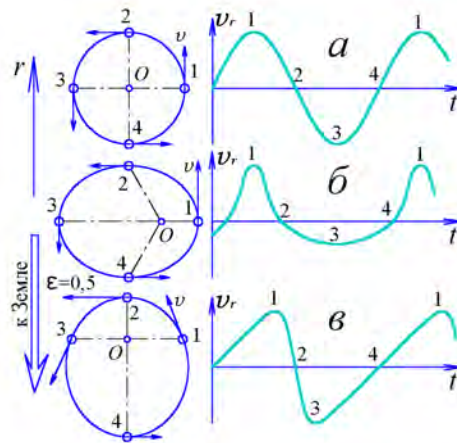


Fig. 66. Orbital v and radial v_r velocities of stars depending on the type of their orbit and position on it.

Consider the case of a circular orbit. If the motion of a star affects the speed of light, then its velocity curve should skew (Fig. 67): the points where the radial velocities are positive (directed away from us, reducing the speed of light to $c-v_r$) will move forward along the time axis (their light will be delayed), and where they are negative - back (their light will arrive earlier due to the increased speed of light). And the shape of the velocity curve (Fig. 67.a) would resemble that for an elliptical orbit. 66.c). In addition, the mirror course of the velocity curves of two stars M and N (Fig. 65.a) would be violated (Fig. 67.b).

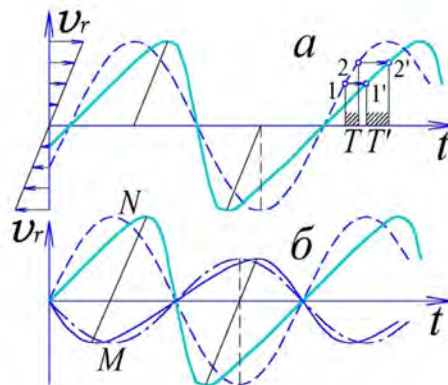


Fig. 67. Distortions (solid lines) of the velocity curves introduced by the motion of the stars.

Knowing the distance and speed of the stars, it is easy to calculate the values of these assumed deviations. But, as observations have shown, such deviations are absent or have a value significantly less than the calculated one. So, there are many spectral binaries with almost circular orbits, which would seem to be strongly elongated from the BTR. It was found that if the speed of light is added with the speed of the source according to the law $c' = c + kv$, then $k < 0.002$ [93]. That is, it turned out that Ritz's theory (according to which $k = 1$) completely contradicts observations.

But everything is not so simple. After all, the motion of spectral binaries is judged only by the displacement of spectral lines, and in the BTR it is created not only by the Doppler, but also by the Ritz effect (§ 1.10). Moreover, in space, in the world of giant scales L , Ritz shifts proportional to La/c^2 can significantly exceed Doppler shifts proportional to v/c . For a star moving in a circular orbit of radius r , the centripetal acceleration is $a = v^2/r$, whence $La/c^2 = Lv^2/rc^2$. And the spectral shift from the Ritz effect exceeds that from the Doppler effect in Lv/rc , or of the order of L/cP times, that is, in the same time as the distance to the star in light years L/c exceeds the period $P = 2\pi r/v$ in its appeal. And since, for most of the spectroscopic binaries studied by De Sitter, the orbital period P was several days, and the distance L/c was many light years, the displacement for them was created mainly by the Ritz effect.

Consequently, in the spectra of close binary stellar systems, the periodic displacement of lines is caused, for the most part, not by the velocities, but by the accelerations of the stars. The motion parameters found by the Doppler formula are erroneous: the true velocities of the stars will be less than those found - just by a factor of L/cP , that is, at least a thousand times. Therefore, the expected deviations proportional to kv could not occur even for $k = 1$: the observations do not contradict Ritz's theory! On the contrary, since the real deviations, according to Ritz's theory, are thousands of times less than those expected by De Sitter, then the detected distortions (corresponding to $k < 0.002$) can serve as confirmation of the BTR. If astronomers were able to observe the motion of spectroscopic binary stars directly, they would have noticed inconsistencies, but the problem is that their motion is judged only by the spectra, and the variable radial acceleration of stars creates spectral displacement curves similar to the radial velocity curves (compare Fig. 66 and Fig. 68). Only by using other measurement methods, it is possible to understand what caused the shift of lines in the spectra of distant stars: their speed or acceleration. So, there are known stellar pairs in which one star periodically covers another. According to the periods between eclipses, the shape and position of their orbit is determined: for some stars it turned out to be elongated exactly along the line of sight r , as in Fig. 66.c. But spectral measurements gave for these stars not a curve from Fig. 66.c, and the curve Fig.

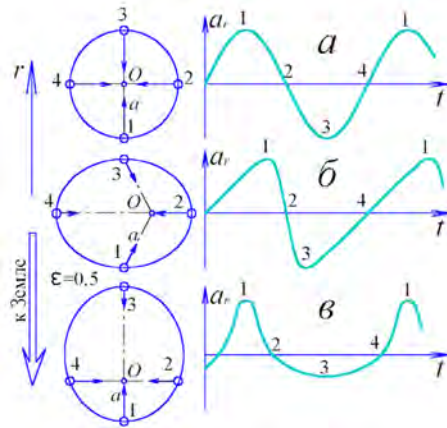


Fig. 68. Centripetal a and radial a_r acceleration of stars depending on their orbit and position on it.

66.b [27, p. 200–203]. From an astrophysical point of view, this is completely impossible. The Ritz effect explains everything easily: if the spectral shift in these cases is caused by acceleration, then for an orbit elongated along r (Fig. 68.c), we get just the curve from Fig. 66.b. The BTR also explains other oddities of binary stars, described in the book by Alan Batten [27] and collectively called the "Barr effect". So, for some binary systems the velocity curves of the stars M and N do not correspond to each other [27, p. 207], just like in Fig. 67.b. It is clear that the observation of such anomalies cannot reflect the real movement of binary stars: as Barr himself notes, the movement is seen to be distorted from some kind of optical effect, as it is easy to guess, from the Ritz effect. Interestingly, the chapter from Batten's book is called "Deformation of the radial velocity curves", but it is precisely this distortion of visible stellar motions that has long been pre-calculated as one of the consequences of the BTR. Moreover, Barr's article "[Orbits and velocity curves of spectroscopic binary stars](#)" was published in the same fateful 1908, when Ritz published his ballistic theory. That is, even then there were all the prerequisites for the recognition of the BTR, and only the militant ignorance of such scientists as De Sitter prevented the triumph of truth.

Similarly, for some reason, modern scientists do not in any way connect the distortion of the calculated orbits with the predicted BTR, although a century ago Comstock and De Sitter noted that the detection of such orbital deformations would confirm Ritz's theory. So, the Barr effect has been discovered in space - the discrepancy between the radial velocity spectral curves and the real motion of binary stars. Astrophysics with the theory of relativity cannot explain this, while Ritz's theory easily and naturally explains. Back in 1913, in a printed discussion with De Sitter, the astronomer E. Freundlich drew the attention of scientists to the Barr effect: the predominant elongation of the ellipses of stellar orbits towards the Earth [3, 107]. Freundlich, following Barr, noted that in reality the orbits should be located randomly (otherwise, we will return to Aristotle's geocentrism), which means that this asymmetry indicates a distortion of visible stellar motions - from the influence of the speed of stars on the speed of light, according to the BTR. Paul Gutnik and Freundlich presented a number of arguments in favor of the reality of such an influence predicted by Ritz's theory and contradicting SRT.

At the same time, they noted that, although it is too early to talk about the confirmation of the ballistic principle $c' = c + v$, nevertheless binary stars clearly show that the speed v of a star affects the speed of light coming from it according to the law $c' = c + kv$, where k is a certain coefficient, albeit different from one. We saw above that such a correction k naturally follows from the ballistic theory, if we take into account that the velocities v of many spectroscopic binary stars are overestimated hundreds and thousands of times. In addition, as J. Fox showed (§ 1.13), from the deceleration and re-emission of light by clouds of gas around the stars, the light, initially flying out with a speed $c' = c + v$, as it moves, loses this speed more and more, and comes to us already at a speed $c' = c$, or at a speed very close to it $c' = c + kv$. Then $k \ll 1$ here will have the meaning of the coefficient of neutralization by the medium of deviations from the speed of light c (similar to the coefficient $1/b$ from § 2.4).

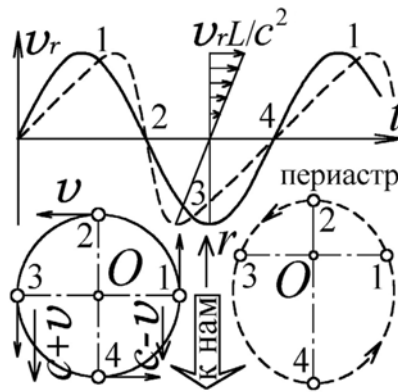


Fig. 69. The skew of the velocity curve changes the calculated shape of the orbit: distortions are shown by a dotted line.

By the way, the same Fox 50 years after Freundlich confirmed that a number of anomalies of binary stars, including the Barr effect, can be explained by the skewed radial velocity graphs - due to the influence of the motion of stars on the speed of light, according to the BTR [2]. Such a distortion will lead to the fact that even for stars with a circular orbit, it will appear to us (based on the spectral line-of-sight velocity curve) elongated in the direction towards us (Fig. 69). If we take into account the spectral shift from the Ritz effect, then the ellipse will turn out to be, in addition, turned clockwise. So, the periastron will more often be located somewhere in the first quadrant, which is what the Barr effect says [3, 14, 27]. If you do not take into account the BTR, then such a sharply inhomogeneous distribution of periastrons and orbits in directions will be completely incomprehensible. In addition, Fox, having analyzed the orbital elements of binary stars located at different distances, confirmed Freundlich's prediction that these distortions (irregularities in the arrangement of the orbits and excess star eccentricities), in agreement with the BTR, increase with distance L , since in proportion to L distortions $v_r L / c^2$, introduced by the motion of stars into the speed of light and radial velocity curves, grow.

At present, the Cosmos presents more and more evidence that the current abstract physics and cosmology are erroneous and more and more testifies in favor of their classical versions and, specifically, in favor of the BTR. So, in

addition to the enumerated mysterious and paradoxical effects, such as the Barr effect, one should mention the observations of exoplanets, that is, planets orbiting in other star systems. It turned out that the orbits of these planets have huge eccentricities ε (about 0.3 and higher), completely not typical for the Earth and the planets of the Solar system (where $0.01 < \varepsilon < 0.2$), as if the Earth and its surroundings were somehow distinguished. It is very possible that such large eccentricities are again only an appearance, an illusion caused by a distortion of the observed motion and spectrum of stars, leading to a skew of the velocity curve. If we abandon the BTR, then we will return to Aristotelian geocentrism - the separation of the Earth, the terrestrial observer. The fact that the ellipses of stellar orbits found from the spectra are more often rotated towards us was noted long ago by Russian scientists, and also did not find an explanation, since very few people knew about Ritz's theory [14].

The effect of skewing the velocity curve and an apparent increase in eccentricity was predicted a century ago as one of the consequences of Ritz's Ballistic Theory. Moreover, as shown, at the beginning of the 20th century, the astronomer E. Freundlich pointed out the real existence of such an effect in binary stars [3, 6]. In general, a very mysterious story is associated with Freundlich. Recall: the ballistic theory was forgotten under the pressure of De Sitter's arguments in 1913, which turned out to be incorrect. And it is not surprising, because De Sitter was an ardent supporter of the theory of relativity, who communicated a lot with Einstein [58, p. 147]. Many of his works are based on Einstein's theory and are devoted to its development, with an application to the phenomena of space. It was De Sitter who contributed to the emergence of the theory of the expanding Universe based on general relativity, and he also gave impetus to Eddington's incorrect experimental verification of the theory of relativity during the 1919 eclipse (§ 2.2). For this reason alone, it was necessary to very critically perceive the arguments of such biased supporters of the theory of relativity as Eddington and De Sitter, for whom it was extremely unfavorable for the recognition of Ritz's theory, which devalued their personal "discoveries".

It should also be borne in mind that by 1913 Ritz had been dead for four years, he could not respond to criticism and stand up for his theory, exposing the absurdity of De Sitter's arguments. The only ones who rebuffed De Sitter and exposed the viciousness of his argumentation were the astronomers P. Gutnik and E. Freundlich, who immediately, in July 1913, gave examples of double stars, just confirming the validity of the ballistic theory and the fallacy of the second postulate of SRT. A whole series of articles took place in the form of a discussion between Freundlich and De Sitter. However, this discussion was abruptly interrupted and never resumed. The case, as they say, was hushed up. Here's what happened. E. Freundlich was a close friend of Einstein [107], visited him and corresponded with him [58, p. 175]. And, so, in a letter sent in August 1913, shortly before Freundlich's personal visit in September of the same year, Einstein complained to him that if the effects of double stars discovered by Freundlich and the conclusions from them are true, then his whole relativity theory flies into hell [6]. It was from this moment that Freundlich left this topic, turning to the study of the effects of general relativity and even writing a book about it, to which

Einstein wrote a preface. The ballistic theory was safely forgotten, considering De Sitter's arguments sufficient, and disregarding Freundlich's inconvenient arguments. They simply did not want to notice such effects, they were hushed up in every possible way, ignored, and if they were mentioned when they could not be hidden, then they were out of any connection with ballistic theory. Now, these effects are becoming so obvious to everyone that they can no longer be hidden, and this means a quick victory of classical ideas and the BTR.

So, double stars not only do not refute, but, on the contrary, confirm the BTR. All evidence against the ballistic theory was obtained due to the false ideas about the phenomena of space, formed under the influence of the theory of relativity. And the observations of de Sitter and others do not contradict the BTR, since, firstly, the resolution of the telescopes is insufficient to visually detect the deviations predicted by the BTR for binary stars. Second, if the Ritz effect following from the BTR is valid, then the velocities found from the Doppler effect are greatly overestimated, and the distortions caused by them are noticeably less than expected. Thirdly, one must take into account that there is not an ideal vacuum in space, especially near close binary systems surrounded by stationary extended atmospheres, clouds of gas, which, re-emitting starlight, partially or completely extinguish the speed given to the light by the source (§ 1.13).

The history of the rejection of the ballistic principle and the Ritz effect by theoretical physicists is in many ways reminiscent of the long-term rejection of the Doppler effect (see epigraph). Only painstaking observations of astronomers and experimental physicists allowed this effect to be recognized in the end. This shows once again how important it is to know the history of science, so as not to step on the same "rake" again. Likewise, the situation with the "absent" distortion of the motions of the stars, allegedly speaking against the BTR, resembles a criticism of the Copernican heliocentric system. Astronomers also argued that if Copernicus's theory were true, distortions would arise in the motion of the stars: due to the orbital rotation of the Earth, each star would describe an ellipse in the sky, which was not observed. But such distortions really exist, just because of the great remoteness of stars and the absence of high-resolution devices, these deviations could not be observed then, as Copernicus showed. Subsequently, such displacements of stars, called parallax, were discovered, confirming the correctness of Copernicus. And, in the same way, the observations of the stars, which until now have been cited as contradicting the BTR, now more and more prove Ritz's correctness. This is exactly how Ritz's theory, explaining the Barr effect for double stars, according to the precepts of Copernicus, relieves scientists from the naive belief in the geocentrism of Aristotle-Einstein. It is interesting to note that Bradley, back in the 19th century, trying to detect parallax - distortions in the apparent motion of stars, confirming the correctness of Copernicus, discovered the phenomenon of stellar aberration, which proved the ballistic principle and the correctness of Ritz [152]. Another example of the similarity of the fate of Ritz, Copernicus and their theories!

§ 2.11. Binary stars, klystron and temporal focusing of light

The electrons that passed earlier have a lower speed, and the electrons that passed later catch up with them. At some distance from the gap, the electron density in the beam becomes sharply inhomogeneous, bunches and rarefaction are formed in it ... On the diagram, the sharpest current "peaks" are obtained where the fastest electrons just catch up with the slowest ones. A little further from the modulating grids, the peaks bifurcate, as fast electrons overtake slow ones and come out ahead.

Gaponov V.I., "Klystrons" [36]

Taking the ballistic principle into account when applied to binary stellar systems leads not only to a distortion of the apparent motion of stars and the calculated shape of their orbits, but also to brightness distortions that repeat with the orbital period of the stars. This consequence of Ritz's theory was pointed out soon after the creation of the BTR, by many scientists, in particular - La Rosa [5]. Indeed, since light from some positions of the star is ahead of its time, and from others it is delayed, we will not only see the motion of the stars accelerated in some parts of the orbit, and slowed down in others, but we will also find fluctuations in the brightness of the star corresponding to this change in the time scale. There is a kind of temporal focusing of light, when some light rays catch up, due to the additional speed of the source, others emitted earlier, which is why the apparent brightness of the source sometimes increases, despite the constancy of its true brightness. In fact, this is one of the manifestations of the Ritz effect.

Indeed, according to the ballistic principle, from the variable speed of a star, its light also acquires different speeds (Fig. 70). He comes to us either lagging behind the "schedule", then ahead of it. Here the star also seems to be brighter, then darker and the more noticeable, the longer the light has traveled. Roughly the same situation in public transport: trams, initially following each other strictly according to the schedule, at regular intervals, lose this frequency over time - some are lagging behind, while others are ahead of schedule. As a result, trams accumulate on some sections of the road, while on others they are almost nonexistent. As in the case of light, fluctuations in the frequency (of the carriages) increase in proportion to the distance traveled.

If the first tram left at a speed V_1 , and the second, after a time T , at a speed V_2 , then they will arrive at the stop located at a distance L : the first one - during the time L/V_1 , the second - after L/V_2 . The difference in travel times $L(V_1 - V_2)/V_1 V_2$ and the time interval T between the arrival of trams to the stop in comparison with the initial T . $T' = T + L(V_1 - V_2)/V_1 V_2$. The beams acquire different velocities V_1 and V_2 from the variable radial velocity of the star - its radial acceleration a . In the first instant, the star emits a ray with a velocity V_1 , and the next, after a time T , its velocity will decrease by aT , and the ray will slow down by the same amount: its velocity V_2 will be $V_1 - aT$. Hence, considering the speeds of the rays V_1 and V_2 approximately equal to the speed of light c , we find $T' = T(1 + La/c^2)$.

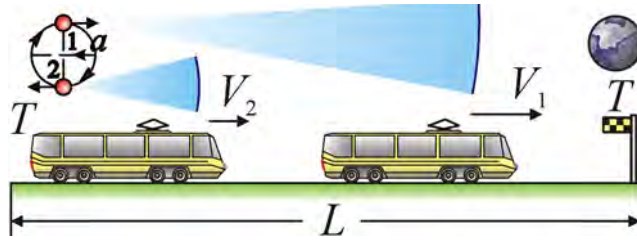


Fig. 70. Scheme of changing the frequency and period T of trams or light, depending on their movement.

Since the light emitted by the star during the time T will be perceived during the moment T' , in proportion to it, the brightness of the star, the "concentration" of light, should change proportionally, depending on the acceleration, similar to the density of trams on different sections of the track. The fluctuations in brightness follow the fluctuations in the radial acceleration of the star and are more pronounced the higher the acceleration is, and the further the star is. It turns out that only stars with great distance and acceleration can noticeably change their brightness. The spectra of the stars also change. After all, light is a periodic, wave process, and, like the distances between trams, the period and frequency of their repetition, the wavelengths of light, the period of light oscillations $T' = T(1 + La/c^2)$ and their frequency $f' = 1/T' \approx f(1 - La/c^2)$. This, we recall, is the Ritz effect.

Thus, in sync with the brightness fluctuations of the binary star, absorption lines will "walk" in its spectrum. And such variable stars, periodically changing brightness and spectrum, are indeed known to astronomers under the name "Cepheids". The displacements of spectral lines from the Ritz effect in distant binary stars, as calculations show, are much larger than the Doppler ones (§ 2.10). That is why in Cepheids the spectral displacement curve reflects not the fluctuations in velocity, but, like the light curve, - the fluctuations in the acceleration of the star. It is not for nothing that the light curves and "velocity" (spectral shift) curves of Cepheids are mirror-like. The frequency shift also changes the color (spectrum of radiation): the star becomes "blue", then "redder". And, since they find its temperature by color (everyone saw how a red-hot hair in a lamp, cooling down, turns from yellow to red), it will seem that in a phase with "speed" and brilliance, the "temperature" of the star changes (Fig. 71).

Note that it is precisely these fluctuations in the brightness of the star, caused by the Ritz effect, that for a long time hindered the acceptance of the ballistic theory. Recall that De Sitter rejected the Ritz theory, since the stars he studied did not have the skew of the spectral curves predicted by the BTR. The reason for this was that the effect of these systems was still very weak due to their relative proximity to the Earth. If the skew was large (in distant binary stars), then it was always accompanied by smooth fluctuations in brightness and the star was no longer considered a double (because of the distance, the second component was indistinguishable), but a single Cepheid (a pulsating star, § 2.12). And, therefore,

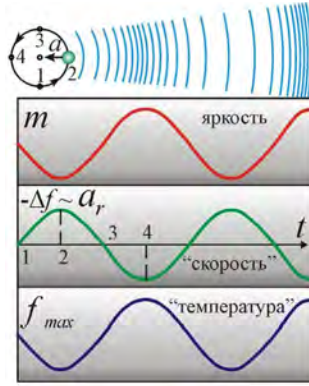


Fig. 71. The motion of a star in its orbit creates, due to the Ritz effect, the same periodic changes in brightness and spectrum that are found in variable stars.

the large skew in the radial velocity graph was no longer associated with the orbital motion of the star and the effects of ballistic theory. As soon as these effects became noticeable, because of the variable brightness, binary stars were assigned to a different type (to the class of Cepheids), excluding them from consideration.

So, a small modulation of light in speed, caused by the motion of a star in its orbit, leads to strong fluctuations in brightness, increasing with distance from the star. It is interesting that it is this effect, predicted by Ritz back in 1908, that underlies the operation of microwave devices for klystrons [36 Part II, 103]. This analogy of the Ritz effect and the klystron effect was first drawn to the author's attention by Professor N.S. Stepanov. The only difference is that in klystrons there is a spatio-temporal focusing not of light rays and beams, but of electronic ones. An initially uniform density electron beam, passing in a klystron through an electric field varying with a high frequency, breaks down, as it moves, into bunches, the more pronounced the longer the electron beam has traveled (Fig. 32). This, again, is caused by the fact that individual electrons that almost do not interact with each other, having received different additional velocities in the accelerating field, begin to catch up with each other and accumulate, group, - there is a spatial beam grouping, which is also called "phase focusing of the electron beam", in view of the analogy with the focusing of light.

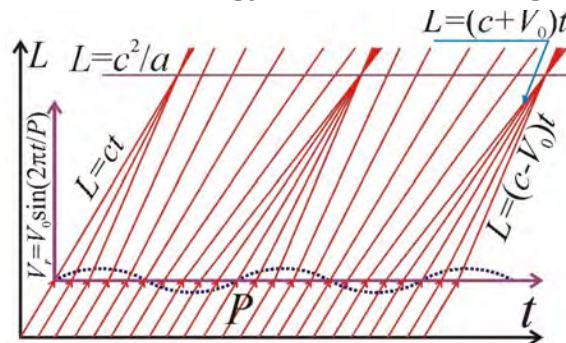


Fig. 72. Space-time diagram showing the effect of bunching of electrons, rheons and kinematic waves due to modulation with a period P of the velocity V_r of the particle flux [103].

In exactly the same way as a beam of light passing through a lens, the further, the more it converges, focuses, increasing its brightness, the same way electrons are focused on the space-time diagram after passing the klystron (Fig. 72). Even

more accurately, this analogy and the space-time diagram is illustrated by the reflection, refraction and focusing of light by the wavy surface of water. The further we place the screen from the agitated surface of the water, the sharper and brighter the reflections of the wave crests will be drawn, which are often invisible to the eye on the surface itself. In the case of spatial focusing, brightness increases due to the collection of rays emitted in different directions, near one point in space (focus). And in temporal focusing, brightness increases due to the collection of rays emitted at different moments, near the same point in time. In such a temporal focus, the rays will gather at a distance $L = c^2/a$ from the light source or electrons, as can be clearly seen in the space-time diagram (Fig. 72).

It was precisely such a space-time diagram, but for light, that V.I. Sekerin, who considered the influence of the speed of binary stars on the speed of light coming from them [111]. Thus, oscillations in binary star systems lead to periodic oscillations of their brightness, just as field oscillations in a klystron create periodic oscillations of the intensity and density of the electron beam. If this beam is directed to the luminescent screen of a television or oscilloscope, then using high-speed shooting, in the same way, one could observe rapid fluctuations in the brightness of the light spot created on the screen by an electron beam. If the screen was placed close to the klystron, we would not see fluctuations in brightness: the beam would be relatively uniform in density, but as it moves away from the klystron, the screen would first give barely noticeable fluctuations in the brightness of the spot, and then - more and more pronounced (Fig. 73). The electron beam, modulated, inhomogeneous in speed, as it moves, becomes more and more inhomogeneous in density, breaking into bunches.

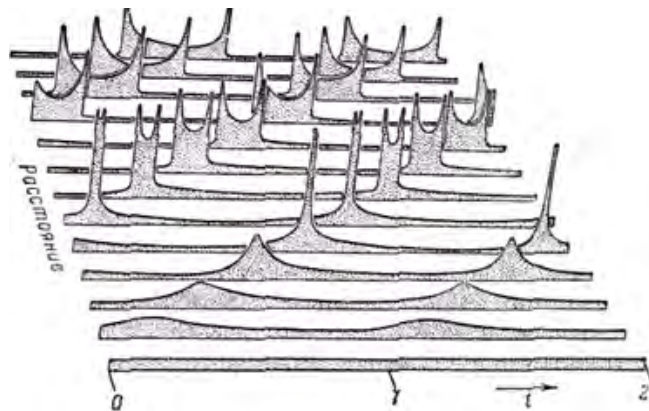


Fig. 73. Three-dimensional diagram showing the formation of more and more powerful bursts of the electron beam intensity with distance from the klystron [36].

Exactly the same fluctuations in light intensity should be observed in binary stars, as they move away from the binary system. Thus, the klystron microwave device operates in full accordance with the effect predicted by Ritz at the beginning of the 20th century for binary stars, which also modulate the speed of the light beam and the rheons carrying it, which do not interact with each other, like electrons in a klystron. It turns out, if the BTR were adopted, the klystron, which finds wide and very important application in microwave technology, could have been created much earlier, and not in the 1930s [36]. Although, it is possible that the idea of creating a klystron was prompted by the discussion by La Rosa in

1924 of the effects of double stars, in connection with the Ritz theory [5]. At the same time, the scientists, of course, did not want to mention this connection with the BTR, although even the formulations of the grouping principle sound similar (see epigraphs to § 2.11, § 2.14, § 2.18). The very name "klystron" comes from the Greek word "surf", since its principle of action illustrates the movement of small wave disturbances of the sea surface, as they approach the coast, creating ever higher and steep crests of the surf, which are even capable of overturning. Likewise, light waves coming from distant sources in the cosmic ocean - to the shores of the Earth, increase the size and steepness of their rolls, creating variability in the brightness of the stars. These waves of density of light and electrons differ significantly from ordinary waves in a medium, and therefore are called "kinematic waves", because they move together with the medium. This is the main difference between Ritz's theory and ethereal theories.

So, the Ritz effect is, in fact, the effect of temporal (phase) focusing of light. In essence, the Doppler effect is the same, leading to visible compression or stretching of time intervals, although, usually, and much weaker than in the Ritz effect. And this is natural: as already mentioned, there is a single Doppler-Ritz effect, which changes their apparent duration due to the movement of the source and the delay of light signals (§ 1.10). We note once again that, in contrast to the relativistic change in the time scale, the rate of the process flow, in the Doppler-Ritz effect we only encounter apparent changes in the duration. Through the Doppler-Ritz time lens, we observe time intervals compressed or stretched, in the same way as through ordinary lenses we see objects reduced or enlarged. But this is just an illusion, an appearance, because the size of objects, as well as the rhythm of the processes in them, does not really change. It is noteworthy that the key role in the astronomical confirmation of the reality of the Doppler-Ritz time-focusing effect was played by A.A. Belopolsky, who not only proved the reality of the Doppler effect in optics [51, 74], being the first to apply it for systematic measurement of the velocities of space objects, but also took the first step towards establishing the role of the Ritz effect in space: convergence-divergence of the crests of light waves due to their unequal speed [17]. As mentioned, the reality of a similar effect for binary stars was discovered back in 1924 by La Rosa, in the form of brightness variability of some stars [5]. Apparently, it was this Italian scientist who was the first to clearly link the variable brightness of such stars with the variable speed of light. Next, we will show that in most variable stars: Cepheids, novae, pulsars, fluctuations in brightness and spectrum, bright flares are caused by this very effect, which turns out to be one of the brightest and most significant manifestations of the Ritz effect.

§ 2.12. The nature of the Cepheids and other beacons of the universe

The law of addition of the speed of light with the speed of the source in this case manifests itself in a change in the brightness of the star S , since at certain moments of the period of the star at a certain distance from it, the light that is "faster" for the observer catches up with the "slower" one and is received by the observer at the same time ... called "variable pulsating stars", which are most likely binary stars, where only one of them shines.

V. I. Sekerin, *"The theory of relativity - the mystification of the century"*

[111]

Let's continue looking at binary stars. As already noted, the Ritz effect leads to a distortion of the calculated shape of the orbits of these stars, as well as to a strong shift of their spectral lines, which, being mistakenly attributed to the Doppler effect, gives overestimated values of the orbital velocity of stars according to the Doppler formula (Section 2.10). But there are also much brighter, more significant manifestations of the Ritz effect, which, as found above, leads not only to a change in the apparent frequency of the source radiation, but also to modulation of its brightness. Although the galactic distances L , at which the binary stars are located, are small (in comparison with the Universe ones, sufficient to create a redshift in § 2.4), the Ritz effect should manifest itself here as well. After all, accelerations in close stellar systems are much greater than galactic ones, which can more than compensate for the small distances. The Ritz effect $T' = T(1 + La_r/c^2)$ noticeably changes the brightness of the star if La_r/c^2 is comparable to unity, that is, if L/cP is of the order of c/v (if we express the amplitude of radial acceleration $a_r = 2\pi v/P$ in terms of the orbital the velocity v and the period of the star P). Since the typical orbital velocity v is tens of km/s, and $c/v \approx 10,000$, then for stars located at a distance of L/c hundreds of light years, brightness fluctuations will become noticeable with an orbital period P of several days. This is the case considered in his book [111] by V.I. Sekerin, who showed that such variable stars predicted by Ritz's theory are actually discovered. As seen above (§ 2.11), a distant star, going around its orbit in time P , should, according to the BTR, smoothly change its brightness with the same period P in proportion to $T/T' = 1/(1 + La_r/c^2)$.

So, for a circular orbit, the radial acceleration curve a_r has the shape of a sinusoid: $a_r = a \cdot \sin(2\pi t/P)$ (Fig. 68.a), and, therefore, the apparent brightness also changes periodically, in proportion to $T/T' = 1/[1 + La \sin(2\pi t/P)/c^2]$. The reason for the change in brightness due to the temporary focusing of light can be explained and clearly. From the skew of the radial-velocity curve (Fig. 67.a), a pair of points 1 and 2, corresponding to the beginning and end of the time interval T , are displaced, and to varying degrees, and the distance between 1' and 2', measured along the time axis t , will give a visible time interval T' different from T . The light emitted by the star during the period T is perceived for a different time T' , and, therefore, it will appear proportionally T/T' brighter or weaker, depending on the position of the star.

But it is precisely such a variable brightness, a periodic light curve, as Sekerin noted, is characteristic of variable stars of the Cepheid type. According to Sekerin, Cepheids are nothing more than double stars. This idea was first expressed by the above-mentioned Russian astrophysicist A.A. Belopolsky (Fig. 54): having taken the radial velocity curves for Cepheids, he noticed their similarity with those of

binary stars and proposed a hypothesis according to which the oscillations of their brightness and spectrum are caused by the rotation of Cepheids in binary systems [51]. But his point of view was abandoned, believing that the Cepheids are pulsating, periodically glowing stars. Taking into account the Ritz effect allows us to return to the Belopolsky hypothesis. If the Cepheids are double stars, then many of their oddities and features will receive a simple interpretation. So, synchronous with fluctuations of brightness, fluctuations of temperatures and radial velocities of Cepheids (Fig. 74) can be easily explained: both are the essence of the consequences of the Ritz effect, - displacements, respectively, of the emission and absorption spectra. And all these vibrations are apparent. Apparently, the distortions predicted by the BTR in the motion of binary stars were not detected only because when such distortions become noticeable due to the skewing of the velocity curves (Fig. 67a), the brightness of the star also begins to fluctuate noticeably, and it is no longer considered double. but a Cepheid. Comparison of typical curves of velocities of Cepheids (Fig. 74.b) with Fig. 67.a confirms the ballistic principle, according to which, in binary star systems with circular orbits, due to the apparent change in the time scale, the radial velocity curve is strongly skewed (Barr's effect) - it is inclined to the right [33, 158]. By the way, [Barr himself in his 1908 article](#) linked the skew of the velocity graphs of spectroscopic binaries with the brightness fluctuations of the Cepheids, which, according to Belopolsky's hypothesis, were also binary stars and it was their orbital and axial rotation that explained the brightness fluctuations.

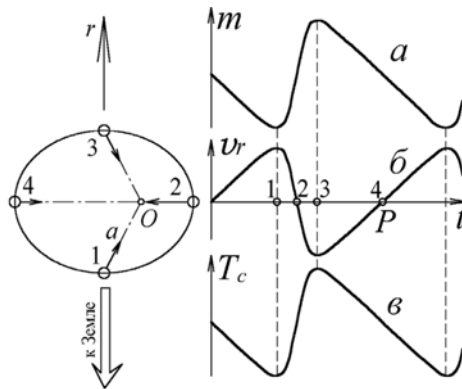


Fig. 74. Oscillations in brightness m , velocity v_r and temperature T_c observed in Cepheids are obtained in the BTR as a natural consequence of the Ritz effect for binary stars. They are just an illusion created by converting the frequency and timescale from the variable acceleration a_r .

If the fluctuations in brightness and spectrum are caused by a single reason - the Ritz effect from the accelerated motion of a star in orbit, then there must be a certain connection between the characteristics of the light curves, "radial velocities" and temperatures. Indeed, it is known that, together with an increase in the amplitude of brightness oscillations, the amplitude of temperature and line-of-sight velocity oscillations increases [65, 102, 140]. Consider a star located at a distance L , moving in a circular orbit with acceleration a and having an average brightness I . Then, according to the Ritz effect of temporal focusing of light (Section 2.11), the magnitude of the brightness at the maximum is $I(1+La/c^2)$, and at minimum $I(1-La/c^2)$. Thus, the brightness modulation depth is $\Delta I/I = 2La/c^2$. Frequency and wavelength undergo the same transformations. Therefore, in the

emission spectrum of the star, the spectral maximum $\lambda_{\max}$ shifts either to the red or to the blue side with a range of $\Delta f/f = \Delta\lambda/\lambda = 2La/c^2$. That is, the star will appear either blue or redder, changing color in sync with brightness. These variations in the emission spectrum are interpreted as a change in the stellar temperature, although in reality the spectral analysis, according to Wien's displacement law $T_c\lambda_{\max} = b = 0.003 \text{ m}\cdot\text{K}$, gives only an estimated color temperature of the body T_c , which often does not coincide with the real temperature [74, 136]. According to Wien's law: the redder the body's radiation, the further its color and the corresponding $\lambda_{\max}$ value are shifted to the long-wavelength region, the lower the body temperature T_c , which can be easily verified by observing the cooling of a metal bar heated over a flame. Accordingly, the periodic shifts of the spectral maximum of the Cepheid are regarded as fluctuations in its temperature $\Delta T_c/T_c = \Delta\lambda_{\max}/\lambda_{\max} = 2La/c^2$. That is, the depths of modulation of temperature T_c and brightness I should be, according to the BTR, the same, which is observed in Cepheids. But, once again, we note that these are only visible fluctuations of parameters caused by the Ritz effect, while the real brightness and temperature of the Cepheids (other than color) do not change.

But there may not be such an exact correspondence between the amplitude of the brightness fluctuations and the radial velocities. The absorption spectrum undergoes much less vibration than the emission spectrum. The reason for this, apparently, is that if the radiation spectrum is observed transformed along the entire route, then the absorption spectrum can be created by layers of gas located much closer to the Earth. Accordingly, the displacements caused by the Ritz effect will be much smaller. It is therefore not excluded that the oscillations of the absorption spectrum are mainly caused by the Doppler effect, and not by the Ritz effect. It is interesting to note that H. Doppler himself explained the difference in the colors of stars in binary systems by their motion and the effect he discovered, which displaces the color of a star, depending on its position in orbit and radial velocity, either in the red or in the blue direction. This interesting hypothesis was criticized by many and hindered the recognition of the Doppler effect [153]. But it turns out that the Czech physicist was somewhat right: it is precisely such color fluctuations caused by the motion of stars in binary systems that we observe in Cepheids. Only it is not the Doppler effect that causes them, but the Ritz effect, or the EDR, since the speeds of the stars are insufficient for a strong change in their spectrum, while the accelerations and the Ritz effect change color quite noticeably due to the large distance L .

Finally, a relation between the brightness amplitude and the degree of asymmetry of the light curve and the velocity curve was also reliably found. All Cepheids have a tendency to sharply increase the brightness and decrease it for a long time to the previous level. The degree of this asymmetry, as it turned out, grows with an increase in the amplitude of brightness fluctuations. This also finds an explanation in the framework of the BTR. Most binaries have circular orbits and therefore must have a sinusoidal radial velocity curve. However, the apparent change in the time scale from the Ritz effect leads to the fact that the radial velocity curves, and, therefore, the light curves become asymmetric, skewed (Barr effect, Fig. 67).

And the higher this skew, the higher the brightness variations accompanying it in the effect of the temporal concentration of light. This explains the observed dependence, first noted by the same Barr in his article in 1908. Therefore, classical Cepheids with sharply asymmetric spectral curves show strong brightness fluctuations. On the other hand, variable stars with an almost symmetric, sinusoidal light curve have weak brightness fluctuations, such as, for example, low-amplitude Cepheids of the ζ Gemini type [157, 158]. This effect can be easily observed on the three-dimensional diagram of the klystron, where it is clearly seen that as the amplitude of the oscillations of the electron flux density increases, the asymmetry of the waves from sinusoidal to conoidal with sharp peaks also increases (Fig. 72, Fig. 73).

Another reason for the asymmetry of the Cepheid light curve may be the effects of the interaction of light from a moving star with the medium. As shown by Fox, light passing through interstellar gas, in the course of re-emission by atoms, gradually loses the additional speed imparted by the star (§ 1.13). This retarding effect of the medium turns out to be different for light rays emitted with different frequencies and speeds at the moments of approaching and receding of the star. Therefore, the transformation of the radial-velocity curve becomes more complicated in comparison with Fig. 67, becoming nonlinear, which creates an additional asymmetry of the light curves and radial velocities of Cepheids, the more pronounced, the higher the amplitude of the radial velocity and brightness oscillations. That is why, the brightness of Cepheids rises quickly and falls off slowly: the crests of light waves (fluctuations in intensity) not only increase as they move, but also steep the leading front, like waves of the surf, which become sharply asymmetric as they move due to nonlinear effects with friction against the bottom (§ 2.11). Such deceleration of the Cepheid light by the medium must also be taken into account because it leads to a reduction in the effective distance L , at which the light is converted according to the Ritz effect. The temporal focusing of light does not occur along the entire path, but only at its initial section, at the effective distance L (which, according to J. Fox's estimates, is of the order of a light year [2]), after which the speed of light is reduced by the medium to almost the value c , and brightness fluctuations practically stop growing. This effect is especially important for determining the distances to Cepheids by the Ritz effect (§ 2.13).

So, the principle of operation of blinking stars - these "beacons of the Universe", as they are sometimes called, consists in a purely mechanical addition of the speed of light with the speed of the star that emitted it. Let's take a closer look at these blinking, pulsing beacon stars. In addition to Cepheids, they also include stars of the RR Lyrae, RV Taurus, and Mira Cetus types [158]. All these stars were called pulsating because it is customary to associate periodic recessions-increases in their brightness and temperature with the pulsation (expansion-contraction) of these stars. But the theory of pulsations (TP), developed by the already mentioned astrophysicist A. Eddington and unreasonably displaced the theory of Belopolsky's Cepheids [51], has a lot of inconsistencies. For example, if a star pulsed, then it would have the greatest temperature and brightness at the moment of ultimate compression. In reality, the

star is brightest at the moment of expansion with maximum speed, judging by the Doppler effect (Fig. 75).

However, theorists, led by the famous schemer Eddington, quickly fitted the facts to the theory with a formal trick: they considered that the outer and inner layers of the star pulsate differently. Another inconsistency did not stop them either. It turned out that pulsations of stars, like any free oscillations, should decay rather quickly, which no one really observed. I had to invent a very complex and contrived mechanism for maintaining the self-oscillations of the star. In the course of such formal adjustments, the modern theory of stellar pulsations arose, with all its complexity and artificiality capable of explaining only very few features of Cepheids.

A completely different picture is formed in the BTR, where from the hypothesis of A. Belopolsky, who considered the Cepheids to be double stars, all their properties immediately follow. Recall that Ritz predicted the effect of the radial acceleration a_r of a source on its frequency f and brightness, which vary in proportion to the factor $f'/f = T/T' = 1/(1 + La/c^2)$, where L is the distance to the source, and c is the speed of light. As shown above, in Cepheids with a period of tens of days, this frequency change effect is much greater than the Doppler effect. Therefore, the motion of binary stars in an orbit with variable radial acceleration should cause strong fluctuations (with a period equal to the orbital) of their apparent brightness and synchronous displacements of spectral lines, giving the "speed" of the star by the Doppler effect (Fig. 76). It is no coincidence that the "light" and "radial velocity" curves (actually accelerations) are mirror copies of each other (Fig. 75). By the way, the TP cannot explain their similarity, because in the case of pulsations, the light curve should follow the shape of the oscillations of the star's radius, and not its velocity.

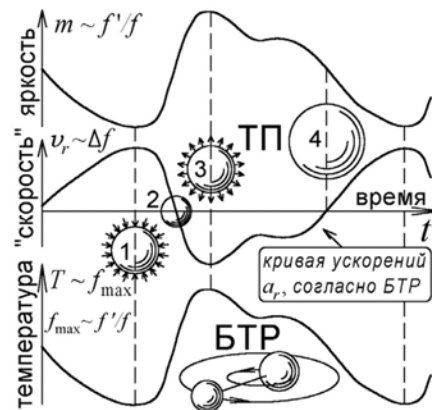


Fig. 75. Synchronous fluctuations of brightness, radial velocity and temperature of Cepheids, similar in shape and not explained by the theory of pulsations, directly follow from the BTR.

As you have seen, from a strong frequency shift in the spectrum of Cepheids, it will seem that their temperature T_c is changing, estimated by the color of the star (its spectral maximum $f_{\max}$). And, at the moment of the limiting value of brightness and acceleration, when the spectrum is maximally shifted to the blue side, it will seem that the star is hot in everything. That is why the fluctuations in "brightness", "radial velocity" and "temperature" are identical and synchronous

[33]. If the vibrations have small discrepancies in shape and phase, then they are caused by different degrees of interaction (absorption and re-emission) of rays of

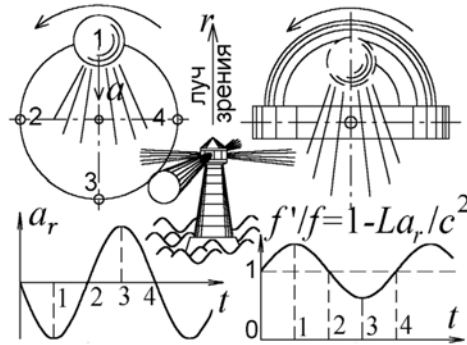


Fig. 76. A star revolving in orbit, like a searchlight near a lighthouse, creates by acceleration a_r oscillations of brightness and frequency f proportional to f'/f .

different colors, having different speeds, with an intermediate medium (clouds of gas), and also by the fact that the light and temperature curves give a general change the brightness and spectrum of a binary star, rather than a single component - like the radial velocity curve. According to the BTR, all these vibrations do not damp for the simple reason that the orbital rotation that generates them is an example of the most stable, almost perpetual motion. So, the Cepheid beacons will flicker forever until the star "burns out". There are, however, Cepheids, which, for some unknown reason, stop changing their brightness, and then, quite often, start again (Science and Life 1967, no. 7). Such is, for example, the North Star. This ancient lighthouse and landmark of sailors turned out to be a Cepheid too. At the beginning of the XX century. its brightness changed by 15% every four days, and by the end of the 20th century, the star almost stopped blinking: fluctuations in brightness $\Delta I/I$ dropped to 2% ("Priroda" 2005, No. 7). Now Polyarnaya is recovering: $\Delta I/I$ has already become 4%, and in the foreseeable future it will again reach 12%. The explanation for such inconsistency of the Cepheids presents a serious problem for the TP, but not for the BTR.

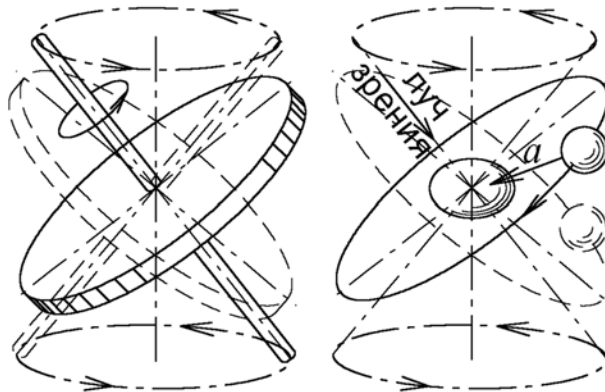


Fig. 77. Changing the inclination to the line of sight of the plane of the top and the stellar orbit.

The point is that in close binary stellar systems, which obviously include Cepheids, orbits, due to huge gravitational and tidal forces, often undergo rapid changes, which is reflected in the radial acceleration curve and, consequently, in brightness fluctuations. In particular, the plane of the stellar orbit can change the

inclination to the line of sight, just as the disk of a precessing top tilts in different directions (Fig. 77). In the same way, for example, the plane of the Moon's orbit tilts back and forth during the precession [28]. So, the plane of the stellar orbit at one moment can appear visible in the plan (perpendicular to the line of sight), and at another - from the edge. In the first case, the radial accelerations will vanish, and therefore the brightness fluctuations will also disappear. When the orbit turns slightly, the brightness fluctuations will return.

Since stars, like the Moon, have a cyclical precessional rotation of their orbits (after making a full revolution, the orbit will take the same position), then the degree of brightness fluctuations of the Cepheids should change periodically. Such variations are especially characteristic of RR Lyrae stars and dwarf Cepheids, variables with periods of several hours. And it is not surprising, because such a short orbital period indicates the proximity of the components of the binary and the perceptibility of the gravitational perturbation of the orbits. It is not for nothing that other anomalies unexplained by the theory of pulsations have been discovered in such stars: the shape of the light curve (the Blazhko effect) changes periodically and very slowly - the period of its oscillations [158]. These variations are easily explained in the BTR. In close binary systems, the orbits of stars rotate, like the perihelion of the orbit of Mercury (§ 2.3), only much faster. For the first time such a phenomenon of gradual displacement of the periastron of binary stars was discovered by the same Belopolsky [17]. As the orbit rotates, the shape of the acceleration curve (Fig. 68) and, accordingly, the shape of the light curve (Fig. 78) changes, depending on the angle of rotation. When the orbit makes a full revolution, the light curve will return to its original shape. That is, in full accordance with the Blazhko effect, the curve variations should be periodically repeated.

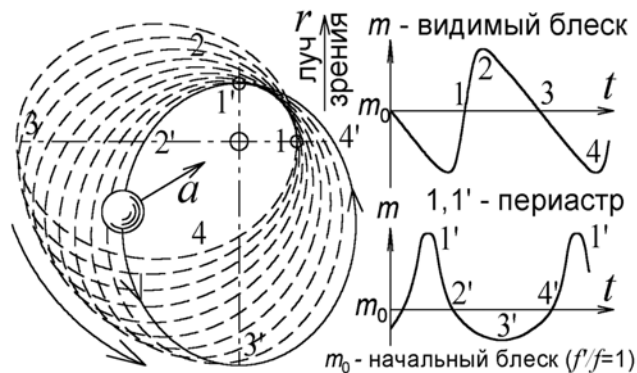


Fig. 78. The rotation of the stellar orbit changes the shape of the curve of acceleration a_r and brightness m .

Now about the reasons for the smooth change in the Cepheid period. Here again, the matter is in tidal gravitational forces, under the influence of which the orbits of stars in close binary systems gradually expand (this effect was actually revealed by astronomers in short-period binary stars and in the Moon, which, gradually moving away from us, increases the length of the month [28]). Accordingly, the orbital period and the equal period of brightness fluctuations increase. For the same Polar period, the period increases by 8 seconds annually.

As you can see, Polyarnaya is a very interesting and even key object ("Priroda" 2005, No. 7), not only as a star from the North Pole of the world and the closest Cepheid to us, but also as one of the main confirmations of Belopolsky's hypothesis about Cepheid duality. No wonder that Polyarnaya was Belopolsky's "favorite" - the subject of his close attention [17, 51]. It was Belopolsky who was the first to discover that Polar is part of a binary system, where the second component is a main sequence dwarf with an orbital period of 30 years. However, the brightness fluctuations with a period of 4 days at Polaris are probably caused by a closer and invisible companion (star or planet). It is not excluded, however, that it is the orbital motion of Polar in the dwarf system with increasing a_r that causes secular variations: a gradual increase in the apparent period of its scintillations $T' = T(1 + La_r/c^2)$, with a slow decrease in the average brightness proportional to T'/T , according to the Ritz effect. Likewise, the Ritz effect can smoothly increase or decrease the blinking period in other Cepheids and variable stars included in multiple systems.

Sometimes, instead of smooth, there are abrupt changes in the Cepheid periods, which are impossible in TP [158]. But if the Cepheids are binary, such period shifts may well be caused by the collision of a star with a small cosmic body. Impact abruptly changes the speed of the star, its orbit and orbital period, but due to the small mass of the crashed body, this change in period is usually small in comparison with the period itself. Thus, all the strange perturbations of blinking stars are the result of changes in the size, shape, tilt and rotation of their orbits.

Speaking of the period, the BTR also explains the famous dependence of the luminosity period: the higher the period of the brightness fluctuations of a star, the higher its absolute brightness. The connection "period-luminosity" made the Cepheids beacons of space: having determined the actual brightness of the Cepheid by the period and comparing it with the visible one, they find the distance of the star. But why is the period higher in bright Cepheids? The reason is that Cepheids are very close systems where the sizes of stars and their orbits are comparable. Therefore, larger and brighter Cepheids and orbits have large, and, therefore, periods. But for stars of the types of Mira Cetus and RV Taurus, which have periods of about a year and wide orbits, the mass of the star is of primary importance. Therefore, the brighter, more massive the star, the faster the satellites revolve around it, and the shorter the blinking period. It is not without reason that the "period-luminosity" dependence of stars of the indicated types is the opposite in comparison with Cepheids: the higher the period, the lower the brightness [158], which in the theory of pulsations they do not like to mention, because they cannot explain.

Even the shape of the light curves cannot be explained using TP. For Cepheids and RR Lyrae stars, these curves often have a distinct hump (Fig. 75) - a secondary maximum [157]. It can only be interpreted by considering the Cepheids to be binary. Usually, in binary stars forming Cepheids, only the main, brighter star is noticeable, while the brilliance of a satellite star, or even a planet, is completely imperceptible against its background, as suggested by Belopolsky [51]. But, in cases where the brightness of the main star and the companion are comparable, their light curves, adding up, will give two maxima and minima (Fig.

79). The existence of two oscillations, superimposed and phase-shifted, explain the secondary maximum in the theory of pulsations, but cannot explain where the phase-shifted oscillation comes from [102, p. 89]. And the BTR explains not only this phase shift (the radial accelerations of a pair of stars oscillate in antiphase), but also its change: the displacement of the hump depending on the Cepheid period [157, 158]. It's just that the positions of the maxima on the light curves of the main star and the companion star depend on their orbital velocity, and, therefore, on the period of their revolution. A single star can create the same secondary maximum effect. After all, the acceleration curve, as shown by computer modeling, has a smooth shape only for stars with orbits of small eccentricity ε . At $\varepsilon = 0.3$ and more, a hump appears on the acceleration curve (Fig. 75), which also goes over to the light curve. Moreover, the simulation program allows one to observe a gradual shift of the secondary maximum along the light curve - with an increase in the Cepheid period, in full agreement with observations. But, despite the success of the BTR in unraveling the shapes of the light curves of Cepheids, the Blazhko effect and other regularities and anomalies, some authors [82] are still trying to convince us that the nature of the brightness fluctuations of Cepheids does not coincide with the predictions of the ballistic theory. In fact, such inconsistencies have always characterized Eddington's pulsation theory of Cepheids.

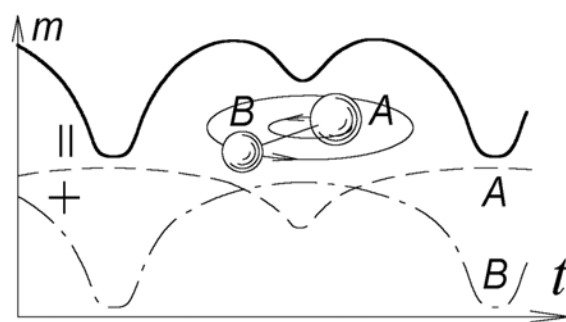


Fig. 79. The brightness of stars A and B changes in antiphase, which in total gives a complex light curve m , as for β Lyra and W Ursa Major.

Another oddity of brightness fluctuations is that sometimes they occur simultaneously with two periods: one fluctuation is superimposed on another, as, say, in AC Andromeda [158]. The BTR easily bypasses this stumbling block of the pulsation theory. Indeed, if the main star has not one, but two satellites with different orbital periods P_1 and P_2 , then the displacements of the main star near the center of mass caused by their attraction also occur with two periods, which is why the double oscillation period will acquire the acceleration and light curves (Fig. 80.1). And such satellites in variable stars have actually been identified, say, in σ Scorpio, and their orbital periods really turned out to be related to the period of brightness fluctuations [27, p. 67]. Two periods give multiple systems, where one component of the binary is itself a pair (Fig. 80.2). Such three-, fourfold systems in space are not uncommon. In this case, fast periodic fluctuations in brightness are superimposed on long-period variations in the average brightness of the star, actually discovered in DF Cygnus and other stars of the RV Tauri type [158]. The presence of two satellites, especially if their orbital periods are close

or multiple, can also explain periodic changes in the shape of the light curve (the Blazhko effect), as well as the mysterious intensification and cessation of brightness oscillations of Cepheids, due to the addition of the acceleration and brightness curves of two satellites (similar to the beat effect from the addition of two vibrations). Finally, if the main star has more than two satellites, say four or five, then their attraction will create a curve of acceleration and light so complex that fluctuations in brightness seem random, irregular. Such incorrect variables, which speak against TP, were actually revealed in observations [158].

In general, it turns out that astronomers have long ago discovered binary stars in which smooth fluctuations in brightness are caused by orbital motion. B Lyrae and W Ursa Major are examples of such stars [76, 158]. B Lyra found smooth fluctuations in brightness, similar to the Cepheid, and a satellite orbiting with the same period of 13 days. And for W Ursa Major, the companion star revolves with a period of 0.33 days (both periods are typical for Cepheids and RR Lyrae stars). Their continuous smooth fluctuations in brightness cannot be explained by episodic eclipses of the star by a satellite. Therefore, astronomers have adopted the following contrived explanation: the stars in the system have an elongated shape, due to which their apparent brightness changes during rotation. In addition, the system was surrounded by a ring of gas, many more assumptions were made, and, still, the model did not fit well with the observations.

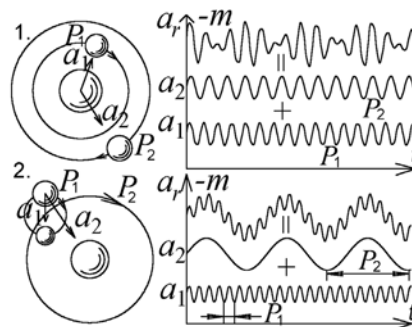


Fig. 80. In multiple systems, the addition of the acceleration curves generates complex modes of oscillations of the acceleration a_r and the brightness m according to the Ritz effect.

On the other hand, from the standpoint of the BTR, the system looks simple to the limit: it is an ordinary double star, where one component is only slightly weaker than the other. It is not for nothing that their total light curve has a two-humped profile (Fig. 79). Other oddities of β Lyrae are resolved just as naturally. On the whole, the star is similar in characteristics to Cepheids and RV Tauri variables [158]. But astronomers do not want to recognize their commonality, otherwise it will become clear that in the Cepheids the brightness fluctuations are caused by the rotation of the stars. Variable X-ray sources were also discovered long ago, smoothly changing the optical brightness with a period equal to the orbital period of satellites found nearby [76]. Like Cepheids, these sources have wavy light and radial velocity curves that are mirror images of each other. And again, scientists do not notice the similarities, attributing the brightness fluctuations to the highly elongated shape of the star, alternately shining bright and dark areas for us. But why the difficulty, if the brightness fluctuations of

binary systems follow by themselves from the BTR? It is no coincidence that in such stars (they include HZ Hercules and Centaurus X-3 [76, 158]), like Cepheids, the “color temperature” changes along with the “brightness” and “radial velocity”, in full accordance with the Ritz effect.

Speaking about variable stars of non-optical ranges (X-ray, as well as gamma and radio ranges, which include pulsars, § 2.19), it should be noted that their variability is also associated with orbital motion, which changes the brightness of stars according to the Ritz effect. The same effect translates the optical radiation of the star into other ranges. Therefore, one and the same optical source can be perceived immediately as a source of intense radio, X-ray and gamma radiation, varying with the period P of the star's revolution. However, even these really open sources [76], which serve as the clearest confirmation of the BTR, sometimes seek to attract for its refutation. Thus, [K. Brecher](#) considered that X-ray bursters in binary stellar systems [6] contradict the Ritz theory, since he accepted the ridiculous official theory of periodic generation of X-rays by these objects, and did not take into account the Ritz effect, which transforms their brightness, spectrum and radial velocity curve (Section 2.10). If this effect is taken into account, then bursters, like Cepheids and other variable stars, provide reliable confirmation of the ballistic theory.

Although Belopolsky's hypothesis about the duality of Cepheids easily explains all their features and properties, astronomers do not recognize his theory (despite the fact that, due to the huge similarity of Cepheids with binary stars, they themselves have repeatedly confused them [27, 51]). The Cepheids are too distant, their satellites are too small to be noticed. Surely one day they will be discovered. But even now there is evidence of their presence. Thus, many Cepheids at the maximum brightness (and the greatest divergence of the spectral lines of a pair of stars according to the Belopolsky hypothesis) indeed reveal the effect of line doubling [27, p. 66; 102, p. 134; 157, p. 86]. And, after all, it is precisely such a periodic bifurcation of lines that has long served as direct evidence of the duality of stars. Already Belopolsky himself observed in the spectra of a number of Cepheids (η Orla, $\alpha 2$ Hounds Dogs, ζ Gemini, etc.) two groups of lines (see the work "[On the change in the intensity of lines in the spectra of some Cepheids](#)" [17]). The intensity of some lines increased with the brightness of the star, while others changed in the opposite direction. It seems that this second group of lines is provided by the Cepheid satellite, which changes the acceleration, brightness and spectral shift in antiphase with the main star, but has a lower brightness and amplitude of brightness fluctuations, and therefore does not make a large contribution to the general brightness fluctuations of the Cepheid. If the stars had close spectra, and their lines could not be resolved separately, then the line brightness fluctuations occurred with a double frequency: in one period of the Cepheid brightness fluctuations, the brightness of some lines had time to change twice.

All this can be explained by the fact that the general fluctuations in brightness are created mainly by the main star, and fluctuations in the brightness of individual lines are created by both stars. Moreover, the brightness of their lines changes in antiphase and, when added, creates two maxima and two minima at

each period, similar to fluctuations in the overall brightness in the β Lyrae system and W Ursa Major (Fig. 79). It is no coincidence that Belopolsky discovered that in β Lyra, individual spectral lines created by different stars change brightness in antiphase, in full agreement with the BTR [17]. It is noteworthy that a similar effect of fluctuations in the brightness of emission lines in antiphase was noted for a long time in ordinary spectroscopic binaries, which could not be explained. And only V.I. Sekerin in 1991 interpreted this mysterious phenomenon in his book [111] as a result of fluctuations in the brightness of stars in antiphase, due to the ballistic principle and time concentration of light. With equal luminosity of the stars, this leads to compensation for the decrease in the brightness of one star with a simultaneous increase in the brightness of another, and the overall brightness of the system changes weakly. However, variations in the brightness of spectral lines of different components are clearly visible.

As you can see, the existence of the Cepheid phenomenon - flashing beacon stars - is a direct consequence of the ballistic principle applied to binary stars. Thus, even without observing the Cepheids, all their properties could have long been predicted on the basis of the BTR. The Cepheids, together with the redshift, are one of the most important cosmic proofs of Ritz's correctness. At the same time, they showed that Cepheids are not physically variable stars. The fluctuations in their brightness and color (spectrum) are just an appearance created by the Ritz effect, as well as the twinkling of ordinary stars in the sky, fluctuations in their brightness and color are an illusion caused by turbulence, the excitement of the atmosphere. Atmospheric air lens, like a wave surface of the sea, scatters, then focuses the light of a star, periodically making it brighter. Likewise, the orbital motion of the star, like a temporary lens, either intensifies the light of the Cepheid, then extinguishes it. And, if the astronauts who have gone beyond the limits of the atmosphere see the stars burning with an even light, then the astronauts who will one day find themselves near the Cepheids will see that they do not change their size and brightness.

It should be noted that the effect of a change in brightness in an orbiting star, which arises as a consequence of the ballistic principle, was hypothetically predicted back in 1924 by La Rosa [5] and associated with variable stars. However, the hypothesis of brightness variability due to the orbital motion of Cepheids was put forward even earlier by their discoverer J. Goodrik and A. Belopolsky [51]. But then this mechanism was forgotten and rediscovered by Moon and Spencer in 1953 [7]. And so, after a long oblivion, the effect was rediscovered many times in the late 80s in Russia by V.I. Sekerin, V.N. Demin and V.P. Seleznev [44, 111], and in the USA - R.S. Fritzius. Finally, in 2002 the author himself independently came to the idea of the Ritz effect in binary stars, suggesting that it manifests itself in the form of Cepheids, pulsars, novae and other variable stars. At the same time, a rigorous substantiation of the effect was found for the first time, both from the standpoint of the BTR and on the basis of the interpretation of many unexplained Cepheid and binary effects, including the Blazhko and Barr effects [116, 117, 119]. This multiple and independent interpretation of variable stars by different authors from a unified position of the BTR serves as the best confirmation of its validity. This proves that the found law

is not an empty invention, but the discovery of a really existing regularity, accessible to everyone. Only true ideas can independently occur to different people, in different eras.

As we can see, nevertheless, it was not in vain that Belopolsky so stubbornly defended his hypothesis about the duality of Cepheids as the main reason for the change in their brightness and spectrum, up to 1927, although by that time many already adhered to Eddington's theory of the pulsating nature of the variability of Cepheids, alien to Belopolsky [51]. Following the example of Copernicus's theory, which showed that many of the movements of the luminaries observed in the sky are only an appearance, Ritz's theory made it possible to prove that the brightness fluctuations of the Cepheids, their imaginary pulsations, are just an illusion, a mirage that occurs in a distant terrestrial observer.

§ 2.13. *Giant stars and measuring distances in space*

Simultaneous observation of the magnitudes of changes in brightness, intensity and displacement of spectral lines in variable "pulsating" and spectrally binary stars allows us to determine, in addition to the parameters of their orbital movements, also the distance to these objects from the Earth.

V.I. Seckerin, *"The theory of relativity - the mystification of the century"*

[111]

Almost all Cepheids are classified as giant stars and supergiants. Typical representatives of such stars are Mira Ceti and Antares, which are believed to be hundreds of times larger than the Sun. These stars, according to modern concepts, are so large that the entire orbit of the Earth and Mars can fit inside them. It was with the enormous size of the Cepheids that, in particular, the main objection to Belopolsky's theory of the duality of Cepheids, as the cause of fluctuations in their brightness, was connected. It was noticed that if the Cepheids were binary stars, then the entire orbit of one star would fit inside another star, which, of course, could not be: the stars must be separated by a certain gap [140, p. 7]. This, in many respects, was associated with the rejection of Belopolsky's theory, and the adoption of Eddington's theory, according to which the Cepheids were depicted as pulsating gas balls. However, we have seen that the theory of stellar pulsations does not explain a number of features of the Cepheids. Therefore, most likely, the size of the Cepheids and the radii of the orbits of binary stars were incorrectly determined.

Indeed, the size of the orbit of a binary star is determined from spectral data, which gives the orbital velocity, multiplying which by the period of revolution (the period of blinking of the Cepheid), we find the length and radius of the orbit. But, after all, the shift of lines in the spectrum of the Cepheid is often caused, as it was found out, not by the Doppler effect, but by the Ritz effect. Therefore, the true velocities may differ markedly from those found by the Doppler effect. This means that the radii of the orbits are also different. Generally speaking, the radius of the orbit of the Cepheid, which is part of the binary system, may well be less than the radius of the star itself, if the mass of the companion - a star or a planet - is noticeably less than the mass of the central star, which we observe. In approximately the same way, the Earth and the Moon move around a common center of mass located at a distance of 2/3 of the Earth's radius from its center -

that is, the Earth's orbit is entirely placed inside the Earth's equator. So, the small orbit of the Cepheid does not reject the hypothesis of the presence of a satellite. Indeed, by the shift of the spectral lines of the Cepheid, we find the radius of the orbital radius of the central star, and not its companion, orbiting outside the stellar atmosphere.

This is one mistake, but there is another. We cannot determine the size of a star unless we know how far away it is. The size of a star is found by its apparent brightness and known distance. Since the brightness per unit surface of a star is known (from its temperature), it is easy to calculate the area of the star's disk required to create its apparent brightness at a given distance. However, the distances to the Cepheids cannot be determined by measuring the parallaxes. Therefore, there is a noticeable uncertainty: the Cepheids themselves are used to determine the relative distances in space, but they do not know the absolute value of the distances to them. And it is very possible that the Cepheids are much closer from us than it is believed. Then their gigantic size is a fiction, and the real size of the Cepheids is much smaller. Indeed, the closer a star is, the smaller its diameter must be in order to provide the same apparent brightness. It is possible that the enormous size of other supergiant stars is a fiction, since they are much closer. In this case, the giant stars will turn out to be ordinary stars.

Due to incorrectly determined distances to Cepheids, giants and supergiants, their absolute luminosity was mistakenly found, which is greatly overestimated. That is why giant stars did not fit into the main sequence of the Hertzsprung-Russell diagram (spectrum-luminosity). If these stars are at distances several times smaller and have a lower luminosity, then they will fall exactly in the main sequence, being normal stars. And nothing contradicts such a reduction in distances, since the distances to the Cepheids and giant stars are not known for certain from direct measurements of their parallaxes. Take, for example, the supergiant Betelgeuse (α Orion), whose angular size Δ was measured back in 1920 using a Michelson interferometer, from which, based on the giant distance L adopted for Betelgeuse, the diameter D of a star was found, which is noticeably larger than the size of the Earth's orbit [19]. And until now, astronomers, counting $L \approx 500$ light years, get the unthinkable size of Betelgeuse $D = L\Delta \approx 10^{12}$ m, comparable to the orbit of Jupiter. But, since the very estimate of the distance L is not substantiated and is questioned even by astronomers, nothing prevents from considering L ten times smaller. Then, with the same angular size of the star Δ , its diameter $D = L\Delta$ will be proportionally smaller: Betelgeuse will turn out to be an ordinary main sequence star with normal size and luminosity. Radiometric estimates of the sizes of all giant and supergiant stars will also decrease, since a proportional decrease in the size and distance to the star keeps its angular size and apparent brightness unchanged, but greatly reduces the calculated absolute luminosity. By the way, a false estimate of the sizes and distances of giant stars was proposed by the same schemer Eddington, who wanted to reconcile these stars with his ridiculous theory of stellar pulsations and stellar evolution.

In general, the scale of distances in space is a very controversial topic [155]. And there is still no confidence in it. We mentioned the method proposed by Maslikov for measuring distances in space based on the effect of space dispersion

and BTR (§ 2.8). Another method, based on the BTR, was proposed by V.I. Sekerin. This method is as follows. From the fluctuations in the speed of Cepheids found from spectral data, one can easily calculate the amplitude of fluctuations in brightness caused by the Ritz effect and therefore proportional to the distance of the star. By comparing the amplitude of these oscillations with the measured one, the distance of the source is determined. The estimates made by Sekerin gave the distances to the Cepheids noticeably smaller than those found by other methods. The only drawback of this method is that we do not know for sure whether the shift of the spectral lines of the Cepheids (according to which they search for velocities) is more caused by the Doppler or Ritz effect.

Great hopes for determining the distances to stars and their sizes are pinned on interference measurement methods. So, from the velocity curve of Cepheids, you can accurately measure how much, according to the theory of pulsating stars, their radius changes. On the other hand, the change in radius can be observed using interferometers that have a high angular resolution and give a change in the radius in angular measure. Therefore, you can find the distance to the Cepheids by dividing the radius change found from the Doppler effect by its angular change. However, as found above, the fluctuations in the spectra of Cepheids are caused not by the pulsation of stars, but by their orbital motion. It also generates illusory fluctuations in the size of stars, and the shape of the stars observed with the help of interferometers differs from the circle and changes periodically: the stars are clearly experiencing non-radial pulsations, the reasons for which will be discussed below (§ 2.16). This effect and the mutual motion of binary stars lead to a periodic visible change in the angular sizes of Cepheid systems, although their actual sizes do not change. Therefore, it is clear that the theory of pulsations cannot give an adequate estimate of the distance to the star.

And, nevertheless, interference measurements of the shapes and sizes of Cepheids will undoubtedly make it possible to finally check the validity of the BTR and Belopolsky's hypothesis about Cepheids as binary stars. Astrometric interferometers will provide an opportunity to accurately measure the distance to the Cepheids, since changes in the shape of the star's disk can be calculated just based on the data on the brightness of the star and its spectrum. High-resolution interferometer telescopes are likely to reveal Cepheid satellites one day. Therefore, further development of interferometric observation methods would be highly desirable, because they can provide decisive evidence in the dispute between the BTR and the SRT. Recall that it was Michelson's interferometric experiment that gave the first argument in favor of Ritz's theory (§ 1.9), and interferometric stellar studies begun by the same Michelson can provide the final confirmation of the BTR. In addition, if the error of SRT with the theory of pulsations of the Cepheids is confirmed, and these "milestones of the Universe" turn out to be not so giants, then all stars and galaxies will become much closer and more accessible, both by removing the light barrier and by reducing the scale of distances.

§ 2.14. Space Mirages - Temporary Lenses or Gravitational Lenses?

Consider an oscillating charge that has zero velocity at the moment $t = 0$ and a positive velocity v after. The wave emitted at the moment $t = 0$ propagates along the axis with the speed c . For a wave launched at time t_0 , the propagation speed will increase and become $c + v'$. So this wave will overtake the previous one at some distance x_0 , then overtake it. At the point x_0 , these two waves emitted by the charge at times $t = 0$ and $t = t_0$ will arrive simultaneously.

Walter Ritz, "A Critique of General Electrodynamics" [8]

Distortion of the calculated velocity curve, distortion of motion, fluctuations in the spectrum and brightness - these are far from all manifestations of the ballistic principle in binary stellar systems. Consider another surprising effect. According to the BTR, the farther from us the system, the stronger the skew of the stellar velocity curve (§ 2.10). At some distance, the skew will lead to the fact that certain parts of the graph are set vertically (Fig. 81.a). That is, close positions of a star, separated in reality by a certain period of time, can be observed simultaneously. Ritz himself spoke about this (see epigraph § 2.14 and § 2.18). On the one hand, this would lead to a strong increase in the brightness of the object, according to the Ritz effect, as in the case of Cepheids and supernovae. But, in addition, if the source in its motion noticeably displaces across the sky, then it will be simultaneously visible at several points of its trajectory, as if drawing it himself. This phenomenon is analogous to the steepening of the wavefront in nonlinear media, leading to the appearance of shock waves, say in klystrons (§ 2.11), and is of great importance for understanding "explosive" variable stars - novae and supernovae (§ 2.18).

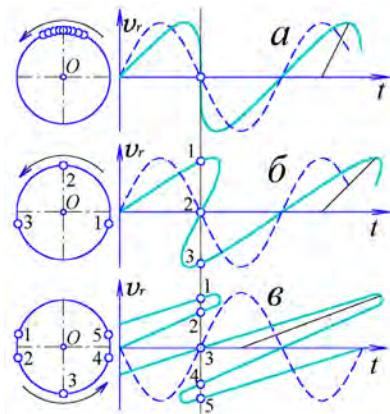


Fig. 81. The further the system, the greater the skew of the velocity curve and the more additional images of the star.

Perhaps, it is this form of the Ritz effect that created mysterious elongated structures: luminous arcs, jets, ejections from galaxies and other space objects (§ 2.16, § 2.21). All of them may turn out to be only traces of an object, or different parts of it, visible simultaneously at different points of the trajectory. Due to the "compression" of time caused by the rhythm effect and the strong frequency shift, these "bursts" will appear to have tremendous speeds. And, precisely, using the accepted calculation methods, astronomers get gigantic emission speeds comparable to the speed of light or even exceeding it. As for the BTR, all these emissions, perhaps, are only visibility (§ 2.15).

Let's continue moving away from the binary system. At some point, the loops of the curve will start to go over each other (Fig. 81.b), and we will be able to

simultaneously see several separate images of one object: the vertical line - the time section corresponding to a certain moment in time, will intersect the curve several times. A similar phenomenon of wave front overturning, reminiscent of wave overturning when approaching the coast, is observed in klystrons (§ 2.11). Such additional images, arising due to ambiguity, were predicted by Ritz, explaining this by the fact that the light emitted at later moments could, due to the higher speed given by the source, come to the observer simultaneously with the previously emitted one, creating an additional image. These additional images of the star, predicted by the BTR, P. Bergman dubbed "stellar ghosts" ([Bergman PG Introduction to the theory of relativity. M., 1947, \[44\]](#)). The absence of such ghosts in binary star systems was considered one of the proofs of the fallacy of Ritz's theory [74]. However, when these "extra" images were nevertheless found in space objects, then for some reason they did not even remember about the BTR, but began to associate them with the "gravitational lenses" of the theory of relativity, invented much later, supposedly decomposing the light from the source into separate beams, although this explanation largely contradicted observations, and many rightly considered gravitational lenses to be delusional.

And, here, the BTR correctly predicts the number of additional images and their configuration: all images must fit into an ellipse (corresponding to the orbit), which is observed, say, for object 0024 + 1654 (Fig. 82). It is easy to explain the motion of images, asynchronous fluctuations of their brightness: over time, the

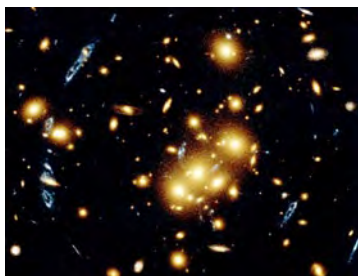


Fig. 82. Multiplication of the number of images with their blurring along the elliptical orbit of the object 0024 + 1654 (www.nur872.narod.ru/cosmolinyz.htm).

vertical line (Fig. 81) shifts, and with it the intersection points (each with its own brightness index T/T' , depending on the acceleration at a given point of the orbit). In this case, half of the images will move in the natural direction of the star's orbit, and half in the opposite direction. Such forward and backward, backward images are born in pairs when crossing the loop and disappear in pairs when merging, when the time section line breaks off the loop. When paired images 1 and 2 (Fig. 81b) disappear, it will seem as if the radial velocity graph suddenly breaks off and at each period consists of separate pieces, which is actually observed in some spectroscopic binaries with discontinuous characteristics [27].

The same images multiplied according to the Ritz principle can turn out to be ejections of radio galaxies, consisting of many points. Multiple overlapping of loops is also possible (Fig. 81.c), and, therefore, as many images as you like, the total number of which will be denoted by k and will be called the "multiplication coefficient of the system". The images can cover almost the entire orbit of an object or two objects of the system (Fig. 65.b, Fig. 83), like a tracing bullet that

draws its trajectory with a dotted line. Is this not how the mysterious double ring of separate luminous points in supernova SN 1987A arose (see about it: http://acmephysics.narod.ru/b_r/sn1987a.htm)? However, it is possible that these rings are, like the expanding envelopes of supernovae, just a "light echo" from a star's outburst (§ 2.18).

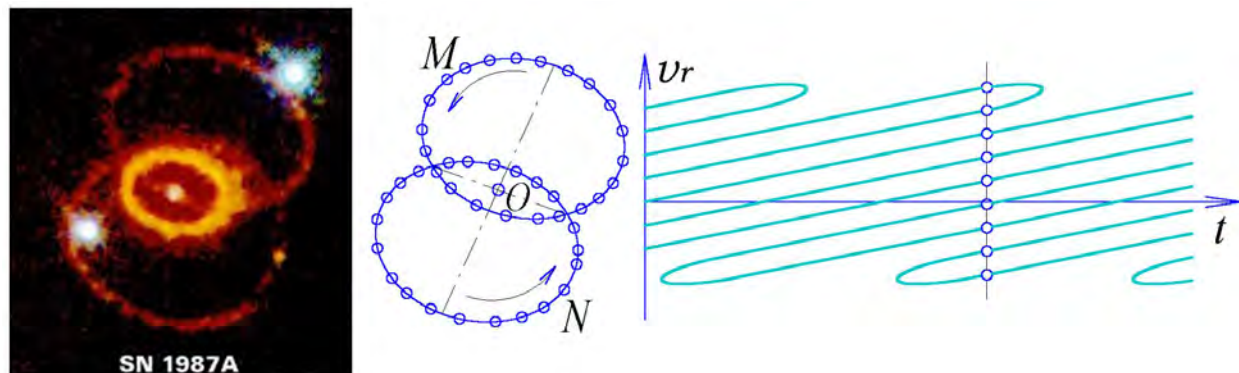


Fig. 83. The two rings of the supernova SN 1987A may represent images of two objects multiplied by the Ritz effect at different points of their orbit.

Note that the authors of the gravitational lens hypothesis are the already mentioned A. Einstein and A. Eddington. Soon after they proposed the idea of gravitational lenses that distort and focus with their gravity the rays of light to create imaginary images, many scientists criticized this hypothesis. The gravitational fields of cosmic bodies are too weak and the angular deviations introduced by them are too small to be noticed. Recall that even rays that have passed near the edge of the Sun are deflected by only two arc seconds, which is at the limit of resolution of modern telescopes (§ 2.2). And this deviation rapidly decreases with distance from the gravitating body. And, meanwhile, relativists believe that such a distortion occurs even at distances of the order of the radius of the galaxy - the entire galaxy appears as a lens! It is clear that for such a focusing of light by gravitating objects, they should have had such powerful gravitational fields that are not found in nature. The same lens galaxies would be instantly compressed by such a powerful gravitational field, or would require tremendous speeds of the stars in them. Finally, the probability of an observer falling into a narrow region of gravitational focusing of light is too small, and the Earth would soon leave this region due to the mutual motion of cosmic bodies, which changes the image created by the "gravitational lens", which does not actually happen.

Thus, **gravitational focusing of light and multiplication of the number of images by "gravitational lenses" is a fiction! The additional images-mirages observed in the sky are a consequence not of gravitational focusing, but of temporal focusing, due to the ballistic principle and the Ritz effect.** It is due to temporal focusing that light rays, images of the same object emitted by it at different times from different positions can be focused in the same time interval. If lenses and mirrors are used for spatial focusing and reproduction of images of objects, then the elliptical orbit of a star, a galaxy, or rather circular motion along it, acts as a temporal lens. The term "lens of time" itself arose at the beginning of the 20th century [95] in relation to cinema cameras, which are also capable of

creating the illusion of acceleration, deceleration, reversal of time and overlapping of its moments (multiple exposure). This analogy with optical projection and cinematographic technology, as we will see, is very useful in terms of understanding cosmic pictures (§ 2.16) and the nature of time (§ 5.6).

Concluding the story about cosmology, we note that B. Riemann, whose mathematical ideas about curved Riemannian space are used by relativists to describe gravitational lenses, was also related to the interpretation of multiple images based on temporary lenses of the BTR. So, it was Riemann who created the theory of simple waves (Riemann waves), the shape of which changes with distance from the source, due to the different speed of motion of the points of the wave [103] (as for light in the BTR, Fig. 81). Riemann was the first to consider the ambiguities arising from this (overlaps of waves, giving several images of an object flying in orbit). He also studied shock waves (in the case of light, giving rise to outbursts of new stars, § 2.18). Riemann himself tried to revive Newton's theory of outflow. Considering charges to be sources of matter escaping at the speed of light, he explained optical, magnetic, inductive and gravitational effects, becoming the forerunner of Ritz's emission electrodynamics [107]. It is no coincidence that Ritz referred to the work of Riemann, who also worked in Göttingen, where he collaborated with Gauss and Weber, these forerunners and forerunners of the BTR (§ 1.7). Even the fates of Riemann and Ritz are similar: both were brilliant mathematicians and physicists, both studied and worked in Göttingen, both died early from tuberculosis, before they reached the age of forty, barely taking up ballistic electrodynamics and not having time to develop it to the end. As a result, their physical works were forgotten, and their mathematical discoveries were captured by quantorelativistic theories, hostile to them in spirit, including the theory of gravitational lenses. Such is the irony of fate.

So Einstein's gravitational lenses have never been observed. And, as if the superfluous images of celestial bodies created by them are simply traces of stars, galaxies and other objects, simultaneously visible in different parts of the orbit due to the ballistic principle. Just like in the song: "The stars - traces of tracer bullets - are also part of the Universe." It was in the BTR that the multiplication of stars, universal sources, was first predicted, moreover, as a direct consequence of Galileo's principle of relativity (ballistic principle), as applied to binary stars. And, therefore, the observation of multiple images-mirages in the sky does not at all testify in favor of the theory of relativity, but serves as a multiple and spectacular confirmation of Ritz's theory.

§ 2.15. Superluminal Emission Velocities

In the beginning, all that are simple and dense,
Through emptiness, making their way, not meeting any External
obstacles, making up one with their parts And steadily rushing
wherever they rushed,

Obviously, they must have a completely immeasurable speed,
Rushing incomparably faster than the sun's radiance rushes, And fly
through space many times farther, while the sun's lightning sweeps
across the firmament.

Titus Lucretius Carus, "On the nature of things", 1st century. BC. [77]

The multiplication of the number of images that occurs in binary star systems due to the ballistic principle leads to other amazing effects. Thus, in space, the motion of objects, for example, emissions from quasars, with superluminal velocities reaching $20c$ [160] have been recorded more than once. Such high speeds were obtained by directly dividing the apparent movement of an object across the sky by the time of movement. Therefore, it may be tempting to use this fact as a refutation of the theory of relativity and a proof of Ritz's theory, which admits superluminal speeds (for example, in cosmic particles), predicted by Democritus and Lucretius (§ 1.21). However, in this case, just do not rush. Of course, there are enough stars in space that are capable of giving the microparticles superluminal speeds. But it is unlikely that there are energy sources and mechanisms in space that can inform a large object: a galaxy, quasar, a simple star or a cloud of gas - not only superluminal, but even near-light speeds. For the same reason, it is impossible to accept the explanation of this phenomenon in the theory of relativity, where superluminal velocities are considered only an illusion caused by the movement of the ejection at a near-light speed towards the observer. Due to this, the visible time interval of the object's movement is compressed by the Doppler effect, and it seems that the object has covered the distance in less time, which leads to a strong overestimation of the speed of movement. However, in this case, for a noticeable reduction in the registration time T' , in comparison with the real time of movement T , the object, according to the Doppler effect $T'/T = 1 - V/c$, must approach with a speed V comparable to the speed of light c . And such high speeds of natural space objects, as it was said, are doubtful. Therefore, it is much easier to assume that the apparent reduction in the travel time is caused by the Ritz effect $T'/T = 1 - La/c^2$, which leads to a strong decrease in the interval T' even at moderate speeds and accelerations a , if only the distance L to the source is large enough.

Indeed, if we consider the point of the star's orbit, where $T' = T(1 - La/c^2) = 0$, that is, the acceleration $a = c^2/L$ (Fig. 81.a), then it will seem that this part of the orbit the star passes instantly, as fast as you like. Moreover, the brightness of the object, with such accelerated movement, will not decrease: the object will not lose in brightness from blur, since it simultaneously increases the brightness from the Ritz effect (§ 2.11). It will be the same at any other point of the orbit, where the condition $a = c^2/L$ is fulfilled and the tangent to the velocity curve is vertical, - it is at such points that the infinite compression of time and the concentration of light take place (Fig. 67). Most likely, such an effect will be observed when ambiguity and ghost images arise from the skew of the velocity graph. Then, at the moment of touching the vertical line (time section) of the velocity graph (Fig. 81.c), it will seem that out of nothing two objects 4 and 5 (in fact, two images of the same star) have arisen, scattering with tremendous speeds, but, with distance all slowing down. Apparently, this is precisely the nature of the emissions of quasars and galaxies: these are simply additional images recorded simultaneously with the main image 3. The tremendous speeds of these objects can also be obtained from the analysis of their spectrum. Indeed, the frequency shift caused by the Ritz effect will also lead to huge shifts in spectral lines, which will be

interpreted on the basis of the Doppler effect as confirmation of the enormous speed of objects, although the true speed may be negligible.

In addition, due to the appearance of ambiguity in the velocity curve, it will seem that, upon reaching the secant time of the edge of the loop, there has been a sharp jump in velocity (Fig. 81) - a discontinuity appears on the ray curve. And such breaks-jumps were actually found in some binary stars [27]. Most often, such discontinuities are observed in variable stars of the RV Taurus type [65, p. 156]. And this is natural, because it is for stars whose brightness fluctuations are in most cases caused by the Ritz effect that the skew of the velocity curve should be the greatest.

It is also interesting that these imaginary images of the star will move in opposite directions in orbit. If point 5 is displaced along the orbit in the forward direction, in the same direction as point 3, then point 4 will be characterized by a reverse, backward motion. Due to this, points 4 and 5 will diverge. As you can see, the imaginary superluminal velocities have a simple classical explanation. Sometimes, the apparent increase in speed caused by the Ritz effect may not reach such high values, but it will still lead to a strong overestimation of the object's speed. Thus, in the nuclei of our and other galaxies, stars have been found that move against the background of the nucleus much faster than one would expect from Newton's law of gravitation and the known mass of the nuclei. Therefore, astronomers conclude that there are dark matter or supermassive black holes in the cores, the unaccounted for by the mass and gravity of which is allegedly caused by the excess speed. But it is much easier to interpret it as a result of an imaginary increase in speed from the Ritz effect, which leads to both the acceleration of the apparent motion of stars in orbit, and to an overestimation of their speed, found from the spectral shifts according to the Doppler effect. This eliminates the need for artificially invented abstract objects such as black holes and dark matter (§ 2.20).

Note that the considered optical phenomena caused by the Ritz effect in BTR are similar to the acoustic phenomena from the Doppler effect in supersonic fighters. Since the plane flies at supersonic speed, the sounds emitted by it later, from new points of the flight trajectory, can reach the observer simultaneously with those emitted earlier, or they can be ahead of them. Due to this, one and the same fighter can be heard in several directions at once (as in the reproduction of images, § 2.14), its movement, perceived by ear, may seem to be backward or occurring at a speed many times higher than the real, visually observed speed of a supersonic aircraft, just like in the case of superluminal emissions. All such phenomena are the result of temporal focusing from the Doppler and Ritz effects, which once again proves their relationship (§ 1.10).

So, we discovered another manifestation of the Ritz effect, now in the form of superluminal emissions of quasars and ultrafast motion of stars in the centers of galaxies. The illusion of anomalously high speed of these movements is created by focusing by Ritz's "time lens", which compresses the time intervals (§ 2.11). In almost the same way, in ordinary lenses, at times, we observe the movement of bodies strongly accelerated in comparison with the real one, due to the stretching of spatial intervals. Note that the images of the ejections created by the

Ritz's "time lens" will be, due to the rotation of the object forming them, elongated along its orbit and the direction of their "motion". It is in this form that they are observed, as we will show in the next section.

§ 2.16. Rotating stars and cosmic arcs

It is necessary to follow the wisdom of nature, which, as it were, is most afraid of doing something superfluous or useless, but often one thing enriches with many actions.

Nicolaus Copernicus, "On the rotation of the celestial spheres" [41]

We saw above that the orbital rotation of binary stars gives rise to many cosmic phenomena - variability of the brightness and color of stars, the multiplication of the number of images, and other cosmic mirages. But the ballistic principle and the Ritz effect enrich the rotation of stars with other illusory phenomena, the form of which seems completely mysterious and inexplicable from the standpoint of modern astrophysics. So, in addition to the orbital, the axial rotation of the stars, these celestial flaming spheres, is very significant. If the classical principle of relativity (ballistic principle) is true for light, then these spheres will cease to look like spheres: spinning stars will seem elongated to us, like ellipsoids. To prove this, consider a star with a distance L , radius R and angular velocity ω (Fig. 84). One side of the star is moving away from us with a peripheral speed $v = \omega R$, and the other is approaching with the same speed. According to Galileo's principle of relativity, the speed of light c will mechanically add up with the speed of the points emitting it, the sections of the star. Therefore, the light from the approaching edge M will arrive at us in the time $L/(c + \omega R)$, and from the receding edge N - in the time $L/(c - \omega R)$ and will be received approximately at the time $T = 2L\omega R/c^2$ later.

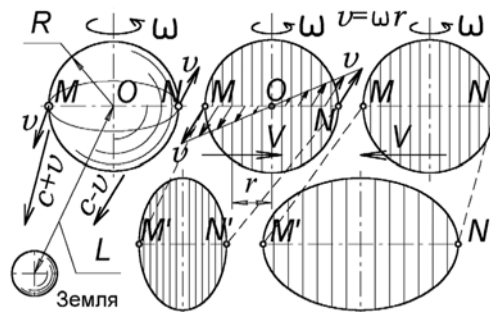


Fig. 84. Delay of light from the right edge of the star in comparison with the left leads to a distortion of its appearance.

During this time, a star flying with a linear velocity V will be displaced by a distance $S = VT = 2LV\omega R/c^2$. Therefore, the light of the two sides of the star, visible to us simultaneously, in reality, is emitted at different times, from different positions of the star, separated by a distance S . Other points of the star have intermediate radial velocities and therefore continuously fill the segment S . It turns out, according to the principle of relativity, instead of asterisks, we should observe the stars-segments, strokes? The image of the star would be blurry, blurred along the apparent trajectory of its movement, as if in a photograph of the starry sky with a long exposure. However, given the available linear and circumferential velocities of the stars, their smearing S is so small that even through the strongest telescopes the star will be visible as a point. Indeed, the

resolution of the best astronomical tubes is on the order of an arc second ($1''$ - $0.1''$). At the same time, the angle at which the segment S is visible is $S/L = 2V\omega R/c^2$ radians, which even for the fastest stars with linear and circumferential velocities of 200 km/s gives an erosion angle of 0.2 arc seconds. Therefore, for most stars, "elongation" will be invisible.

But this is only when observed with simple telescopes. And at present, interferometric telescopic methods have begun to develop widely, giving such high angular resolutions (up to $0.0001''$) that the disks of stars can be distinguished. And, just, here the scientists were in for a surprise, since these observations, capable of revealing the blur effect, actually discovered it and gave very strange results that disagree with current physics. So, some of the rapidly rotating stars really turned out to be very elongated. An example of this is the star Achernar (α Eridani), which has a gigantic peripheral speed: something about 240 km/s. To the surprise of scientists, the star is not a circle, but an elongated ellipse with an axis ratio of 1.5. As scientists admit, even a fast rotation could not flatten a star into such a compressed ellipsoid [141].

So maybe this ellipsoid is a consequence of star erosion? Indeed, if we conditionally divide the disk of a star into stripes, then the blurring of the disk will create a visible shift of each stripe proportional to its radial velocity ωr , i.e. distance r to the center O . Then, depending on the direction of motion of the star, its apparent diameter MN will stretch or contract by the value S , giving it the form of an oval (Fig. 84). After all, a linearly stretched or compressed circle is an ellipse, as you can easily see by observing the shadow of a round coin. Only by admitting that the speed of the source affects the speed of the light emitted by it, it is possible to explain the riddle of Achernar.

Scientists were no less surprised when they tried to directly observe the pulsations of some Cepheids using an astrometric interferometer. So, in the Polar Star, as in the Cepheid closest to us, it was supposed to detect radial pulsations, i.e. periodic fluctuations of its radius. But it turned out that in reality, depending on the phase of oscillation, the disk of the star did not change its size, but its shape, becoming now elongated, now compressed, as if different parts of the star pulsed in different ways (see http://express-meta.narod.ru/html/astro_u_u7_04.htm). The same was found in the long-period variable star Mira Cetus (see www.schools.keldysh.ru/sch1216/students/Cetus/mira.htm). This is to be expected if the fluctuations in the brightness of the Cepheids are caused not by pulsation, but by orbital motion, giving different speeds to the rays of light (§ 2.12). As a result, the intensity and frequency of light change periodically, like the unstable repetition rate of tram or subway cars from the variability of their speeds (Fig. 70). And the imaginary fluctuations in the shape and size of a star arise from its axial rotation, leading to a blurring of the disk.

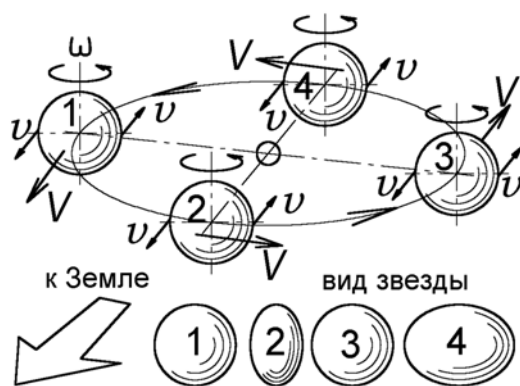


Fig. 85. Changes in the apparent shape of a star depending on the position in the orbit and the direction of motion.

So, if the ray from the left edge of the star M is ahead of the rays from the right N , then during the orbital motion of the star to the right, its disk will "shrink" along the direction of motion. At the opposite point of its orbit, the star, shifting to the left, on the contrary, "stretches" (Fig. 85). If the orbit is seen not from the edge, but at an angle, the axis of the star is tilted to the line of sight, and the frequency of rotation of its layers varies in latitude, then the oscillations of the star's shape take on an even more complex form. It is these complex fluctuations in size and shape that have puzzled scientists that have been recorded by interferometers at Betelgeuse, a variable star that changes brightness with a period of 6.4 years. It turned out that in time with the brightness fluctuations, the star periodically changes its size and shape, but in a completely different way from what the theory of pulsations prescribes. Due to the irregular oscillations of the visible shape of the star, scientists even put forward a theory that the star itself has an irregular non-spherical shape, and, therefore, as it rotates, it shows us one or the other side, having different outlines and brightness. In fact, these fluctuations in brightness and shape, as seen, can be imaginary due to the dependence of the speed of light on the motion of the star, which has a spherical shape and constant brightness. At the same time, measurements of the average diameters of such stars by means of interferometers show their fluctuations in time with the brightness fluctuations, although the real sizes and absolute luminosities of the stars do not change (Fig. 85). No wonder, astronomers were so puzzled by the decrease in the apparent diameter of Betelgeuse by 15% in the period from 1993 to 2009 at a constant brightness. And, from the point of view of the BTR, there is nothing strange in such variations in the visible parameters at a constant luminosity of the star, if these variations are an optical illusion.

The possibility of the ballistic effect of changing the visible shape of a spinning star, during its movement, was first drawn to the attention of the author K.A. Khaidarov in 2006 (the author pointed out the effect of stretching the image of a star along its orbit from the difference in radial velocities of its different regions in [117]). Khaidarov noted that, if the BTR were correct, the Vega star, which has a huge rotation speed, would appear before us noticeably elongated, while in reality interferometric observation methods showed that its disk has a round shape. To this, the author replied that the axis of rotation of Vega, as is known, is directed almost exactly to the Earth, which is why the circumferential velocities

of different parts of its surface do not have a ray component and, therefore, cannot lead to stretching of the image of the star. Thus, Vega's observations do not contradict the BTR.

An interferometric analysis of the Cepheids revealed another mystery: some of them, for example, the same Polar one, were surrounded by a strange annular shell-cocoon, which was 2-3 times larger than the star itself, 20 times inferior to it in brightness (see www.e1.ru/news/spool/news_id-268135-section_id-37.html or "Nature" 2006, No. 7). The nature and stability of these "cocoon" is completely incomprehensible. But such an annular trail may well leave a satellite, which, rotating around the main star, and causes its flares according to the Ritz effect, with the corresponding motion of the star near the center of mass. With a sufficient rotation speed, the image of the satellite can be so blurred that it will stretch along its entire orbit and appear before us in the form of a solid luminous ring or ellipse surrounding the main star (Fig. 86). For Polar, the satellite is completely blurred if the difference in travel times $T = 2L\omega R/c^2$ exceeds the orbital period P of Polar, which is 4 days and is equal to the flashing period. The distance L/c to Polar in light years is 430 years, which is 40,000 times its orbital period. This means that in order for an annular blurring to occur, it is enough for a satellite to have a circumferential velocity $\omega R > c/2 \cdot 40,000 \approx 4$ km/s. So blurring is quite possible: even our Sun has a rotation speed of 2.3 km/s at the equator.

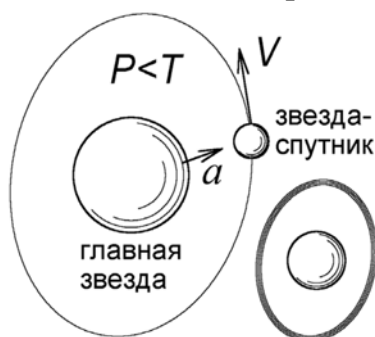


Fig. 86. "Cocoons" around the Cepheids, as a result of the erosion of the satellite along its orbit into a ring (right).

Such rings were observed not only in Cepheids, but also around other stars and galaxies, although astronomers tend to attribute them to the action of gravitational lenses, ignoring many contradictions (§ 2.14). These rings are rarely closed and often have the shape of a narrow sickle. If the structures are created by an image of a star "smeared" along the orbit, then their appearance is determined by the degree of blurring T/P , - the ratio of the difference between the path times T and the orbital period P . Images of stars with a large orbital period (in years) are unlikely to stretch along the entire orbit, and such stars will appear as sickles, arcs or strokes (Fig. 87). Roughly the same picture develops when shooting the starry

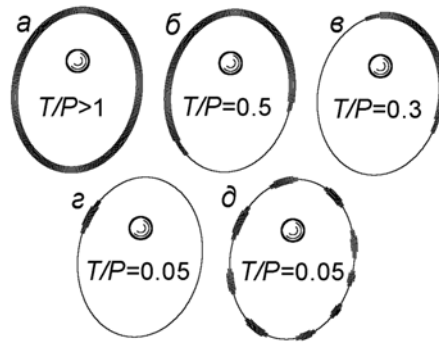


Fig. 87. Forms of blurring of a star: a) ring, b) sickle, c) arc, d) prime, e) dotted line (multiplication $k = 9$).

sky. Stars moving in a circle due to the Earth's rotation appear in photographs, depending on the exposure time, in the form of strokes, arcs or closed rings, by the way, also surrounding the North Star. The duration of the exposure here plays about the same role as the delay time T , when the star is blurred, and $P = 1$ day.

These arcs created by the satellite are displaced as it moves in orbit, and can not only surround the central star, but also intersect it if the visible orbit of the satellite is projected onto the Cepheid disk. In this case, it will seem that an extended luminous ejection emerges from the Cepheid, moving away from the star or forming loops connected to the star, like prominences. And such extended "outbursts", "outflows of matter" were actually discovered in the process of interferometric observations in many Cepheids, including the Pole Star, the semiregular variable Betelgeuse, Mira Kita and others. Such powerful "ejections", of course, cannot be real outflows of matter, but they are directly related to the ballistic theory of outflows, being illusory, blurry images of a satellite or several satellites of the Cepheid, and sometimes, possibly, a blurred image of the main star.

In the form of such arcs, dashes, sometimes objects are also visible, having instead of one - several separate images. They also tried to associate such a multiplication of the number of images with hypothetical gravitational lenses and black holes. But, as mentioned in the previous section, a star can be seen at once in several points of its orbit even if the light emitted by it at different times and at different speeds comes to us simultaneously (as if, when filming a moving star, we did several exposures intermittently). The same effect, taking into account the rotation of the star, will result in blurring of each point image (Fig. 81) into an arc, a dash elongated along the orbit (Fig. 87.e). Object 0024 + 1654 has such a view (Fig. 82). As you can see, such a blurring of an object is much easier to explain not by supernatural black holes and gravitational lenses, but by the dependence of the speed of light on the speed of the source.

It is worth mentioning, perhaps, another cosmic curiosity that once again confused cosmology. In the Andromeda nebula, astronomers found a strange ring of hundreds of identical red stars, and inside it - a smaller ring, already consisting of blue stars (see www.cnews.ru/news/top/index.shtml?2005/09/21/187467): the stars go in a circle, as in a cosmic round dance. Scientists cannot figure out the nature of such a strange cluster of stars and its stability. And again, the exit opens

the assumption that in reality there are only two stars (or two globular star clusters) - blue and red, rotating near the common center of mass O in elliptical orbits (Fig. 88). It is this rotation that multiplies their images into thousands of separate, visible at once, and, like beads, strung into orbit. No wonder, both rings lie in the same plane - this is the common plane of their orbit.

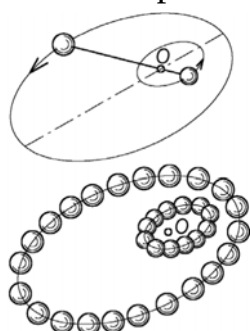


Fig. 88. Rotation of a double star or two globular clusters of stars (above) creates two necklaces of stars strung into orbits.

It turns out that all the cosmic arcs and multi-colored rings visible in the sky are the same illusory celestial pictures, like a halo or a rainbow, also accompanied by the appearance of unnecessary images ("false suns"), colored rings near the star, which are only its images blurred in arcs. However, the darkness of the ignorance sent by the theory of relativity has given rise to the opinion that the source of these pictures is in mystical objects such as gravitational lenses and heavy black holes. In a similar way, the ignorant once believed that the source of the rainbow was a mystical pot of gold from a leprechaun buried in the ground. And only the BTR gives space arcs a simple scientific and rational explanation. It is no coincidence that all these effects of double stars (fluctuations in brightness, color, multiplication of the number of images, their blurring, backward, slow and accelerated orbital motions) can be easily simulated using a simple computer program. When launched, such a program produces pictures that are surprisingly reminiscent of those that we observe in space. And all these beautiful pictures are a natural consequence of the inherent in the program of the motion of binaries in orbit and the ballistic principle.

So, the main advantage of Ritz's ballistic theory is that it predicts all phenomena of space (even unsolved by science) as direct consequences of one single hypothesis - the classical principle of relativity, according to which a source transfers its speed to the light emitted by it. Both Ritz and Copernicus, who were themselves (in the opinion of contemporaries) good engineers, understood that nature, as a brilliant engineer guided by the principle of simplicity, would not tolerate unnecessary principles and details of the cosmic mechanism - all these black holes, neutron stars, etc. It is no coincidence, according to Ritz and Copernicus, all the variety of celestial phenomena naturally follows from the rotational, orbital motion of cosmic bodies, coupled with the classical principle of relativity, which is increasingly confirmed by the latest observations using satellites, radio telescopes and interferometers. But, I think, even with exhaustive evidence, the official science will not want to admit Ritz's correctness for a long time. Likewise, the official church for almost three hundred

years (up to 1831!) Banned the teachings and books of Copernicus, Galileo, Kepler and, in spite of all the facts, amused itself with the illusion of the immobility of the Earth. However, there is no need to go back centuries for examples of fanatical adherence to dogmas: it is enough to observe how long the current scientific community, ignoring the classical principle of relativity, which Galileo and Copernicus with such difficulty approved, will consider Ritz's teaching heresy.

Even 500 years ago, Copernicus came to the bold conclusion that many celestial phenomena and the picture of the Cosmos painted by scholastic scientists, supporters of Aristotle, were imaginary. The visible circular motions of the Sun and stars, looping paths and backward movements of the planets turned out to be an illusion born of the axial and orbital rotation of the Earth. But the lesson taught by Copernicus was forgotten, and, behold, again, scientists, smothered by Einstein, sacredly believe in the reality of whimsical heavenly pictures, puzzle over them, coming up with explanations no less mystical and complex than those of their ancient colleagues who considered the Earth the center of the world. Only now the picture of the cosmos began to clear up again, it was only necessary to return to the classical principle of relativity discovered by Copernicus and Galileo, according to which any movement (including the movement of light) is relative: it depends on the frame of reference, its speed. But the official science, rejecting this progressive principle, wants to remain in captivity of illusions and mirages created by the rotation of the celestial spheres, blindly believing Aristotle and Einstein, who absolutized the illusions of an earthly observer.

§ 2.17. Quasars

The cosmological interpretation seemed so inconceivable that many astronomers eventually began to regard quasars as local objects ... could the redshift be caused by some new physical phenomenon other than the Doppler effect? The latter possibility seemed to be confirmed when astronomers found closely spaced images of two or more objects with completely different redshifts. According to one hypothesis, these objects showed some kind of unexpected aging effect of light, in which its length changes over time.

P. Hodge, "The Cosmological Controversy" [155]

As you can see, many mysterious objects of the Cosmos, thanks to the BTR, appear in a completely different light, turning out to be a kind of cosmic illusion, a mirage. Ballistic theory reduces almost all mysterious cosmic phenomena to various manifestations of binary stars common in space. And, such supernatural objects as black holes, predicted by the theory of relativity, turn out to be completely useless invention. Thanks to the BTR, another mystery of the Cosmos - quasars - finds a simple explanation. These objects have huge redshifts, which, according to Hubble's law, makes astronomers consider them to be very far away. However, the brightness and size of quasars are so great for such a distance that they do not agree with the rapid fluctuations in their brightness (only small astro-objects are capable of rapidly changing their brightness). Therefore, even those astronomers who believed in the cosmological redshift from the scattering of galaxies were forced to turn again to Belopolsky's hypothesis about the aging of light (§ 2.4).

And, for sure, everything becomes clear if the ballistic theory is correct. If the redshift is caused not by the scattering of galaxies, but by the Ritz effect, then quasars may indeed turn out to be relatively compact objects of not too high luminosity, which are much closer than is commonly believed. Then the exorbitantly high redshift of quasars will be a consequence of the smallness of their size R and the speed of their rotation, and, hence, large accelerations $a = V^2/R$. And, therefore, the Hubble coefficient $H = a/c$ in the redshift law for quasars will turn out to be much larger than that adopted for galaxies. That is, even at a small distance, their redshifts will turn out to be much larger than those of galaxies at the same distance. The fact that the value of the Hubble constant for quasars and small galaxies is much greater than for ordinary galaxies is proved by at least the fact that equally distant cosmic objects often have very different redshifts, which contradicts Hubble's law. So, objects are known that, according to astronomers, are physically connected pairs, and, therefore, are equally distant from us. However, the redshift of such objects sometimes differs by several times (such are, for example, the galaxy NGC 4319 and the quasarlike object Markarian 205 [52]), so, according to the Hubble law, they should be placed at different distances. But, according to the BTR, the redshifts of equally distant objects of different types can be very different, due to the different speed of their rotation and sizes (Fig. 89).

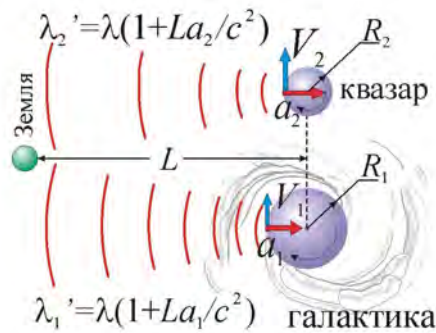


Fig. 89. A strong difference in redshifts for a nearby quasar and a galaxy.

There are many such examples of inequality of redshifts for the components of paired galaxies or galaxy-quasar pairs. Most of these pairs were discovered by Halton Arp, who proved by this the falsity of the cosmological interpretation of the redshift [39, 87, 155]. Previously, they tried to explain this discrepancy by the gravitational frequency shift. But then it turned out that this cannot be attributed to the redshifts of quasars, since then they would have such a large mass and density that they would be extremely unstable [155, p. 140].

Sometimes, instead of one quasar, several separate images are observed, corresponding, judging by the spectrum, to the same quasar. This multiplication is explained by gravitational lensing. But, in reality, it is easier to explain this by multiplying the number of images by the ballistic principle - the simultaneous arrival of light from quasars from different points of the orbit (§ 2.14). This explains why multiplied images of quasars always fit into an ellipse. This is the ellipse of the orbit along which the quasar moves, simultaneously visible at different points of the orbit. An example of such a quasar is the double quasar Q 0957 + 561 [26], the quasar QSO 2237 + 0305 (see Nature 2005, No. 1), or the

galaxy NGC 7603 and several quasar-like objects near it (http://www.haltonarp.com/articles/research_with_Fred.pdf). Both the quasars themselves and their so-called "ejections" (and in reality blurred images of the same quasar) exactly fall on the orbital ellipse (§ 2.15, § 2.16). These images have different brightness and redshifts, due to different accelerations at different points in the orbit, causing corresponding changes in brightness and spectrum. Over time, the images of the quasar move along the same ellipse, simultaneously changing the brightness and spectrum, and, moreover, all in different ways, due to the orbital motion and the Ritz effect. If the redshift of quasars was caused by the Doppler effect from their removal, then two images of one quasar would have the same redshift. But these displacements are sometimes noticeably different, and this can no longer be explained by the accidental hit of two objects on one line of sight, as H. Arp tried to do in the indicated examples of paired objects [52, 155]. The theory of gravitational lenses cannot explain all this, while the Ritz effect and the BTR easily explain: the brightness and spectrum shift correspond to acceleration at a given point of the orbit and, naturally, change when the image is shifted. Earlier it was noted (§ 2.15) that the "ejections" of quasars often move, judging by their apparent displacement across the sky, with superluminal velocities. As mentioned, this can be explained by the Ritz effect, but it can also be associated with a strong overestimation of the distances to quasars, based on their redshift and Hubble's law. If the quasars are much closer, then the apparent angular displacements of their emissions correspond to a much smaller path and speed.

What are quasars? If we follow Occam's principle and do not multiply entities, then we must admit that quasars are not some new exotic objects, but - either clusters of stars, or, more likely, compact galaxies, or, more precisely, the visible nuclei of galaxies - their central areas. Indeed, due to the fact that in the central regions of galaxies the speeds of rotation and acceleration are much higher than at the periphery, their rotation can lead to much larger redshifts according to the Ritz effect (Table 1). Thus, it really turns out to be quite compact objects with a high rotation speed. Apparently, in the nuclei of galaxies there are regions of transparency through which these central parts of the nuclei can be seen. Or these galaxies are rather rarefied, young, not clouded by clouds of galactic dust. Indeed, quasars are now commonly associated with galactic nuclei. It is the central parts of galactic nuclei that, like quasars, are strong sources of radio emission. This proves once again that space is not replete with superfluous types of objects. All the observed variety of space objects are only particular manifestations of a few basic ones, already known and studied.

So, another great mystery of the Cosmos - quasars, was explained with the help of the BTR. Thanks to the Ritz effect, he also finds an explanation for the strong radio emission of quasars. After all, deeper regions of quasars, rotating with even greater speed and in smaller orbits, have immeasurably greater acceleration, which means that the frequency shift according to the Ritz effect for them can be enormous. Therefore, it is possible that the radio emission of quasars is only the optical radiation of the stars, which form the core of a quasar or a galaxy, strongly shifted towards the red by the Ritz effect. Thus, there is no need to invent complex

artificial (say, synchrotron) mechanisms for generating radio emission from quasars and other radio-emitting objects. The Ritz effect naturally predicts such long-wavelength radiation.

§ 2.18. *New stars and supernovae*

Consider again the case where the point P' participates in oscillatory motion, and the distance PP' is large enough. This will allow the waves that started at times $t_1', t_2', \dots$, when the velocity P' had different values $v_1', v_2', \dots$ to arrive at P simultaneously, due to the difference in their propagation velocities (in practice, this case will be presented only in optics)

Walter Ritz, "A Critique of General Electrodynamics" [8]

The Ritz effect, which is so significant for quasars, can have more impressive manifestations. The fact is that the Doppler effect $T'/T = 1 - v/c$ is not able to noticeably change the time scale and frequency, since usually space objects have a ratio $v/c < 10^{-3}$. On the contrary, the Ritz effect $T'/T = 1 - La/c^2$, as it was found for the same binary stars, is capable of giving a shift in L/cP (thousands) times larger (§ 2.10). In other words, the La/c^2 value turns out to be comparable to unity, and $T' = T(1 - La/c^2)$ may even vanish. That is, all the light emitted over a long time interval T can come to the observer in one extremely short instant T' . Then, even the dimmest source, moving with the appropriate, not even particularly large, acceleration, is capable of producing the brightest flash, albeit very brief.

So, perhaps, it is the Ritz effect that causes bright outbursts of new and supernova stars, which, as observations have shown [27, 76], are precisely binary systems? Recall that with such flares, a star sometimes increases in brightness billions of times. Flares would occur extremely rarely, since the acceleration a of the star over some time should be almost exactly equal to c^2/L , which, naturally, does not happen often. And the more accurate this coincidence (the shorter the period T'), the brighter and shorter the outburst should be in proportion to T/T' (this is precisely the relationship that was revealed in supernovae). After all, the outburst is caused not by a real physical increase in the luminosity of the star, but only by the "compression" of time, as in the Doppler effect, only - much more powerful. However, due to the re-emission of light by the interstellar medium and the suppression of its excess velocity according to the Fox principle, the effective distance L , at which the brightness transformation takes place, is usually noticeably less than the distance to the Earth. Therefore, a star may seem to flash brightly even at small distances from it (generating, for example, a light echo), and with a distance greater than L , the relative brightness of the flares will not change noticeably. That is why we see supernova explosions in other galaxies almost the same as if they happened in ours.

Today's astrophysics associates bright outbreaks of new and supernovae, flashing in the darkness of the cosmic night, with the most powerful explosions of these stars. These are the so-called "explosive" or "eruptive" stars. Thus, unlike the Cepheids, these beacons of space, novae and supernovae play the role of a kind of signal fires, rockets visible, thanks to bright flares, at great distances. And, nevertheless, it is much easier to admit that, in reality, this sharp burst of brightness is produced, according to the Ritz effect, by ordinary binary stars, which themselves do not physically change. This is confirmed by the absence of

a difference in the brightness and spectrum of the nova before and after the outburst [34]. It is not clear how the explosion of a star, which caused the loss of part of its atmosphere, mass and other perturbations, might not have been reflected in it. It is also strange that this explosion does not destroy nearby companion stars found in novae. This proves that the explosions of new ones are the same illusion as an "explosion" from a supersonic fighter, accumulating in one instant all the energy of sound.

Thus, a flare is only an appearance and is associated not with the physical variability of the star, but with the purely optical Ritz effect. That is, new ones are not physically, but only visually variable stars. An optical explosion of a star is only an appearance, just as a deafening explosion from a supersonic aircraft is only "audibility." A sound source of small intensity is perceived in a short moment, as very loud due to the accumulation in this moment of all the energy of the sound emitted over a long time. The perceived shock sound wave of an aircraft is the result of the simultaneous arrival of sound waves emitted by the aircraft at different times to the observer due to the supersonic speed of its movement $v \geq c$. In fact, this is a consequence of the Doppler effect $T' = T(1 - v/c) = 0$. All the energy emitted by the aircraft during a long time T is accumulated in a single instant T' . A shock light wave from a moving star also arises, due to the inequality of the speeds of the light emitted by it, perceived at the same time due to the Ritz effect.

This is the limiting case of temporal focusing of light, similar to focusing a beam of light to a point (§ 2.11). Such light shock waves have been searched for for a long time in nonlinear media, near lasers, and could not be found. And, now, it turned out that they exist in space. Similarly, sound shock waves were first discovered in the sky and in space, long before the creation of supersonic aircraft [151]. Shock waves are characterized by the fact that in some areas the tangent to the wave profile is vertical. Namely, when the temporal secant touches these areas (Fig. 81), and the condition $a = c^2/L$ of extreme temporal focusing of light is achieved. Moreover, as you can clearly see, immediately after such a touch, the image should split in two: instead of one point of intersection of the loop, two points 4 and 5 appear, giving two images, gradually decreasing the brightness (Fig. 81.c). And, indeed, immediately after the outburst, novae look like not one, but two stars [70, p. 4].

The fact that the outburst is only an appearance is also convinced by the fluctuations in the brightness of the novae, which occur with the rotation period of the star. They are explained by the fact that there are bright spots on the star, which it, like a lighthouse searchlight, turns either towards us or away from us [158]. However, they forget that the outburst, according to their own theory, is produced by the rapidly expanding envelope of the star, which is not able to rotate as a whole. Therefore, such artificial assumptions are again superfluous: the rotation of a star (caused by the attraction of a nearby satellite) may well create a variable acceleration, albeit small, but capable of upsetting the exact balance $aL=c^2$, which will lead to a periodic drop in brightness.

And how can an exploded star not cool down as it fades, but, as they found out, warm up [34]? On the other hand, the BTR predicts an imaginary increase in the

temperature of the star as a result of the cosmic dispersion discovered by Belopolsky - differences in the speed of light rays of different frequencies (§ 2.8). First, the low-frequency radiation of the flash comes to us, then more and more high-frequency radiation, which is evaluated as hotter. The enormous expansion rate of supernova shells, reaching a tenth of the speed of light, is also an illusion, after and how can an exploded star not cool down as it fades, but, as they found out, warm up [34]? On the other hand, the BTR predicts an imaginary increase in the temperature of the star as a result of the cosmic dispersion discovered by Belopolsky - differences in the speed of light rays of different frequencies (§ 2.8). First, the low-frequency radiation of the flash comes to us, then more and more high-frequency radiation, which is evaluated as hotter. The enormous expansion rate of supernova shells, reaching a tenth of the speed of light, is also an illusion following from the Ritz effect (§ 2.15). Nebulae, supposedly created by explosions of new stars and supernovae, are also illusory. The star does not emit luminous gas, but only illuminates clouds of interstellar gas, which belatedly reflect the light of the flash to us. This phenomenon, called "light echo", has been repeatedly recorded near new ones [17]. But other nebulae of novae and supernovae for some reason do not associate with light echo, despite the fact that it is the reflection and scattering of flash light on clouds of interstellar gas that it is easiest to explain the polarization of the radiation of such nebulae, for example, the famous Crab nebula that arose around a supernova 1054 BC. After all, the reflection and scattering of light polarizes it (this is how the radiation of the Sun scattered by the earth's atmosphere is polarized). Reflection can also explain why nebulae emit not only in the optical, but also in the radio, as well as in the X-ray and gamma ranges: the gas simply reflects the all-wave radiation of the supernova, which became such from the transformation of the optical spectrum of the star by the Ritz effect. At the same time, the current explanation of the polarization and emission spectrum of the Crab and other nebulae, according to the mechanism of synchrotron radiation of relativistic electrons in the magnetic field of the nebula, looks completely improbable and does not explain a number of features.

It is possible to give a physical interpretation of bright supernova explosions, from the point of view of optics and electrodynamics. In the Ritz effect, due to the accelerated motion of the source, a spatial grouping of light-carrying rheons arises. The frequency of their strikes is increasing, and, therefore, the intensity and frequency of light. If, as in charges, the radial acceleration of the source changes periodically, as, say, in binary stars, then periodic clumps and rarefaction of the rheon flux appear in space, causing fluctuations in the brightness of the light. No wonder, among binary stars, Cepheids are known that regularly change brightness (§ 2.12). And if the star is very far away, there are effects similar to shock waves in nonlinear media, in plasma [103]: the profile of the rheon wave steepens, then overturns (Fig. 90). In the case of stars, this leads to supernova explosions, generating a kind of shock light waves, similar to sound shock waves from supersonic aircraft [103].

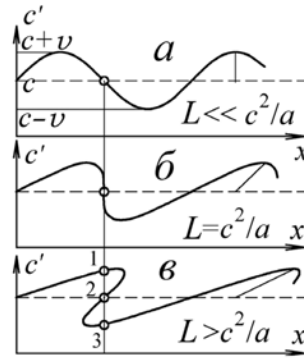


Fig. 90. The difference in the velocities of the rheons in the stream (a) leads, as L moves away, to overtake some rheons by others and to group them: the profile $c'(x)$ of the rheon wave first steepens, forming a shock wave (b), then overturns (c).

Since the motion of the star that generates "flares" occurs in a closed orbit, the flares must be repeated from time to time, like the flares of the Cepheids (§ 2.12). It is the hypothesis of purely visual brightness variability that makes it possible to explain the repeated outbursts of novae with similar characteristics. It is striking how one and the same star can periodically explode, at intervals small by cosmic standards, and so that the flares in many respects repeat each other. If the brightness variability is purely visual, these periodic flares will be explained by the fact that a star flying in an orbit simply passes the same positions with a period equal to the orbital one, having the same accelerations, which gives visible flares of the same brightness, duration, and other characteristics. Flares can follow and not strictly periodically, as in the repeated new T of the Northern Crown (1866 and 1946), T Compass (1890, 1902, 1920, 1944, 1966) and nova-like type U Gemini [158]. This is possible if they are included in multiple star systems. Indeed, when a star moves in a binary system, the same acceleration values $a=c^2/L$ on its acceleration curve are repeated periodically (Fig. 68), and its flares are repeated with the same period. And in a multiple system with three or more components, the acceleration values $a=c^2/L$, and hence the star's flares, are repeated aperiodically (Fig. 80). Although, here, too, we can distinguish a certain average characteristic time scale of the flare repetition.

So, only due to the Ritz effect in the same nova, flares can be repeated with the star's orbital period. Moreover, as follows from the ballistic theory, the characteristics of the flares are repeated from time to time. But, here, modern physics cannot explain these repeated flares of new ones, because, firstly, they should occur extremely rarely, and, secondly, after each flare, a new one should lose part of its mass and change its physical characteristics, which, in fact, is not happening.

It also allows the Ritz effect to explain the empirically found connection between the brightness of nova flares and their duration and repetition period. Observations show that brighter flares usually last less, and the periods between them are longer, as if the longer time T the energy accumulates and the shorter the interval T' it is perceived, the brighter the flare [158]. It is this dependence that follows from the Ritz effect, according to which only the accumulation, temporal focusing of energy, light emitted by a star over a long period of time occurs. Since the average radiation power of stars of the same spectral class is

approximately the same, the shorter the time interval T in which the energy is collected, the higher the peak power, the brightness of the flare, naturally. This phenomenon of temporal focusing of light beams from stars, as said, is in many ways reminiscent of the temporal focusing of electron beams in klystrons microwave devices (Section 2.11), as well as the effect of light concentration in femtosecond lasers, which convert constant pumping radiation of moderate power into ultra-powerful, but extremely short pulses due to synchronous addition of laser radiation modes.

Obviously, the flare is the brighter, the longer the orbital period, since it is during this movement, in fact, that the flare energy is accumulated: the energy of a supernova explosion is proportional to the orbital period of the star. Therefore, the brightest supernova explosions are rare. Less bright new-star outbursts occur much more frequently. Finally, the outbursts of new-like U-stars of Gemini occur even more often, but their increase in brightness is not so significant - only four to five magnitudes. The frequency of outbreaks of novae is so high (in comparison with novae and supernovae) that one can observe repetitions of outbreaks in the same star with a period of the order of a year [158].

It is worth noting that V.I. Sekerin, A.V. Mamaev, R.S. Fritzius. The author himself figured out the nature of novae and supernovae in 2003, having sent for publication the corresponding work [117] in 2005. Such a unanimity of opinions, independently expressed by different authors, serves as additional evidence in favor of the validity of this concept. But the most surprising thing is that Ritz himself spoke of the practical possibility of such powerful manifestations of the Ritz effect in optics in 1908 (see epigraph § 2.18), when novae and supernovae were completely unexplored, and nothing was known about their duality. The complete opposite of Ritz's perspicacity is the scientific blindness of Einstein, who, even in 1952, criticizing in his letter to K. Guines [6] the BTR and the Ritz effect, leading to a superstrong concentration of light, said that nothing of the kind is observed in nature, although novae and supernovae literally screamed in the optical range about the reality of the effect. As we can once again be convinced by the example of De Sitter and Einstein, ignorance is not an argument.

So, another mysterious object in space turned out to be just one of many manifestations of double stars and the ballistic principle. It should be noted that the duality of novae and supernovae is a direct consequence of the BTR: only in binary systems, where a star moves in an orbit with variable radial acceleration, strong fluctuations in brightness and spectrum can occur. Therefore, when astronomical observations confirmed that almost all supernovae, novae and nova-like ones enter binary stellar systems as components [27, 76, 158], this in itself could be considered a triumph and confirmation of the ballistic theory. Now more and more astronomers agree that all the novae are binaries and that this is what their flares are associated with [70]. However, when it was discovered that the outbursts of novae are associated with their orbital motion in a binary system, they began to come up with very complex and artificial mechanisms explaining how this motion leads to outbursts of stars when they exchange their mass and throw the atmosphere into a gravitational field [70,76]. Against this background, the BTR looks much more plausible and convincing, since initially it was the

ballistic theory that predicted the outbursts of novae, as a natural consequence of the motion of stars in orbit and their duality. Therefore, the mere title of books such as "Explosive Variables as Binary Stars" [70], written by authoritative astrophysicists, sounds like a hymn to the victory of the BTR.

§ 2.19. Pulsars

... Is the same light shining here or new,
The same or a new shadow moves from place to place ...
Only reason is obliged to resolve this question;
The eye, however, cannot cognize the nature of things at all,
Therefore, do not blame him for what only reason is to blame. It seems
to us that the ship on which we are sailing is motionless, The same one
that is moored passes by; Hills and valleys seem to run to the stern
Our ship walks past them, sails unfurled. The stars seem to us fortified
in the vaults of the ethereal,
But nevertheless, they all move without interruption.
Titus Lucretius Carus, "On the nature of things", 1st century. BC. [77]

In addition to supernovae, other variable stars are known that send very bright flares to us, like beacons, following each other at regular and very short intervals. These stars are called pulsars. It is quite possible that the Ritz effect is also responsible for the powerful periodic radio bursts of these stars, which are also part of binary systems [26, 76]. The high repetition rate, sharpness and strength of these bursts suggest the compression-focusing effect of the time $T' = T(1 - La/c^2)$ according to the Ritz effect (§ 2.11). Finally, the Ritz effect is also capable of creating huge shifts in the frequency of light $f'/f = T/T'$, which makes a simple optical source we perceive as an X-ray or, on the contrary, as a radio source. And, therefore, both X-ray and radio pulsars are, in all likelihood, ordinary optical stars, but with the radiation strongly shifted, due to the Ritz effect, to the short-wave or long-wave region (§ 2.21). No wonder that some pulsars, including the famous pulsar in the Crab Nebula, have been identified with variable stars [75].

In principle, pulsars are often compared to flashing beacons. According to modern concepts, a pulsar, like a spinning lighthouse searchlight, emits a narrow radio beam (Fig. 76), which regularly crosses the Earth during the fast rotation of the star [76, 158]. It is at such moments that the instruments register powerful radio bursts. However, if we take into account the huge frequency of pulses, such a rotation frequency would break any cosmic body, and, therefore, the pulsar is proposed to be considered an unprecedented compact neutron star with such a high density and gravity that it can keep even a super-spinning star from breaking. On the other hand, the BTR also allows the pulsar to be considered an ordinary binary star, periodically amplifying the radiation due to its orbital motion and the Ritz effect. Indeed, the huge repetition rate of impulses, their abruptness, impossible for stars, suggests that pulsar flares are just an appearance, an illusion, a mirage created by the temporary focusing of light from the Ritz effect (§ 2.11). Let's remember that this is how the period of shots from an accelerating vehicle $T' = T(1 - La/c^2)$ seemed subjectively shorter (Fig. 27).

According to this ballistic analogy, to an observer who is from an accelerating approaching vehicle at a sufficiently large distance L , the repetition rate of bullets and flashes may seem so high that he decides by the rate of fire: they are not

shooting from a pistol (with a repetition period of shots $T = 1\text{ s}$), and from a machine gun, as a last resort, from an automatic pistol such as "Walther" or APS Stechkin. The rate of fire of the machine gun (10 rounds per second $T' = 0.1\text{ s}$) will be achieved if the distance L is increased to 8 km (since this is just an illustration, we consider the firing range to be unlimited). The Ritz effect can subjectively increase the rate of fire of the weapon so much that all the bullets will arrive at the observer at the same time, that is, $T' = 0\text{ s}$, which, under the given conditions, will occur at a distance of $L = 9\text{ km}$. In the same way, the Ritz effect, due to the inhomogeneity of the light beam in terms of velocities, subjectively increases the frequency of pulsar flashes, increasing the frequency of the pulses sent by it. It is interesting that the machine-gun analogy and the role of beam inhomogeneity are intuitively given by astronomers [77, p. 158]: "Frank Drake, while studying pulsars at the Arecibo radio observatory, discovered that each of these searchlight beams is not uniform, but consists of many smaller beams that are thrown out like a machine-gun burst." It is no coincidence that the English word projector means not only "searchlight" with which the pulsar is compared, but also "mortar, flamethrower, machine gun". So, it is the ballistic Ritz effect that leads to a cluster, an increase in pulsar pulses.

The same effect translates the optical radiation of the pulsar into the radio range. Indeed, many pulsars are known that are part of close binary systems, say the PSR 1913 + 16 pulsar, in which the components, separated by a distance of the order of the solar radius, revolve with a period of 8 hours [26]. Examples of such pulsars can be found in Lipunov's book [76]. Binary radio pulsars have also been discovered, say PSR J0737-3039A, where the pulsars turned out to be both components orbiting the center of mass in 2.4 hours and blinking, one with a period of 2.8 s, and the other with a period of 0.02 s ("Nature" 2005, No. 2). This really discovered duality of pulsars and other variable stars is one of the triumphs of ballistic theory, which predicted such a mechanism of fluctuations in their brightness a century ago.

The connection between pulsar radio brightness fluctuations - with its duality, rotation, causing outbursts of stars (§ 2.12, § 2.18), is confirmed by synchronous fluctuations in the brightness of pulsars in the optical, radio, X-ray and gamma ranges. An example is the famous pulsar PSR 0531 + 21 in the Crab Nebula, which changes not only radio brightness, but also visual brightness, X-ray and gamma radiation 30 times per second [75, p. 154]. To explain this within the framework of the quantorelativistic theory of pulsars, it was necessary to invent complex mechanisms, since in different ranges the radiation is generated in different ways. And in the armored personnel carrier there is no need to explain anything: the Ritz effect equally generates and synchronously changes the brightness of the source in all radiation ranges. At the same time, in the optical and radio ranges, in some pulsars, in addition to the primary, a secondary maximum of radiation was found [75], as well as a hump in Cepheids, probably caused by synchronous brightness oscillations of the second, weaker component of the binary star in antiphase with the blinks of the main one (§ 2.12).

The brightness oscillations of pulsars in optics and X-rays are noticeably smoother than in the radio range. This is probably due to the fact that the Ritz

effect manifests itself much more strongly in radio beams than in optical ones, and, therefore, leads to a better concentration of light. Indeed, as it was found earlier (§ 1.13), due to the interaction with the interstellar medium, the light from re-emission gradually loses the speed of the source, and the effective distance L in the Ritz formula decreases. Therefore, in the optical range, the pulsar's brightness fluctuations are less pronounced and smoother, like the bursts of intensity in the klystron corresponding to short distances (Fig. 73). The absorption of light by the medium can also lead to a phase shift of the bursts of optical and X-ray radiation, as in the PSR 0833-45 pulsar [151, p. 524], and also - to a strong decrease in brightness, which is why most pulsars are recorded only in the radio range. Radio emission interacts much less with the interstellar medium and, therefore, firstly, it is absorbed less, and secondly, it retains the velocity obtained at launch for a long time. And, therefore, the Ritz effect in the radio range leads to a much sharper temporal focusing of radio emission, in the form of very high and short peaks. In the formula $T' = T(1 - La/c^2)$, the effective distance L (at which radiation is converted according to the Ritz effect) given, taking into account re-emission by the interstellar medium, is much larger in the radio range than in the optical one.

That is why the pulsar flashes differently than the Cepheid: it does not change the radio brightness smoothly, but gives abrupt and powerful pulses of radio emission. Such bright and short flares are probably caused by the fact that when the pulsar moves, its acceleration a at some moments is exactly equal to c^2/L , and the brightness proportional to T/T' turns out to be infinite. This is possible if the radial-velocity curve of the pulsar is so skewed that its loops go over each other. In this case, several images of the pulsar appear: due to ambiguity, the vertical line (time slice) will intersect the curve several times. And at the moments when this line, shifting, touches the curve, providing the equality $a = c^2/L$ (Fig. 91), the brightness of the star according to the Ritz effect becomes infinite. But the moment of contact also lasts extremely short $T' = T(1 - La/c^2) = 0$. This is how sharp flashes of a pulsar are born, similar to periodic flashes of a pulsed laser, which also converts a small average pump power from a continuously operating light source into short, but very powerful pulses of laser radiation, due to the accumulation of energy in a short time interval. It is interesting that the typical shapes of pulses given by pulsars are very similar to those that should be obtained in binary systems due to the temporal focusing of light, as well as the typical shapes of electron pulses in klystrons (Fig. 73). It is precisely such sharp double and single pulse peaks that are observed in pulsars [80; 151, p. 523].

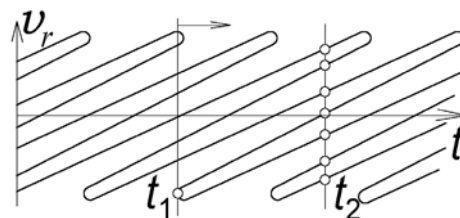


Fig. 91. The contact at the moment t_1 creates a radio pulse of the pulsar. At the moment t_2 , the pulsar gives 7 images ($k = 7$).

Strikes in pulsars and the frequency of their impulses following each other in a fraction of a second. Any cosmic body spinning with such a frequency will be torn apart by centrifugal forces. But for an armored personnel carrier, a huge frequency and a short period are not a problem. Indeed, the real orbital period of a star P can be a value of several days, which is usual for blinking stars, which for a distant observer may well shrink into fractions of a second (the period P' , with which the apparent radio brightness of the star changes) from the strong Ritz effect $P' = P(1 - La/c^2)$ caused by the attraction of another star. With the help of the BTR, it is possible to easily explain why the periods of pulsars gradually increase, although sometimes there are abrupt changes in them. As in the case of Cepheids, this can be caused by tidal forces and collisions changing the orbital period (§ 2.12). Interestingly, along with the usual ones, X-ray pulsars have been discovered that send glimpses of not radio, but X-radiation to us from the depths of space. In them, the period usually does not grow over time, but falls [76]. This may be due to the fact that their binary systems are much closer than in pulsars. Therefore, it is not tidal friction that predominates there, but relativistic effects (predicted not only by general relativity [26], but also by BTR § 2.3), gradually decreasing the radius and period of rotation of the star's blinking.

However, a smooth change in the pulsar blinking period can be imaginary if it is caused by a gradual change in the acceleration a of the pulsar system and the Ritz effect: for radio pulsars for which the blinking period $P' = (1 - La/c^2)$ smoothly increases from the acceleration drift a , before it could be equal to zero, due to the exact equality $a = c^2/L$. But then the compression of the periods to zero should have led to a giant increase in the brightness of the star, as in the case of supernovae (§ 2.18). Indeed, the pulsar in the Crab Nebula is observed on the site of a supernova that erupted there a millennium ago, and the pulsar needs about the same period to increase the period from zero to the current 0.03 seconds [151]. On the other hand, X-ray pulsars, the period P' of which smoothly decreases, due to the approach of the acceleration to the critical value $a = c^2/L$, in the future may explode as supernovae, and then turn into radio pulsars, which will decrease the flashing period. Moreover, X-ray pulsars with the shortest period and with the highest rate of its decline should flare up first.

The huge frequency of pulsar flares can be explained by another mechanism. It was shown above how a pulsar creates several images, visible simultaneously and superimposed on one another, and their number k can reach thousands (Fig. 91). And, if the binary system of the pulsar itself enters into another system (Fig. 80.2), it will multiply the number of images, and hence the frequency of flares by a factor of k . In turn, this triple system can enter into another, etc. The resulting flash frequency, equal to the original one multiplied by the multiplication factor k of each of the systems, can become enormous. In space, such multiple, multilevel systems are common, including among pulsars, say the same PSR J0737-3039A, each component of which, apparently, has a satellite that provokes flares of the central star. In contrast to the BTR, which easily explains many of the features of pulsars, the modern theory, which represents them as rapidly rotating neutron stars (§ 2.20), the further away, the more entangled it becomes. Discovered, for example, are pulsars with a period of many seconds, which are

generally incapable of generating radio emission, according to the official theory of pulsars. This is both the aforementioned PSR J0737-3039A, and PSR J2144-3933, which has a blinking period of 8.5 s (Science and Life 2000, No. 2).

Thus, **according to the correct remark of Lucretius (see epigraph § 2.19), observing the phenomena of the cosmos, one should not take what he saw for reality**, since it is easy to be deceived by sight. It is interesting that long before Copernicus and Galileo, Lucretius associated such a deception of the senses with the relativity of movements, including for light. Indeed, as has been shown, the variability of many stars, especially pulsars, is only an appearance, an illusion due to the relative nature of the movement of light (in fact, the ballistic principle of § 1.9) and the Ritz effect - the superposition of light rays emitted at different times and indistinguishable separately neither by the eye nor by the device. Therefore, the imaginary pulsar flashes or the imaginary movements of the luminaries across the sky, discovered by Copernicus, can only be established with the help of a mind capable of recognizing an illusion.

That's all there is for now about variable lighthouse stars. When the first interstellar ships go into space, the way for them, as at the dawn of navigation, will indicate the stars. Among them there are many who are already called "beacons of the Universe" - these are blinking Cepheid stars, flashes signaling how far from us islets of stars and galaxies, scattered in the endless ocean of space. There are also radio beacons in the Universe, like those that cover our planet with a network and standard radio pulses show the way to ships. They correspond to pulsars, which regularly send pulses of radio emission to the Earth. Finally, we mentioned new stars and supernovae similar to signal flares, bonfires, clearly visible from afar. Now we see that all these variable lighthouse stars, given to us by nature, have a common structure: these are the most common binary stars, whose orbital motion due to the Ritz effect leads to periodic fluctuations in brightness and spectrum. Let's hope that the luminous ideas of Ritz and the sparkling stars, these beacons, the beacons of the knowledge of the Universe, will finally disperse the darkness and show the way out of the labyrinth of dead ends, fjords and reefs, into which non-classical, abstract, dark physics has led science.

§ 2.20. Dwarfs, neutron stars, black holes and dark matter

With a whole retinue of selected courtiers and dignitaries, among whom were the first two, who had already seen the fabric, the king appeared to the cunning deceivers who were weaving with all their might on empty looms.

- Magnifique! Is not it? - spoke the first two dignitaries. - Would you like to admire? What a drawing! What colors!

And they poked their fingers into space, imagining that everyone else can see the fabric.

Hans Christian Andersen, The King's New Dress

Just as there is no need to invent exotic and specific objects such as quasars, supernovae, pulsars and Cepheids, there is no need for superdense stars - white dwarfs, neutron stars and black holes. The density of these hypothetical stars is billions of times that of water [75]. So, neutron stars have the density of an atomic nucleus. All of these stars were predicted as consequences of false theories: quantum physics and the theory of relativity. Astronomers were so eager to find

confirmation of the reality of these fictional objects that, of course, they "found". However, their detection is the result of incorrect interpretation of observational data and disregard for the Ritz effect.

Consider, for example, dwarf stars, more precisely, white dwarfs [75]. Their small size and huge density were obtained indirectly, based on spectral observations of binary systems that included white dwarfs. From the velocity curve obtained from the Doppler shift of the spectral lines, the radius of the orbit and the period of the star's revolution were found, from where its mass was obtained. And the size of the star was found by the known distance to the star and its apparent brightness. At a given temperature of the star, its brightness is proportional to the area of the visible disk of the star and inversely proportional to the square of the distance to it. By dividing the mass of a star by the cube of its radius, a gigantic density was obtained. But here, in both points, a mistake is possible. First, the periodic shift of spectral lines, which were used to search for orbital velocities and radii, may be caused not by the Doppler effect, but by the Ritz effect, which is still being ignored. And, in fact, the Ritz effect at large distances can lead to much larger frequency shifts than Dopplers. Therefore, if we use the Doppler formula, it would seem that the companion star is moving at a much higher speed and in a wider orbit, which will lead to a strong exaggeration of the mass of the central star (the mass is proportional to the cube of the orbital radius). The significance of the Ritz effect for dwarfs is also manifested in the fact that many of them are variable stars.

The second error arises from an incorrectly found luminosity of a star, say, if it is surrounded by a dense cloud of gas and dust. Then its visible radiation will be strongly weakened by absorption, which will lead to an extremely underestimated star. This is exactly how the dimensions of the first open white dwarf, Sirius B, which is part of the binary system, unacceptably small for a star, were found from the radiometric method for estimating its diameter [19]. With a mass of the order of the sun, this star had a visual magnitude hundreds of times less than the Sun at the same distance. Hence the conclusion was drawn about the small size of Sirius B and its gigantic density. But, if due to optical effects we see the radiation of stars strongly weakened, then such estimates of sizes are worth nothing. Radiation can be attenuated due to strong absorption by clouds of dust and gas around the star, which is why it emits the bulk of its energy in other, non-optical ranges (especially in the infrared, as in a number of dwarfs). It is no coincidence that white dwarfs are so similar to the nuclei of planetary nebulae, that is, stars surrounded by a shell of gas and dust, which, like white dwarfs, have temperatures of the order of 10^5 K and strong radiation in the infrared range. Or, conversely, if the atmosphere surrounding the star is extremely rarefied, then for it (from the small re-emission of light according to Fox, § 2.4) the Ritz effect may be great, which reduces the brightness and frequency of radiation of atoms accelerated by the gravitational field of the star. The role of the Ritz effect for white dwarfs is confirmed, at least, by a strong redshift and broadening of spectral lines [151], due to the inequality of radial accelerations in different parts of the stellar disk. So, the real luminosities of white dwarfs, and, therefore, their sizes, may turn out to be much higher.

Together, these two errors in the values of masses and sizes inevitably lead to incorrect values of the density of these stars. That is why white dwarfs, like all other stars, do not fit on the main sequence of the Hertzsprung-Russell diagram (spectrum-luminosity), as well as on the mass-luminosity dependence common for all stars [75, 151]: the reason is in the incorrect definition their masses and luminosities. If their characteristics are determined correctly, then the dwarfs will fit exactly on the main sequence and will obey the universal mass-luminosity relationship. Indeed, many dwarf stars, including our Sun, lie on the main sequence. These ordinary, so-called "red" and "yellow dwarfs" have sizes, masses and densities determined correctly. On the other hand, white dwarfs are knocked out of the general row precisely from an inadequate assessment of their characteristics, first of all, the absolute luminosity of stars and distances to them. Judging by the spectrum, white dwarfs are very hot stars, which means that if they are included in the main sequence, then their true masses and luminosities should be large. The mass of the "white dwarfs" is indeed impressive (for example, Sirius B has the mass that it should have for main sequence stars of the same temperatures and spectral types), but the luminosity value was mistakenly taken to be greatly underestimated. So, dwarf stars and giant stars (§ 2.13) do not fall on the main sequence only from unaccounted for effects, including the Ritz effect, which changes the visible parameters of stars. If these effects are taken into account, then dwarfs and giants, with the correct determination of their characteristics, will themselves fall into the general row of stars. The same Ritz effect sharply distinguishes from the general row of stars - "dwarfs" and "giants", for which it is most significant: it is among them that variable stars are most often encountered. Their variability, as well as their other parameters, is only an optical illusion, visibility. One mistake leads to another. A very strong shift of spectral lines towards the red end of the spectrum was found in the spectra of white dwarfs. And this, according to the general theory of relativity, proves their huge specific gravity. Indeed, the stronger the gravitational field, the more the frequency of the processes is changed (§ 1.18). In fact, a strong frequency shift can be caused by the same Ritz effect from the rotation of a star and the accelerated motion of atoms in its gravitational field. The fact that the Ritz effect manifests itself in white dwarfs is also confirmed by the variability of the brightness of some of them with periods of minutes and hours, as in Cepheids and pulsars (§ 2.12, § 2.19). In the part of the star visible to us, the acceleration is directed towards the center of the star (that is, away from us) and, according to the Ritz effect, can, as in the case of redshift in galaxies, lead to a shift of lines to the red side (§ 2.4). And, since in different parts of the star the magnitude of the radial acceleration is different, the spectral lines should be strongly broadened, which is observed [151]. In addition, a strong broadening and red shift of spectral lines is possible under the influence of high pressure in the dense atmospheres of such stars. This is a well-known effect discussed for stars such as P.N. Lebedev [17, 19, 133].

So it turns out that superdense stars, "white dwarfs", are an illusion, fiction, white-hot delirium of some drunken-minded astronomers. And objects mistaken for white dwarfs are ordinary stars with normal density. It is worth noting that the quantorelativistic theory of white dwarfs was invented by the already known

rogue and falsifier A. Eddington, who in the same way invented pulsating giant stars (§ 2.13), and all just to substantiate his false theory of stellar evolution. Astrophysicist theorists invent various mythical supernatural objects in space, taking advantage of the fact that you cannot fly there and check everything on the spot. They ignore Occam's principle that entities should not be multiplied beyond what is necessary. Indeed, to explain all the phenomena of space, ordinary double stars and the ballistic principle, with the resulting Ritz effect, are sufficient.

The same is true for neutron stars and black holes, the theory of which was largely developed by the famous criminal from science R. Oppenheimer on the basis of quantorelativistic theories (§ 5.17). Confirmation of the reality of neutron stars in the remnants of supernovae that have thrown off the envelope is considered to be pulsars, which supposedly can only be neutron stars with a super-strong magnetic field and a small radius. Otherwise, with their huge rotational speed, they would be torn apart by centrifugal forces. For the small radius of the pulsar, it allegedly also says that the dimensions of an object that changes brightness should be less than the product of the speed of light c times the period P' or the duration of the pulses, which, with pulses in milliseconds, gives the dimensions of the pulsar or its emitting region - in hundreds meters. But the inconceivably high frequency of rotation, the ultra-short period P' of pulsars' blinking and their other strange properties - this, as we saw (§ 2.19), is also an optical illusion caused by the addition of the speed of light with the speed of the binary stars that emitted it. Therefore, these untwisted neutron stars-magnets are fiction.

Likewise, the masses of neutron stars and black holes found from spectroscopic velocity curves that do not take into account the displacements from the Ritz effect are erroneous. So, lately there has been a lot of talk about dark matter and supermassive black holes in the centers of galaxies. Only by assuming their existence, astronomers manage to explain the enormous rotation speeds of matter and stars in the nuclei of galaxies. But, if the spectral shift, according to which such velocities are found, is mainly caused by the Ritz effect, and not by the Doppler effect, then these velocities are greatly exaggerated. And, therefore, there is no need to introduce mythical superheavy black holes. Since the super-fast movements of the stars near hypothetical black holes are illusory, then nothing speaks of a their large gravity. The real speed of the stars is much less, if you search more correctly its according to the Ritz formula, not Doppler. Likewise, visible super-fast movements stars around galactic centers, as seen (§ 2.15), can be an illusion that does not require the involvement of hypotheses about a supermassive central body. And, therefore, there is no need to introduce mythical superheavy black holes. Since the super-fast movements of the stars near hypothetical black holes are illusory, then nothing speaks of a large gravity. The real speed of the stars is much less, if you search more correctly its according to the Ritz formula, not Doppler. Likewise, visible super-fast movements stars around galactic centers, as seen (§ 2.15), can be an illusion that does not require the involvement of hypotheses about a supermassive central body. All such effects can occur in the absence of superdense bodies that distort the direct path of light rays. The visible multiplication of the number of images, blurring of

images of objects in a ring and a short-term increase in the brightness of stars are the result of the arrival of light to the observer simultaneously from different points of the object's orbit, due to the difference in the speed of light and the Ritz effect (§ 2.12, § 2.14, § 2.16).

Of course, Ritz's theory also allows the bending of light rays (§ 2.2), up to their complete reversal or stopping (if the redshift reduces the frequency of light to zero). Such stars, which do not emit their radiation, would in part resemble black holes and would lead to a strong deflection of light around them. However, the giant densities of such stars required for this and the sizes of their atmospheres (in which there is a gravitational bending of the rays) are unlikely to be realized in nature. Therefore, to explain the cosmological mirage, it is much easier and more natural to admit not gravitational, but temporary lenses that do not require such exotic objects. Black holes are also not needed to explain the X-ray and radio sources of radiation of the Cygnus X-1 type found in space, where the black hole is believed to be located [39, 76]. After all, the Ritz effect, as was said, is capable of creating huge shifts in the frequency of light $f'/f = T/T'$, which is why a simple optical source can be perceived as an X-ray or, on the contrary, as a radio source. And, therefore, X-ray and radio sources are not black holes or neutron stars, as it was believed until now, but ordinary ordinary stars, which, due to cosmic illusions and mirages, are perceived by us in an unusual light. So, you should not believe in the existence of all this mysterious dark matter, black holes and neutron stars, invisible, like the matter of the dress of the naked king. All this was a bluff, bashfully supported by the academic retinue, who managed to see a "miracle" in the place of naked new and supernova stars that shed their shell. And scientists stubbornly repeat the opinion imposed by crooks, so as not to reveal their "incompetence". Quasars, Cepheids, pulsars, black holes, gravitational lenses - all this, from the point of view of Ritz's ballistic theory, may, like the scattering of galaxies, turn out to be just an illusion, an optical illusion of sight, so grandiose that it makes the entire Universe "blush". Only the luminous Ritz effect and the ballistic theory make it possible to expose this deception, declaring to everyone the obvious truth, similar to the words of a child from a fairy tale: "And the king is naked!"

§ 2.21. Radio galaxies and other space anomalies

Thus, one of the brightest revelations of the Universe opens before us, that all these "monsters": radio galaxies, quasars and other anomalous objects of radiation are nothing more than ordinary galaxies, the optical radiation of which, as a result of the Doppler effect, is transformed into radiation of other ranges of the electromagnetic spectrum ... In other words, an observer located in the frame of reference of a radio galaxy, quasar or the famous "exploding" galaxy M-82, will observe our Galaxy as a radio galaxy, quasar or "exploding", respectively.

S.P. Maslikov, late XX century. [81]

Completing the story about the mysteries of space, various space anomalies and lighthouse stars, it is worth mentioning the object SS 433 (sometimes called a microquasar), which not only blinks, but also looks, according to scientists, like a lighthouse [76, 158]. SS 433 is considered to be a rapidly rotating star, launching jets of gas from two opposite points on the surface, rotating after the star, like the

beams of a searchlight in a lighthouse. Due to rotation, the projection of the speed of the jets on the line of sight periodically changes along a sinusoid, and the speed of gas flows found from the spectral shift is enormous and amounts to 80,000 km/s - more than 1/4 of the speed of light! What generates such fast flows is unclear. Isn't it easier to consider SS 433, like other anomalous objects, just a double star, for which the Ritz effect is especially strong? It will cause strong regular shifts of the spectral lines of the two stars according to the Ritz effect. And the orbital speed of these stars will, of course, not be 80,000 km/s, but much less, because in this case the Doppler effect estimates do not work. All such super speeds are an illusion (§ 2.15).

Also, with the help of radio interferometers, a structure resembling two oppositely directed ejections was detected near the SS 433 object. They were mistaken for symmetrically flying jets of gas. But, if SS 433 is just a double star, then the ejections are, apparently, two images of this pair of stars blurred along the orbits (Fig. 92). It is not in vain that the "ejections" move, changing

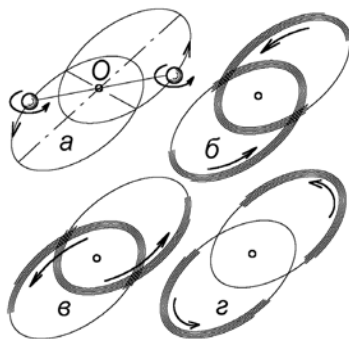


Fig. 92. Rotation of binary stars in the SS 433 system (a) creates their blurring in the form of "ejections" (b, c, d), which, moving along the orbit, change their direction.

their direction with the same 164-day period, with which, judging by the radial velocity and brightness curve, the orbital motion of a pair of stars in the SS 433 system occurs. Note that the resulting configurations are similar to exotic forms of galaxies, in which the spiral arms do not move away from the core, but from the ring surrounding it, as if in the "§" icon (Fig. 92.b, c), or, leaving the core, bend in a loop back (Fig. 92.d). Therefore, it is possible that such strange shapes of the arms of galaxies are also an illusion created by their rotation. Luminous ejections, jets, tails, barriers of galaxies [34] can have the same illusory nature, if these are their traces along the orbit. No wonder, most often these structures are found in double galaxies, like paired stars circling near a common center S (Fig. 93).



Fig. 93. Axial and orbital rotation of galaxies and their nuclei leads to multiplication and blurring of images in the form of irregular arms, "ejections", "bridges", "tails".

Since we are talking about galaxies, it's time to move to higher spheres and talk about the rotation not of individual stars, but of entire galaxies, with their almost spherical cores. Earlier it was shown that it is the rotation of the nuclei, coupled with the Ritz effect, that creates the redshift in galaxies described by the Hubble law (§ 2.4). The rotational acceleration of the nucleus imparts a different speed to the beams of light emitted earlier and later, which is why, as they move, the rear crests of the waves lag more and more behind the front ones: the wavelength increases with distance, like intervals in a chain of trams traveling at different speeds (Fig. 70). But, as mentioned, there is also a blue shift, which we do not observe only because the nuclei are opaque to light (§ 2.4). However, for radio emission, the nuclei of galaxies are to some extent transparent. Is this why observations of the sky, galaxies in radio beams present astronomers with many surprises?

So, examining an ordinary galaxy, we see only the near parts of its nucleus, in which the acceleration is directed away from us, and, therefore, the Ritz effect leads to a decrease in the frequency f and the brightness of the light emitted by the nucleus (Fig. 93). But let's move on to the far side of the nucleus, where the acceleration directed towards us leads to an increase in the frequency and brightness of the radiation. The energy of the radio emission coming from the invisible side is vanishingly small in comparison with the energy of the light from the visible side. But the situation changes dramatically for distant galaxies. According to Hubble's law, with removal, their brightness and frequency in optical rays gradually decreases. But in radio beams coming from the opposite side, the brightness and frequency of radiation should, on the contrary, increase with distance. Therefore, we would perceive distant galaxies rather as sources of bright radio emission. And such radio galaxies have indeed been found in space!

At a certain distance from us, the Ritz effect and blue shift can become so great for the radio emission of galaxies that, in addition to an increase in brightness, they will also cause a strong shift in the frequency of the radiation and transfer it from the radio to the optical and even to the gamma range, and, on the contrary, the optical can be converted to radio and gamma bands. Therefore, the BTR predicts powerful sources of not only radio and optical, but also gamma radiation,

actually discovered, say, in the form of bursters. It is impossible to say exactly at what distance such an effect will manifest itself, since in the BTR the Hubble constant, found by the formula $H = V^2/Rc$ (where V is the circumferential velocity of the galactic nucleus, R is its radius), and its accepted value of 55-75 (km/s)/Mpc has only an average statistical meaning. The value of H varies slightly not only for different galaxies, but even within the same galaxy (Table 1). The closer O is to its center, the faster the rotation and the higher the H value, with a corresponding conversion of frequency and brightness.

Due to the opacity of the nuclei, these effects are not so strong for light, since the radiation comes only from the relatively thin surface layer of the nuclei. But for all-permeable radio waves, the effect will cause a noticeable increase in intensity from the central regions of galaxies with a large blue shift or redshift, which translates optical radiation into the radio range. It seems that it is this effect, and not some mysterious activity of nuclei, that makes their centers powerful sources of radio emission. The nucleus of our galaxy also radiates strongly in the radio range. However, the absolute value of its radio brightness is low, since it is located incomparably closer to the nuclei of other galaxies, and, therefore, the Ritz effect is not so great for it. The same mechanism of concentration of radio emission according to the Ritz effect should work in such powerful radio sources as quasars, identified with active galactic nuclei. For quasars (§ 2.17) have, like the cores of nuclei, small sizes and high rotation speeds.

The hypothesis of the conversion of optical radiation due to movement into other ranges, as the main reason for the radio emission of galaxies and other objects, was put forward by S.P. Maslikov in 1998. However, the mechanism of spectrum transformation according to the Doppler effect proposed by him required either the adoption of a complex nonlinear dependence of the Doppler shift on the velocity (contrary to experiments), or near-light velocities of motion of space objects, which are unlikely. But the transformation of the spectrum of galaxies by means of the Ritz effect, proportional to the distance, does not require extreme velocities and accelerations, but occurs at a sufficiently large distance, even with very moderate kinematic characteristics. Note that the first radio astronomers K. Jansky and G. Reber, enthusiasts who were able to discover cosmic radio emission, including the radiation from the core of our Galaxy, without official support, believed that it had, like optical radiation, a thermal character. And, indeed, all heated bodies emit, in addition to light, also radio waves. However, the intensity of radio emission from the galactic nucleus was much higher than what was required by Planck's law. In addition, if Planck's law predicted an increase in the intensity of radio emission with an increase in its frequency (Jeans law), then observations showed an inverse relationship: shorter-wave and high-frequency radiation turned out to be weaker.

Therefore V.L. Ginzburg and others proposed exotic nonthermal mechanisms for the generation of radio emission by space objects, first of all, synchrotron and bremsstrahlung. These mechanisms, based on the rotation of relativistic electrons in strong magnetic fields, look extremely artificial, and therefore have limited significance in space, being responsible only for the weak radio emission of planets and stars. On the other hand, if the true nature of powerful radio emission

is thermal, then all its features can be easily explained by the Ritz effect, which shifts the maximum thermal radiation of stars from optics to the radio range (as if from low-temperature bodies), in which the energy of the star will be absorbed. Then, the falling branch of the Planck spectrum (Fig. 144) will also fall into the radio range, and the radio emission spectrum will have to be described not by Jeans' law, but by Wien's law, which speaks of a decrease in radiation intensity with increasing frequency, which is observed in cosmic radio sources. It is not for nothing that the appearance of the spectrum of pulsars and other radio sources in many respects resembles the spectrum of radiation of an absolutely black body, only with a very low temperature and a maximum strongly shifted to the low-frequency region (it is no coincidence that at frequencies $f < 100$ MHz, where the "collapse" of the pulsar spectrum begins, the ascending branch of the Planck spectrum, described by the Jeans law $u \sim f^2$, becomes visible, because pulsars in this range give a spectrum of the form $u \sim f^{-\alpha}$, where the spectral index is $\alpha = -2$ [151]). But just such a powerful shift in the optical spectrum of a star could produce the Ritz effect.

And, on the contrary, if the Ritz effect shifts the spectral maximum to the high-frequency region, then the radiation in the X-ray and gamma ranges will greatly increase, as if in a body with a giant color temperature T_c . And, precisely, the spectrum of X-ray bursts of bursters is identical to the spectrum of radiation of an absolutely black body, with an inconceivably high equivalent temperature $T \approx 7 \cdot 10^7$ K [151]. Of course, such a temperature T_c , found from Wien's displacement law $T_c = b/\lambda_{\max}$, is just an illusion from the Ritz effect, which increased the frequency f of thermal radiation from a star with a temperature of $T \approx 10^4$ K. The effect converts radiation from optics ($f = 10^{15}$ Hz) to X-rays ($f = 10^{18} - 10^{19}$ Hz), with a proportional reduction in the wavelength $\lambda_{\max}$ of the spectral maximum and an increase in the color temperature T_c - by a factor of thousands. However, even these bursts of bursters are being interpreted as a manifestation of synchrotron radiation of spinning electrons generating a complex spectrum, which, in part, is similar to the spectra of orbiting stars, the reason for which is also the Ritz effect common to these phenomena (§ 1.11). But, since the stars flying in orbit themselves generate such a spectrum, which explains the recurrence of flares and their enormous energy (this is the energy of the thermal radiation of the star), then there is no reason to attract the rotation of superfast electrons that have come from nowhere in the superstrong magnetic fields that have arisen. Likewise, the peaks (gyrolines) in the continuous X-ray spectrum of pulsars [151] are caused, by no means, by synchrotron radiation of electrons in the magnetic field of stars, but by the Ritz effect, which shifts the optical emission lines of atoms into the X-ray range. Thus, bursters and X-ray pulsars, contrary to the opinion of [Brecher](#) [6], do not reject, but brilliantly confirm the BTR. After all, if Ritz's theory had not been fulfilled and the Ritz-effect of spectrum transformation had not worked, X-ray sources would not have been observed at all.

So, the hypothesis of Maslikov, Yansky and Reber about the nature of X-ray and radio emission, as usual thermal radiation of stars, acquires a strict justification based on BTR. In addition, as Jansky suggested, there is also natural,

unbiased thermal radio emission from space gases. This includes, among other things, microwave background radiation (§ 2.5) and hydrogen radiation at a wavelength of 21 cm, which is no longer associated with continuous, but with a discrete linear thermal spectrum of hydrogen. This is about radiation of exotic stars and galaxies. Rotation leads to other interesting effects, especially those affecting the shape of galaxies, their visible structure. Since the cores of the nuclei, due to the huge concentration of stars in them, have enormous rotational speeds, then the corresponding will be for them the degree of blur, due to the dispersion of the velocities of stars and light (§ 2.16). Therefore, observing the nuclei of distant galaxies and radio galaxies in radio beams, we would find interesting things.

Just as a spinning star creates a blurred image along the direction of flight, the even faster cores of galactic nuclei create elongated structures. As a result, some galaxies should have two long ejections emanating from the nucleus in opposite directions and formed by the "lagging" and "leading" edges of the nucleus. And such spindle-shaped ejections are the most common occurrence, especially for radio galaxies [34]. There are also "outbursts" in simple galaxies, in which they take either the form of an axis crossing the galaxy like a whirligig needle, or the shape of elongated polar rings perpendicular to the galactic plane ("Priroda" 2005, No. 3). But most of these "ejections" are nothing more than blurred images of nuclei stretched along elliptical orbits and lines of motion of galaxies with their satellites (§ 2.16). The huge velocities of "ejections" found by the Doppler effect are the same optical illusion as the ejections themselves, because the main contribution to the frequency shift, in this case, should be made by the Ritz effect (§ 2.15). Science does not know of energy sources capable of imparting gigantic velocities to emissions and generating powerful radio emission from nuclei. Therefore, the conclusion suggests itself that the activity of nuclei, the explosions of galaxies are illusory, like the explosions of new stars (§ 2.18). If the core contains a sufficiently bright object, say, a star cluster or a supernova, its image can multiply due to the rotation of the core. Then several bright spots will be visible along the "ejection" line. That is why the image of the "blowout" is often divided into separate groups of spots and dots (Fig. 93.a). The image of an entire galaxy moving in orbit may also double. Also, quite often, images of quasars and radio galaxies double and triple. Therefore, often, instead of one of their images, two mirrors are observed, having a similar shape, spectrum and connected by an ejection-bridge (Fig. 93.b, c). Then they speak of a double radio source [20, 34], although in reality it is a multiplied image of one galaxy, where the compact central image corresponds to point 2, and the symmetrical lateral ones correspond to points 1 and 3 in Fig. 81.b. All images are elongated along the orbital line due to blur from the rotation of the galaxy (§ 2.16), and the side images, due to symmetry, have similar shapes and brightness. If the multiplication factor is even higher (Fig. 81.c), then each ejection will consist of several spots elongated in a line, like the "ejection" of Virgo A.

It must be said that the "emissions" of radio emission were also supposed to have a synchrotron nature, as if the radio emission was generated by electrons spinning in strong magnetic fields, gradually losing energy for radiation. This,

allegedly, is confirmed by the noticeable polarization of emission from emissions. But polarization is not proof. It can be caused by many reasons, for example, scattering of radiation by a gas. To some extent, radiation can be polarized, and light can also be blurred by stars. Indeed, in addition to the stars, the electrons that create radiation in their atoms also rotate. The visible orbit of the electron is distorted, blurred, like the shape of a star (Fig. 85), which leads to the inequality of the intensities of its radiation in the plane of the longitudinal and the plane transverse to the motion of the star. At short distances, this does not affect in any way. But on a cosmic scale, the effect becomes noticeable and leads to polarization of the radiation of the atom along or across the direction of its motion. If the atoms also rotate with the star, circular polarization of light is also possible. It is not for nothing that pulsars, some variable stars and especially objects called polars (the bright representative is AM Hercules) show noticeable polarization of radiation, the fluctuations in the magnitude and direction of which occur with the same period as the brightness fluctuations [76]. This should be the case if all these variable objects are binary stars. Due to their movement, along with the brightness, the polarization of the radiation will periodically change. Thus, the polarization of radio emission does not testify against its thermal nature.

So, we see that it is the ballistic principle (in fact, the principle of relativity of Galileo and Copernicus, applied to light) and double stars that are the key that allows you to reveal most of the mysteries of space, to reduce all the countless number of mysterious, fabulous, supernatural objects to ordinary stars and galaxies. It is precisely this conclusion of K. Tsiolkovsky that Part 2 and the XX century opens, and the equally deep thought of S. Maslikov completes them (§ 2.21). So, guided by the principle of Tsiolkovsky monism (the unity of the nature of all phenomena) and the principle of Occam's razor (not to multiply entities beyond what is necessary, giving preference to simple hypotheses over complex ones, rejecting supernatural explanations, if there are natural ones), it was possible to reduce the number of types of objects to a minimum and simplify the picture of the cosmos, thanks to the classical principle of relativity. Likewise, Copernicus 500 years ago, applying the kinematic principle of relativity and realizing that the visible motions of the stars and the Sun are an illusion, removed unnecessary celestial spheres and significantly simplified the picture of the Universe, easily explaining a number of regularities of the cosmos, for the interpretation of which a number of artificial mechanisms were previously introduced and hypotheses. And, here, again, following the precepts of Tsiolkovsky, Copernicus and Galileo, we brought the Cosmos into a state of primordial order by adopting the classical principle of relativity for light.

KEY IDEAS OF PART 2

1. Radar measurements of distances in space confirm the dependence of the speed of light on the speed of the source and the Ritz effect, rejecting the theory of relativity. These effects are also manifested in the curvature, slowing down of light and radio beams near the Sun.
2. The secular displacement of the perihelion of Mercury and other planets was strictly predicted by Ritz in 1908 on the basis of his electrodynamics, as a result of a change in the force of gravity due to the motion of the planets, similar to a change in the forces of interaction of moving charges.
3. The redshift of galaxies is a direct consequence of the Ritz effect, which predicts the correct value of the Hubble constant and removes all the paradoxes of redshift. Taking into account the simple interpretation of the CMB in the framework of the stationary Universe model, this rejects the theory of the Big Bang and the scattering of galaxies, indicating the eternal life and youth of the Universe.
4. Observations of binary stars and other objects in space lead, contrary to common misconception, to the rejection of the theory of relativity and the recognition of Ritz's theory, which predicted a number of effects that are now really discovered.
5. Variations in the brightness and spectrum of Cepheids, pulsars, quasars, busters, supernovae and novae, as well as other variable objects, get a simple explanation as a consequence of the Ritz effect from the revolution of stars, galaxies in binary or multiple systems that generate variable acceleration.
6. X-ray, gamma and radio radiation of space objects is naturally interpreted in BTR as a result of the conversion of optical radiation from stars into other ranges according to the Ritz effect. This rejects complex theories of radiation generation, which attract many controversial mechanisms and mystical objects, such as black holes, white dwarfs, neutron stars, etc.
7. Many fictional objects in space, such as dark matter and energy, supermassive black holes in the centers of galaxies, were invented only from the erroneous interpretation of observations. If we take into account the Ritz effect, then the need for such objects will disappear and all the mysterious phenomena observed in space will receive a simple explanation.
8. "Arcs", "ejections", multiple images of space objects have long been predicted by the BTR as an optical illusion from the simultaneous arrival of light emitted at different moments by objects flying in orbit. This makes it easy to understand all the features of such celestial pictures, rejecting dubious explanations according to the theory of relativity, such as gravitational lenses, etc.

Part 3.

MICROMIR BY RITZ

Everything, in itself, is made up of nature by two things: These are, firstly, bodies, and secondly, empty space, where they reside and can move in different ways ... Further, bodies or things represent beginnings, or they consist of a confluence of original particles.

Titus Lucretius Carus, "On the nature of things" [77]

The key to the mysteries of matter, as the ancient Greek atomists understood, is hidden in the depths of the microworld - on the lower floors of the universe, the hierarchical system of which is often compared to a high-rise building. On its upper, transcendental floors, there is a megaworld, considered in the previous part - the Universe. Below - galactic clusters, galaxies, then stellar and planetary systems, finally, the stars themselves, planets and satellites. Near the earth itself there are floors of the macrocosm - the world of things and scales familiar to us: from oceans and continents to the smallest crystals and organisms. Descending deeper, we will enter the secret halls of the basement floors, into the area of the microworld - the world of molecules, atoms and elementary particles. And there are many levels here too. These, hidden under the surface levels and transitions between them, we will consider in this part.

The floor of molecules and atoms, sometimes even distinguishable through an electron microscope, is familiar to everyone. Under it lies the floor of the subatomic world - the world of elementary particles, each of which is noticeably lighter than an average atom. Of the particles, the mass, and, therefore, the reality of which is reliably established, the electron turns out to be the smallest. All particles that are lighter than it and which we will call "subelectronic" form the next deeper level of the microworld. So far, rheons and arheons can be attributed to such particles. So, we have reached the lowest of the yet available floors of the universe (deeper - an unknown abyss). Next, we will show how all subsequent ones are erected on the foundation of this floor.

Unfortunately, it turned out that if the megaworld is described from the standpoint of the theory of relativity, then the microworld - from the standpoint of another non-classical theory - quantum mechanics, sometimes involving SRT. Here, as in space, the artificiality of non-classical concepts is striking. Just as in Ptolemy-Aristotle astronomy, numerous spheres and epicycles were speculatively introduced to describe the motions of planets and stars, so to describe atomic planetary systems, quantum theory completely arbitrarily introduces sets of quantum numbers, rotating electron spheres-shells, artificially selected in such a way as to describe the state of electrons in an atom. But one gets the impression that in the microworld it is possible to find a more rational device for atoms and particles, on the basis of classical laws and models, far from not exhausted, especially when it comes to the Ballistic Theory of Ritz (BTR). It is no coincidence that it is in the microcosm, in the domain of high-energy physics, that ballistic terminology has such a wide circulation: bombardment of samples, shots and explosions of particles with recoil, cobalt

guns and nuclei, targets and accelerators, likened to powerful arthro-guns, as in their intended purpose, and in strength, size. No wonder the giant cyclotron in Dubna was even called the Tsar Cannon.

Indeed, it is the classical science and the ballistic theory based on it that turns out to be fair and effective not only in explaining the phenomena of the Cosmos, but also in the microcosm, including in the study of the structure of the atom, elementary particles, nuclear energy and annihilation. Only excessive quickness made scientists, for lack of better, accept the theory of relativity and quantum mechanics in this area. But, as the saying goes: "hurry up - you make people laugh" - all these non-classical theories turn out to be erroneous, and, in return, there are much more natural and accurate classical concepts. Below we will illustrate the efficiency of the classical BTR in the microworld with specific examples.

§ 3.1. The magnetic model of the atom and the Ritz principle

This suggests a hypothesis that the oscillations in the serial spectra are created by purely magnetic forces. It will be shown below that this makes it easy to understand the laws of spectral series and anomalous Zeeman effects.

Walter Ritz, "Magnetic Atomic Fields and Serial Spectra", 1908 [50]

Soon after the discovery of the electromagnetic nature of light and the construction of the first emitters and receivers of radio waves, scientists seriously thought about the device of natural light emitters - atoms. In the first model, proposed by J. Thomson, the atom appeared in the form of an antenna, like a metal ball, emitting radiation with vibrations of electrons embedded in an atom, like plums in a pudding. Then came Rutherford's planetary model of the atom, where electrons revolved around a charged nucleus, like planets. But such an atom is unstable: electrons scurrying about in orbits, emitting energy, would fall on the nucleus. This deficiency was eliminated by the quantum model of the atom of Bohr, a student of Rutherford, but at a price that still prompts many to seek a more rational arrangement of the atomic world. It is suggested to return to both the pudding model and the planetary one. But it turns out that there is a third classical model of the atom - magnetic, proposed in 1908 by W. Ritz.

In fact, it was this model that made it possible for the first time to find the entire spectrum of frequencies emitted by the hydrogen atom, and in such an original way that it deserves attention today, as shown in the remarkable article [50]. Ritz did not use quantum ideas: electromagnetic waves in his model generated not abstract quantum transitions, but classical oscillations of electrons. Even before Rutherford, Ritz realized that the movement of an electron in an atom is controlled by a certain central mechanism, the skeleton, the skeleton of the atom, called the nucleus. But Ritz, unlike Rutherford, guessed that this is controlled not by electric, but by magnetic forces, for which his model of the atom was called "magnetic".

We are accustomed to thinking that electrons in an atom move in orbits - under the action of **the electric attraction of the nucleus**, forgetting that in practice ourselves - in particle accelerators, plasma installations and induction

furnaces - we create circular motions of electrons with the help of **magnetic fields**. In his 1908 work "Atomic magnetic fields and spectral series" Ritz convincingly showed that only the forces of magnetic nature can explain the emission spectra of atoms. According to him, the magnetic field of an atom is created by a set of elementary magnets of a standard size a connected in series, forming an elongated magnetic rod (Fig. 94). Instead of magnets, you can take turns with current that make up an inductor, a solenoid with a constant turn pitch a . As Ritz showed, depending on the number of magnets (turns), the rod creates such magnetic fields in which the electron must vibrate with the frequencies that were found in the spectrum of the hydrogen atom.

For all the seeming naivety of representing the atom as some kind of device (a hybrid of a cyclotron and a magnetic antenna), the Ritz model not only correctly described the hydrogen spectrum and the Zeeman effect, but also predicted new spectral series of hydrogen and other elements, which were actually discovered later. But the tragic early death of Ritz in 1909, a year after the publication of his ballistic theory and model of the atom, made it possible to forget about them, although scientists did not disdain the principles discovered with their help and are still using them. In the light of the discoveries of the past century, which did not clarify the quantum model of the atom, but only confused it, the Ritz model of the atom acquires a new sound and meaning.

So, they discovered that each electron has a standard magnetic moment μ , which endows the electron with the properties of an elementary magnet. The antielectron, the positron, discovered in 1932, has the same magnetic moment μ . Imagine now that a positron has combined with an electron, and this dipole began to attract electrons at one end, and positrons at the other. As a result, electrons and positrons, sequentially clinging to each other with a train, can merge into extended straight chains, in which all magnets (magnetic moments) of electrons and positrons are oriented in the same way. The distances between their centers will turn out to be constant, the same: of the order of the electron size a (Fig. 95). As was shown (§ 1.16), when electrons come into contact with positrons, they are not annihilated at all, but simply stick together into a neutral particle, being separated by a distance equal to the classical radius of an electron.

So, magnetic rods, axes, recruited from elementary magnets, which Ritz only assumed, in principle, can grow on their own, like salt crystals from alternating Na^+ and Cl^- ions, or linear polymer molecules built from thousands of identical links, for example, from alternating atoms of Si and O (silicone). Rods containing an equal number of electrons and positrons would have no charge, but would generate a noticeable magnetic field. Therefore, an electron near the rod would not be rejected or attracted, but could make circular motions in the magnetic field of the rod near the equilibrium point with a frequency f that does not depend on its velocity V and the radius of the orbit r (Fig. 94). In a magnetic field with induction B , the Lorentz force $F = eVB$ acts on an electron with charge e and mass M , making it move in a circle with a centripetal acceleration $a = V^2/r$. Since $Ma = F$, we have $MV^2/r = eVB$, whence the angular velocity of the electron is $2\pi f = V/r = Be/M$. That is, the frequency $f = Be/2\pi M$ of the

revolution of the electron, equal to the frequency of the light emitted by it, depends only on the induction of the field B , since the value of $e/2\pi M$ is constant.

However, the emission spectra of atoms consist of a discrete series of frequencies. This means that the field B can only take on certain values. This made Ritz assume that the electron is capable of occupying only some stable positions in the atom, each of which has its own value of the field B , given by the distance of the electron to the rod. This idea of the presence in the atom of stable positions and orbits of the electron, Ritz, in contrast to Bohr, developed within the framework of the classical, not quantum approach. He believed that since the distances and sizes a of magnets are standard, then the same distance a should be separated from the possible, allowed positions of the electron - nodes 1, 2, 3, ..., where it is able to stay (Fig. 94).

This is exactly how an electron would behave near an electron-positron rod, which, due to an uneven (discrete) distribution of charges, creates a small

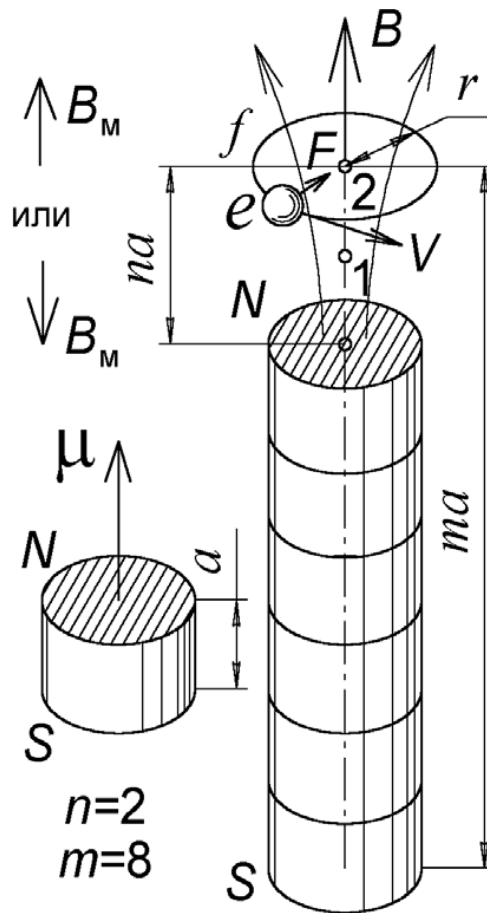


Fig. 94. The magnetic axis, recruited from magnets, controls the flight of electrons.

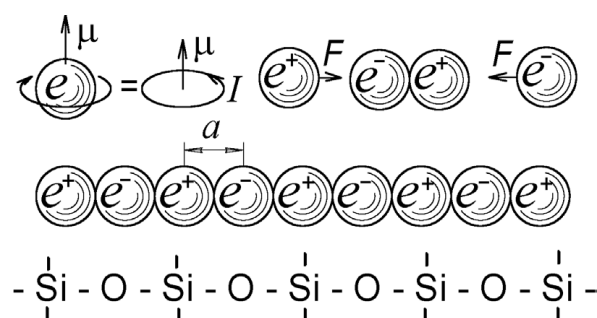


Fig. 95. The magnetic moment of the electron as a result of rotation. Merging of electrons with positrons into chains of the type of linear silicone molecules and needle crystals.

longitudinal electric field. Therefore, wherever the electron is, it always tends to stand against the positive positron, and the longitudinal force arising from the displacement of the electron returns it to its place (Fig. 96). That is, the electron is able to stably occupy positions - only opposite the positrons, and can "jump" along the rod only at a distance of $2a$.

But the displacement of an electron along the rod does not affect the magnitude of the magnetic field. Yes, and Ritz believed that the electron has a multiple of a changes in the distance to the magnet. Therefore, we come to the conclusion that the atom has not one, but two rods, two magnetic axes, connected perpendicularly, like the crossbeams of a cross (Fig. 97). The electron, located opposite the positrons of each axis, must be in one of the nodes of the grid formed by the positron level lines, and its distance to each rod will be a multiple of $2a$.

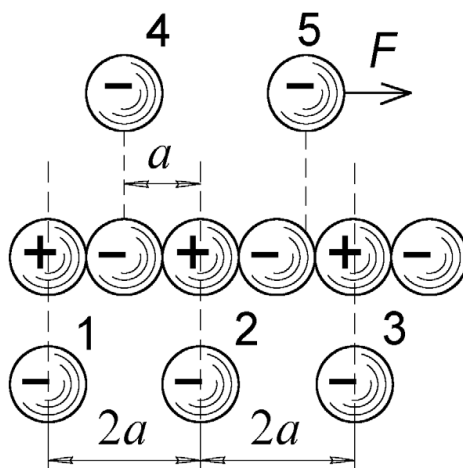


Fig. 96. Stable (1, 2, 3) and unstable (4, 5) positions of the electron near the chain.

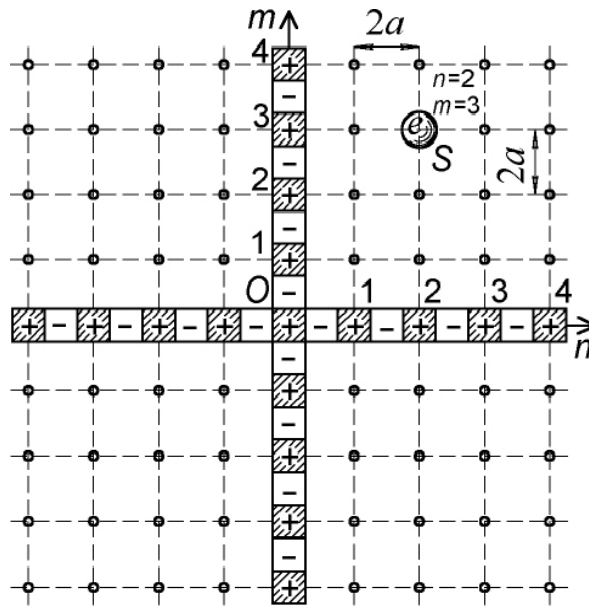


Fig. 97. Grid and nodes in which electrons can be located in the crosspiece.

Therefore, the field B changes intermittently. So, in the cross magnetic model of the atom, the electron can indeed occupy only some stable positions, near which it oscillates in the magnetic field of the cross. And, what is very important, this discreteness is introduced within the framework of classical physics. We will discuss in more detail the reasons for the stability of such positions of electrons below (§ 3.2, § 4.14).

The crosses can grow as naturally as individual rods. The cross could be formed from two "stuck together" rods. But, rather, electron-positron chains, rods, axes and crosses grow, "crystallize" from certain centers, nuclei, just as it happens with real crystals, dendrites, and, especially, snowflakes that grow symmetrically from certain centers and nuclei of crystallization. These centers can be the nuclei of atoms, their protons and neutrons. Moreover, as we will show (§ 3.9), they can contain thousands of positrons and electrons; in the neutron there are equal parts, and in the proton there are one more positrons. It is the nuclei that can supply the particles necessary for the growth of the cross.

During the "crystallization" of the cross, as in the growth of iron polycrystals, the magnetic moments of the particles are initially oriented randomly. But, if one rod accidentally contains a little more particles with a moment directed upwards, then its magnetic field will make some particles of the second rod turn so that their moments, orienting themselves along the field lines, go down. Then, and this rod will create a field, which in turn induces more particles of the first rod to turn upward. And so gradually, by means of such self-organization, the magnetic moments of both rods will be ordered, so that the first rod forms a downward-directed field in the plane of the cross, and the second - upward (Fig. 98). In fact, such a model of the atom has much in common with the first model of the atom by J.J. Thomson [49, 50], as well as with the self-organization of magnetic systems actually observed in experiments. After all, Thomson originally

built precisely the structural model of the atom, based on the now undeservedly forgotten experiments with floating magnets, performed by A. Mayer at the end of the 19th century. [50].

These experiments were as follows [78]. Plugs floated in a vessel with water, into which were inserted magnetized needles slightly peeking out of them. The polarity of the visible ends of the needles was the same on all plugs. Above these plugs, at a height of about 60 cm, a cylindrical magnet was placed with the opposite pole, and the needles were attracted to the magnet, simultaneously repelling from each other. As a result, these plugs spontaneously formed various equilibrium geometric configurations. If there were 3 or 4 plugs, then they were located at the vertices of a regular polygon. If there were 6 of them, then 5 plugs floated at the vertices of the polygon, and the sixth was in the center. If there were, for example, 29 of them, then one cork was again in the center of the figure, and the rest were located around it in rings: 6 floated in the ring closest to the center, 10 and 12 floated in the next rings as they move away from the center, respectively. Thomson decided that a similar central magnetic mechanism (nucleus) determines the placement of electrons in the atom, which explains the electron-shell structure of the atom and the correct structure of the periodic table (§ 3.3). And A. Mayer himself believed that his simple experience could serve as a model of the structure of atoms and molecules.

All this is very close to the ideas of Ritz, who represented the atom in the form of a set of magnets organizing into a regular structure with a nucleus coordinating the positions and movements of electrons. It is interesting that Thomson, referring to Mayer's experiments, considered the basis of the atom to be a certain nucleus, a central magnet, near which the electrons occupy stable positions and vibrate, each with its own characteristic frequency, like the floats in Mayer's experiment when they are taken out of equilibrium. This nuclear hypothesis of Thomson would be developed later by his student E. Rutherford, but already within the framework of the erroneous planetary model of the atom, which was rashly accepted by physicists. Similarity of views of Ritz and Thomson can also be traced in the fact

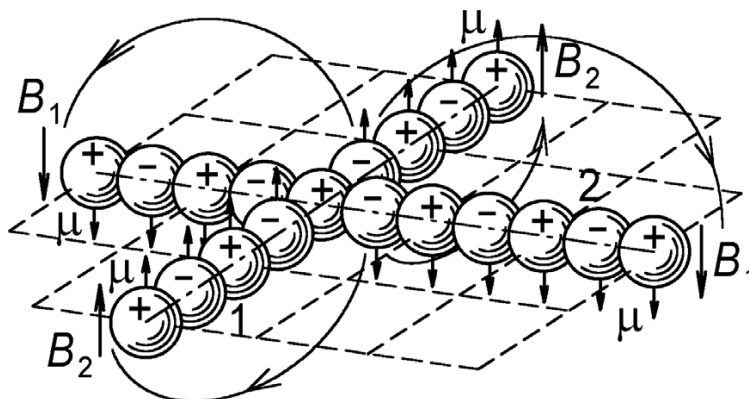


Fig. 98. Self-ordering of the structure of the cross in the process of its growth and interaction of particles.

that Thomson, as a classical physicist, supported the ballistic principle [6, 93]. It is interesting that another well-known specialist in ballistics and electromagnetism, M.V. Ostrogradsky, who discovered the Ostrogradsky-Gauss theorem in electrostatics (§ 1.6), investigated the interaction of such chains of magnets of the same type.

Let us now consider this crystal model quantitatively and find the magnetic field of the cross, this atomic nucleus. Since each particle in the circuit can be likened to a loop with a current I , the magnetic moment of which is $Ia^2 = \mu$, where a^2 is the area of a square loop, then, when added together, the loops give the same field as two parallel and oppositely directed currents I (Fig. 99). One current located at a distance r_1 from point S will create a field $B_+ = \mu_0 I / 2\pi r_1$ (μ_0 is the magnetic constant) in it, and another, already at a distance $r_1 + a$, generates an oppositely directed field $B_- = \mu_0 I / 2\pi(r_1 + a)$. Taking into account the smallness of a , their difference gives at the first rod $B_1 = \mu_0 I a / 2\pi r_1^2 = \mu_0 \mu / 2\pi a r_1^2$. The same field $B_2 = \mu_0 \mu / 2\pi a r_2^2$, but directed oppositely, would create on distance r_2 the second bar (Fig. 100). In general, the field $B = B_2 - B_1 = \mu_0 \mu / 8\pi a^3 (1/n^2 - 1/m^2)$ acts on an electron located at a distance $r_1 = 2ma$ from the first rod and $r_2 = 2na$ from the second, where n and m - arbitrary integers 1, 2, 3

Accordingly, the oscillation frequency of an electron in such a field and the frequency of the light emitted by it is $f = Be / 2\pi M = Rc(1/n^2 - 1/m^2)$, where the constant is $R = e\mu_0 \mu / 16\pi^2 c a^3 M$. Ritz derived a similar formula in 1908, proceeding from his magnetic model of the atom, and formulated on its basis the combination principle, according to which the entire set of frequencies emitted by an atom can be obtained by assigning different integer values to the quantities n and m , combining them in different combinations. So, Ritz was the first to find the entire frequency spectrum of the hydrogen atom, given by the well-known formula $f = Rc(1/n^2 - 1/m^2)$, where the coefficient R is called the Rydberg constant.

Thus, the hydrogen spectrum is given by the Ritz formula: an atom emits a discrete set of frequencies $f = Rc(1/n^2 - 1/m^2)$, where R is Rydberg's constant, c is the velocity of light that, n and m are integers. It follows from the Ritz model

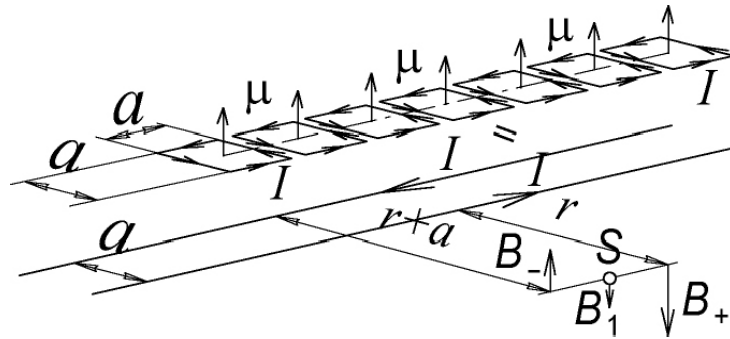


Fig. 99. Calculation of the magnetic field B of one of the axes of the cross, equivalent to two currents.

that $R = h/16\pi^2ca^2M$, where a is the period, the step of the electron-positron grid of the atom, at the nodes of which the charges generating the spectrum lie. Planck's constant h is related to the electron magnetic moment μ and its radius r_0 as $h = e\mu_0\mu/r_0$ [82]. The real value of the Rydberg constant is given by the formula $R_H = e^4M/8\epsilon_0^2h^3c$, where M is the electron mass. From the condition $R = R_H$, we find the value $a = 0.37 \cdot 10^{-10}$ m, with an accuracy of 0.71, which coincides with the Bohr radius of the hydrogen atom $a_0 = \epsilon_0 h^2 / \pi M e^2 = 0.53 \cdot 10^{-10}$ m. So, the distance a between electrons in the lattice is of the order of the atomic radius a_0 . This is natural: since an atom is composed of electron layers, including up to 30 particles, then its dimensions are of the order of interelectronic intervals (§ 3.3, § 4.14).

Ritz's magnetic model of the atom was the first and only classical model to explain the hydrogen spectrum. Therefore, it is completely unclear how Ritz's contemporaries, using the results of the magnetic model, could bypass it. The simplicity and clarity of this model is striking. The frequency with which the electron will vibrate and emit depends solely on which of the nodes of the atomic coordinate grid it will be in. Moreover, the numbers m and n simply express the number of the node - as if the coordinate of the electron along the corresponding axis of the cross, - of this intra-atomic coordinate system, the cross of which is really similar to an antenna, a radio mast and cross chains of radio telescopes. This model harmoniously combines Ritz's magnetic model and his earlier model, which depicted an atom as a flat square membrane with a doubly infinite number of sites [50]. It is the spectra of atoms, as Ritz understood, that provide the key to understanding the structure of the atom, the atomic mechanism. And Ritz was the first to use this key correctly. It is noteworthy that the mathematical apparatus developed within the framework Ritz's model, physicists are still using quantum mechanics [50, 82], when calculating waveguides, in the cross section of which, like on a membrane,

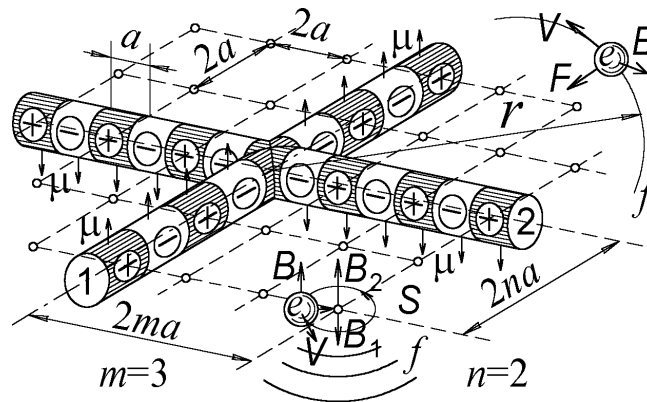


Fig. 100. Two types of electrons in an atom: one performs small vibrations near the nodes, emitting light; others move in wide orbits around the cross.

rectangular cells of nodes and antinodes of electromagnetic field oscillations are formed [88]. And when constructing a quantum model of the atom, Sommerfeld and Bohr repeatedly referred to the results of Ritz, however, they did not accept its classical basis [50]. And later, as M. Elyashevich notes, Ritz's successes were generally hushed up in scientific literature, deliberately discriminating against his classical ideas.

The Ritz model of the atom not only explained the spectrum of hydrogen, but also had no defects of the planetary model of Rutherford, created three years later, in 1911. An electron, emitting at the frequency f of natural oscillations in a node, loses energy and velocity $V = 2\pi r f$, as the range decreases r oscillations, but, at the same time, does not fall on the core, as in the planetary model, but simply freezes at its node. When an atom, participating in a chaotic thermal motion, collides with another atom, then "shaking up" the electrons in it, like passengers on a bus, will again give the electron in the node speed. Therefore, the spectral lines are brighter, the higher the gas temperature and the more intense the excitation of electron vibrations in its atoms. This classical mechanism of vibrations and emission of atomic electrons, at strictly specified frequencies, illustrates the example of a box with weights suspended on springs of different stiffness, which begin to vibrate at natural frequencies when they hit the box, until their vibrations damp out, like electrons in an atom.

The absorption of light by an atom is the reverse process of radiation. An incident electromagnetic wave, acting on an electron at rest in one of the nodes, can cause its noticeable oscillations only if its frequency f coincides with the natural frequency of electron oscillations in a given node, that is, if there is a resonance. Therefore, the atom effectively absorbs only those frequencies that it itself emits: the emission and absorption spectra coincide. When the effect of radiation on the atoms of the substance is over, they remain in an excited state for some time: their electrons, gaining speed and circling in their nodes, continue to emit energy exponentially decreasing for some time. This is how the magnetic model explains luminescence and phosphorescence.

In addition to electrons oscillating near stable positions in the nodes of the cross, there are also electrons in atoms that revolve around the atom, held by its magnetic field. If the first (nodal) electrons are responsible for the individual line spectra of atoms, then the second (external), having no stable orbits and positions, generate a continuous thermal spectrum of the atom (§ 4.1), and also manifest themselves in the photoeffect (§ 4.3), the Compton effect (§ 4.7) and a number of others, where the connection discovered by Planck between the frequency of revolution of an electron f and its energy $E = hf$ works. As we will show below, this relationship is also due to the structure of the magnetic field of the atom, which captures the outer electrons (§ 3.3, § 4.3). Thus, atoms, with their slender, precise mechanism, are in many ways reminiscent of a clock, in which different cogwheels (different electrons) rotate at their standard frequencies. These frequencies, as in the Ritz formula, are related to each other through gear ratios containing in the numerator and denominator integer coefficients (in hours set by the number of periodically placed teeth, and in the atom - electrons), as well as through their differences (as in a Swiss watch with a

differential, planetary mechanism). There are also balance wheel wheels with a spiral spring, rotating at a variable frequency, and in the ballistic model of the atom corresponding to external electrons, which, when spinning in the "atomic sling", either store or release energy and move in a spiral. It turns out that it is quite natural that it was the spinning electron and the atomic mechanism that became the basis for the creation of the most accurate atomic clocks, and that the Swiss Walter Ritz, a native of the country of watchmakers, was looking for such a precise mechanism in the atom.

Ritz, using the model of the atom discovered by him, also easily explained, long before quantum theory, all the main features of the Zeeman effect, including those that the planetary model of the atom did not allow to understand. Indeed, in an external magnetic field, the magnetic moment of the atom will be established along the lines of the field. In this case, the external magnetic field B_M , superimposed on the field of the cross B , either increases or decreases it (Fig. 94). Therefore, for some electrons the vibration frequency will increase by $\Delta f = eB_M/2\pi M$, while for others it will decrease by the same amount. As a result, spectral lines will appear, shifted to the right and left of the usual ones.

So, of the classical models, only the Ritz model of the atom explained the spectral laws. True, for this Ritz had to attract new bold ideas - about elementary magnets, about the scale of the length of the micro-world (what is now called the classical radius of an electron, equal to the radius of action of nuclear forces). And the 20th century fully confirmed his predictions: the spin, the magnetic moment of the electron, the atomic nucleus (also possessing a magnetic moment) were discovered, and the nuclear interaction entered physics, setting the standard for distances in the nucleus. All this characterizes Ritz as a courageous thinker, as a brilliant soothsayer with a powerful scientific intuition, who was able to penetrate both into the depths of the atom and into the abyss of space so far that he was ahead of science by a hundred years.

Of course, the magnetic model of the atom is still imperfect and requires improvement. In addition to the hydrogen spectrum, it has to explain the spectra of other atoms, which was also partly done by Ritz (§ 3.4). It is necessary to find a place in it for protons, neutrons and electrons of the electron shells of the atom. The latter, probably, are also located in the nodes of the cross, as in the nodes of the crystal lattice (§ 3.3). Such a crystal-like structure of the atom, the gradual filling of sites with electrons at the levels n and m , allows naturally (unlike quantum mech) to explain the periodicity of the properties of elements. All this echoes the ideas of V. Manturov [79], who also represents atomic nuclei in the form of crystals composed of positrons and electrons separated by standard gaps. Crystalline models of the atom, in contrast to unstable dynamical ones, show that it is possible to understand atomic and nuclear laws within the framework of classical physics. And the constantly instilled thought about the inevitability of quantum mech for the microworld is a myth and even a deception, if we take into account the long silence on the success of the magnetic model of the atom, implemented by Ritz entirely within the framework of classical mechanics.

§ 3.2. Atomic spectra and atomic models

I remained a supporter of the mechanistic views of the 19th century and I think and know what can be explained, for example, spectral lines (so far only hydrogen) without Bohr's theory, Newtonian mechanics alone.

K.E. Tsiolkovsky [69]

Walter Ritz has repeatedly pointed out that atomic spectra should be the key to understanding the structure of the atom. And, as shown above, Ritz really came, on the basis of the spectral regularities he found, to the classical model of the atomic structure. We are talking, of course, not about Rutherford's planetary model of the atom, which has led to a dead end, but about the much less well-known - the classical magnetic model of the atom, proposed by W. Ritz in 1908 [50] (§ 3.1). According to Ritz's idea, it is the spatial structure of the nucleus that is the program center that controls the life of the atom and the behavior of electrons in it, just as the life of a biological cell is determined by the structure of the cell nucleus and the informational DNA molecule. In the magnetic model, the nucleus controls the flight of electrons through magnetic rather than electrical forces. And this is natural: in nature and technology, the circular motion of electrons is created precisely by the magnetic force, and only it explains the stability of the atom.

If the motion of electrons, as in the planetary model, was caused by the Coulomb force, they would rush along orbits at speeds of the order of the speed of light c and instantly (in 10^{-10} s) fall on the nucleus, wasting energy on radiation. Magnetic forces are less than electrical and allow electrons to spin much more slowly and lose energy for longer. Indeed, from the magnetic model, as we will show (§ 3.3, § 4.3), it follows that Planck discovered the connection between the energy E of an electron in the orbit $E = MV^2/2 = hf$ and the frequency of its revolution f , where h is Planck's constant. Reducing by $MV/2$, we find $V = 2hf/MV = h/\pi Mr$, where r is the radius of the electron orbit. If r is of the order of the radius of an atom (10^{-10} m), then $V = 2300$ km/s. This speed, which is common for electrons in ray tubes and lamps, is two orders of magnitude less than c . Then, the acceleration associated with rotation $a = V^2/r$ is already four orders of magnitude less, the radiative deceleration is small, and the electron in the orbit of the atom lives for a long time. If we take into account that in a magnetic field all the electron energy is purely kinetic $E = MV^2/2 = h^2/2\pi^2 Mr^2$, then during its decay the electron no longer falls on the nucleus, but moves away from it, increasing r orbits in the atom for an unlimited time.

We depicted the nucleus of such an atom, according to Ritz's concept, in the form of two chains of alternating electrons and positrons (so is the informational basis of the cell nucleus - a double DNA chain of alternating nucleotides). However, it is believed that electrons and positrons upon contact disappear (annihilate) with the release of energy, since then neither electrons nor positrons are found. But this is just an illusion. After all, even when a bomb explodes, the fuel combines with the oxidizer, sharply releasing energy. And, although here, too, in the end, neither fuel nor oxidizer remains, no one will say that they disappeared, turning into energy. The atoms of the oxidizer only combined with

the atoms of the fuel, forming an invisible gas that expanded by the explosion. Likewise, when a positron contacts an electron, the particles do not disappear, but, merging into a pair that has no charge, they cease to be registered by the instruments (§ 1.16). Apparently, from such paired combinations of electrons and positrons, a proton, neutron and other "elementary" particles are formed, as suggested by F. Lenard (§ 3.3), and as later substantiated by V. Manturov [79]. By the way, according to quantum mechanics, an electron and a positron could form positronium, similar to a hydrogen atom. But, in fact, positronium, unlike atoms, is unstable: whirling particles merge in just 10^{-10} s [82], wasting energy, which proves the fallacy of the planetary model, even in its quantum version. After all, the positron, which plays the role of a nucleus, does not have its structure and the corresponding configuration of the magnetic field.

What is the nucleus of a hydrogen atom, in other words, a proton, and how is its structure created? A little higher, following Ritz's idea, a nucleus in the form of a cross made of alternating electrons e^- and positrons e^+ was simplified, comparing it with a salt crystal, also composed of periodically placed charged particles. But, since real crystals, with the exception of snowflakes, have the form of polyhedrons - parallelepipeds and pyramids with flat faces, it is more logical and simpler to represent the hydrogen nucleus in the form of a cube or parallelepiped, say, in the form of a double square layer of particles (Fig. 101). It is in the form of such crystals of regular shape, as we will see later, that it is most logical to represent particles, including the proton that forms the hydrogen nucleus (§ 3.9). Since, as was found above, mass is an additive quantity (§ 1.17), the mass of the nucleus should be equal to the sum of the masses of the electrons and positrons that form it. Since a proton has a weight of 1836 electrons, then it can be conventionally depicted as a parallelepiped with dimensions of $2 \times 30 \times 30$ particles, or, for accuracy, $2 \times 27 \times 34 = 1836$. Note, what else J. Thomson, who

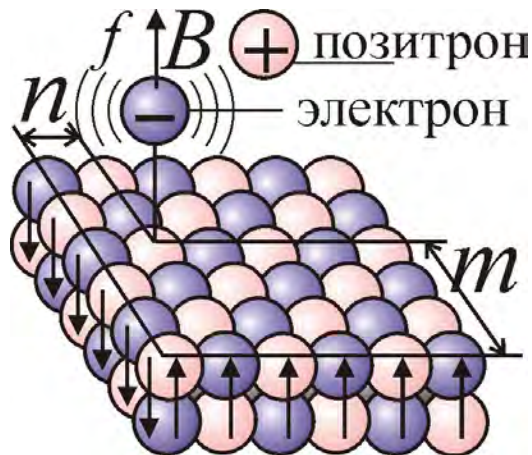


Fig. 101. Possible structure of a proton or neutron in a nucleus and a scheme for generating a spectrum.

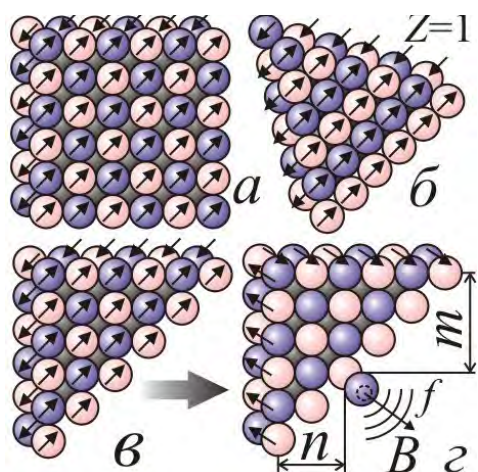


Fig. 102. The structure of protons in the form of squares and triangles and the orientation of the magnetic moments in them.

discovered the electron and built the first model of the atom (see his book ["Electricity and Matter"](#)), proposed the hydrogen atom and its mass to be considered the sum of about a thousand electrons and the same number of positively charged particles (positrons) [139].

In each of the layers, the magnetic moments of the particles are oriented along the diagonal of the layer, minimizing the interaction energy. In the upper and lower layers, the moments are oppositely directed (Fig. 102.a), forming a magnetic field structure, like a cross. It is easy to verify this by representing the system as a set of magnetic dipoles: in the equivalent circuit (Fig. 101, Fig. 102), only the edges of the squares create magnetic fields (they are perpendicular to the layer plane and look up and down). The e^+ positrons and e^- electrons are staggered, like the Na^+ and Cl^- ions in a salt crystal. In the hydrogen atom, an electron sticks to this "magnetic checkerboard", being located exactly above the positrons, being attracted by them, and at small vibrations in the magnetic field of the nucleus, it emits light. In this case, the electron, like black checkers in a game, discretely jumps, walks on this chessboard, freezing on white cells corresponding to positrons, which is why the magnitude of the magnetic field and the frequency of oscillations of the electron in it change discretely. Since the structure of the magnetic field is the same as in the cross atom, the frequency f of oscillations and radiation of an electron takes on the same discrete series of values $f = Rc(1/n^2 - 1/m^2)$, where n and m are integer coordinates of the site, in where the electron sits (Fig. 101).

The proton can also be represented as a single square layer of particles. Folding along the diagonal in half, it forms a double triangular layer - with the structure of the field of the cross and the same frequency spectrum. This paired triangle can be both rectangular and equilateral, as well as giving a hydrogen spectrum (Fig. 102). In addition to hydrogen, the model allows calculating other atoms. Consider an atom with atomic number Z - containing Z protons. The squares of the protons can, like in a sandwich, stick together in layers if the electrons of the other are above the positrons of one layer. Their mutual attraction also gives

those nuclear forces that resist the repulsion of protons and quickly (exponentially § 3.12) fall off with distance [79]. When such a "stack" of protons folds in half along the diagonal, a puffed corner is obtained. In its upper and lower parts, the magnetic moments look in different directions along the fold line (Fig. 103).

Here the magnetic moment of unit length a turns out to be not μ , but μZ^2 : it will be found as the sum of the magnetic moments of individual magnetic dipoles, forming an arithmetic progression $1\mu + 3\mu + 5\mu + \dots + (2Z - 1)\mu = \mu Z^2$. Accordingly, the magnetic field and the oscillation frequency of the electron in it will grow in proportion to Z^2 : $f = RZ^2c(1/n^2 - 1/m^2)$. And precisely, for ionized hydrogen-like atoms He^+ , Li^{2+} , Be^{3+} , B^{4+} , C^{5+} , devoid of all electrons except one, the spectra obey this formula, which gives the spectrum of hydrogen with a scale of Z^2 magnified. The presence of the remaining electrons would lead to the fact that by their field they would distort the motion of the electron generating the spectrum, and it would acquire a completely different character than that of hydrogen (§ 3.4). However, in many-electron atoms with large Z , the magnetic field is so great that the distortions introduced by electrons are insignificant. Therefore, for the emission spectrum of electrons rotating in such strong fields with a huge frequency and generating X-rays, the Moseley law $f = R(Z-b)^2c(1/n^2 - 1/m^2)$ is valid, which differs from that found only by a small correction b , caused by the influence of the remaining electrons [49, 134].

Another, simpler explanation for the change in the Rydberg constant R with a change in the atomic number and charge of the nucleus Z is possible. Perhaps, in proportion to the increase in the charge of the nucleus Z , the equilibrium distance $a = a_0/Z$ between electrons and positrons decreases and, accordingly,

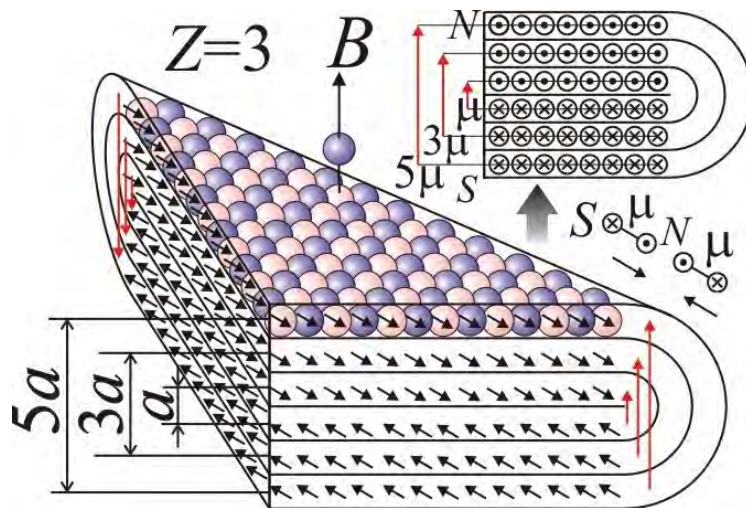


Fig. 103. Bonding of protons into a layered corner with a field B increased by a factor of Z^2 . Above is an equivalent circuit of magnetic dipoles μ .

increases $R = h/16\pi^2ca^2M = R_H Z^2$. This would be possible if this equilibrium distance was specified, for example, by the amplitude of the oscillations of electrons near the nucleus, or if it were specified by the magnetic moment and the charge of the nucleus (in sum with the moment and charge of the electrons

of the inner shells surrounding it), in the same way as the distance between the magnetic floats in the experiments of A. Mayer was determined by the magnetic moment of the central magnet (the nucleus of the atom § 3.1). Such a change in the equilibrium distance between electrons in the electron shells would also explain the decrease in the size of atoms with an increase in the atomic number in the periods of the periodic table.

In the magnetic field of an atom, electrons can perform two types of oscillations. Some electrons whirl with fixed frequencies near the nodes of the atom, generating a discrete spectrum of radiation. Such electrons will be called "internal" or "nodal" electrons. Others, as if in a magnetic trap, whirl with a continuously changing frequency f around the atom itself, having energy $E = hf$. These electrons, which we will call "external" or "orbital", create a continuous (thermal) spectrum of radiation and do not occupy stable positions in the atom, but circle in the magnetic field of the atomic core (Fig. 107). This external magnetic field no longer depends on the ordinal number of the element and is the same for all atoms. External electrons trapped in the magnetic trap of the atom also give rise to the photoelectric effect and the Compton effect (§ 4.3, § 4.7). Such electrons do not stay in the atom for a long time, but regularly, from energy losses and de-orbit, leave it and are captured by new atoms. In general, an atom is a kind of combination of different devices: a magnetic trap, a horn antenna, a gyrotron, a cyclotron, which convert the movement of electrons into radiation and vice versa. So, the usual laws of mechanics, vacuum microwave electronics operate in the atom, and there are absolutely no quantum laws, as K.E. Tsiolkovsky, who also created a purely classical model of the atom, about which, however, nothing is known now. It is only known that this model, described in Tsiolkovsky's work "Bohr's hypothesis and the structure of the atom", was probably introduced through A.B. Shershevsky A. Einstein [69, p. 185]. But this is a completely forgotten story.

It turns out that Tsiolkovsky was right: the spectra of atoms can be fully explained by the classical laws if we use the crystalline magnetic model of the Ritz atom. Moreover, the spectra literally scream about such a clear model. Ideally similar sets of spectral lines for atoms of one element with frequencies specified by exact relations with integer variables - isn't that surprising? Such a clear line structure can appear only in a crystal-like atom, where the electrons generating the spectrum occupy only some stable positions, separated from one another by a discretization step equal to the period of the crystal electron-positron lattice. It was Walter Ritz, who was the first to find a general formula for atomic spectra, who showed that the atomic mechanism of spectrum generation is due to the periodic arrangement of particles. So, discrete atomic spectra confirm the discrete crystal structure of the atom.

§ 3.3. *The structure of atoms and the periodic law of Mendeleev*

The properties of simple bodies, as well as the shapes and properties of compounds of elements, are in periodic dependence (or, speaking algebraically, form a periodic function) on their atomic weights.

D.I. Mendeleev

It is believed that the chemical properties of atoms, the nature of the movement and placement of electrons in them have nothing to do with the structure of atomic nuclei. Meanwhile, a lot says about the existence of such a connection. It is hushed up in every possible way, since it contradicts quantum physics, and only the classical magnetocrystalline model of the Ritz atom reveals this connection.

In the planetary quantum model of the atom, it was assumed that the structure of the electron shells of an atom is influenced only by the nuclear charge, but not by its structure. And what role does electricity, the charge of the nucleus, play in the magnetic model of the atom? If the field of the axes of the cross determines the arrangement of the electrons, then the field of the nucleus is their number in the atom. Indeed, the positive charge of the nucleus must be balanced by the negative charge of the electrons, otherwise the charged atom will repel or attract electrons until it becomes neutral. But, although the charge of the nucleus determines the equilibrium number of electrons in the atom, it is not at all responsible for keeping them there. That is why there are negative ions - atoms with an excess of electrons, which is impossible according to Bohr's theory. After all, if electrons are held by an electric force, then how can a neutral atom hold an extra electron, and even more so - two or three? Even a polarized atom cannot do this. But for the magnetic model, anions are not a problem. A neutral atom can easily keep an extra electron in one of the grid nodes (§ 4.14). There is another mechanism for capturing many electrons: the magnetic field of the crosspiece, the atomic core. The excess external electron entering the atom is acted upon by the Lorentz force capable of keeping it in orbit, even when repulsed by the internal electrons (Fig. 100).

Let us now consider how the internal electrons are located in an atom. According to the structural model of the atom, the structure and filling of the electron layers is determined by the structure of the nucleus (the skeleton of the atom), not just by its charge, as in quantum physics, but, namely, by the spatial structure of the skeleton and the configuration of the fields. It also sets the periodicity of the properties of the elements. Recall that the numbers of elements in the periods of the periodic table form the following series: 2, 8, 8, 18, 18, 32, 32. These are the doubled squares of integers k of the form $2k^2$: $2 = 2 \cdot 1^2$, $8 = 2 \cdot 2^2$, $18 = 2 \cdot 3^2$, $32 = 2 \cdot 4^2$. Long before Bohr's theory of the atom, many scientists - J. Thomson, G. Lewis, I. Langmuir - realized that periods are associated with the successive filling of certain layers, levels, shells in the atom with electrons [49]: in the first layer there are 2 places, in the second - 8, etc. When the electrons completely occupy one layer, the level begins to fill the next, opening a new period, like egg cells stacked one above the other as eggs fill, or cannonballs stacked in a pyramid. In inert gases located at the end of periods, the layers are completely filled and therefore tightly bind the electrons.

Hence - the chemical inertness of these extremely perfect, noble gases.

But, according to quantum mechanics, the capacities of the shells for periods from 1 to 7 are different: 2, 8, 18, 32, 50, 72, 98, which does not correspond to the number of elements in the periods. Therefore, even by the end of the period, the shells remain not filled, losing their meaning, because they are filled inconsistently. And the very idea of shells and the way of filling them, borrowed from the classical model of the atom by J. Thomson, looks very tense in quantum mechanics, if only because four quantum numbers are arbitrarily introduced, set by artificially introduced rules, which are nowhere and are not substantiated. Therefore, to understand the nature of electron shells, let us turn to the forgotten ideas of Gilbert Lewis. Like Ritz, he believed that the reason for the atomic spectra is the ability of the electron to occupy different equilibrium positions in the atom, which correspond to their vibration frequencies. And Lewis connected the shells and the number of electrons in them with the presence of a certain spatial structure in the atom - a certain regular geometric volume, layer by layer filled with electrons, which occupy new levels during the transition to new periods [49]. The function of the nucleus is to set this spatial structure by crystallizing electrons around itself. It remains to find a body that gives the desired configuration of the layers and the number of electrons in them.

It is easy to see that this body should be a bipyramid - two four-sided pyramids, like the pyramids of Cheops, connected by tops (Fig. 104). These pyramids are filled with electrons layer by layer from the top, like blocks of real pyramids, or like the aforementioned pyramids of cannonballs. The fact that the number of electrons in the layers is the doubled squares of the numbers 1, 2, 3, 4, should indicate that the layers have the shape of gradually growing squares - successive sections of the pyramid. Well, the fact that the electronic layers, the number of elements in the periods are duplicated, means that there are two of these pyramids.

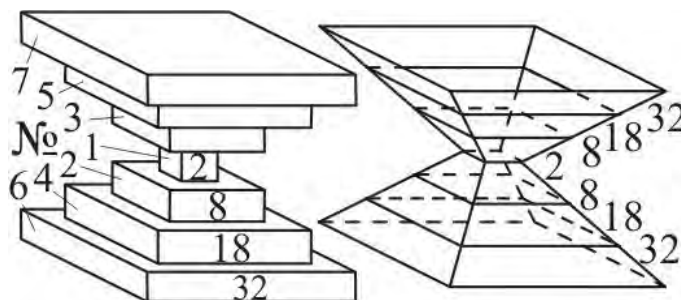


Fig. 104. Bipyramidal model of the atom, the scheme of the arrangement of seven electronic layers in it, their capacities and numbers (correspond to the number of the period).

They have a common vertex - a layer with the number of places equal to 2, that's why it is one and not duplicated. It is interesting that V. Manturov also came to a similar bipyramidal shape of the nucleus, but already from considerations of nuclear physics [79]. Moreover, even in Ancient Greece, Plato proposed to consider elementary particles, atoms, as having the form of polyhedrons, pyramids (§ 5.3) [63]. Likewise, the first atomist, the ancient Greek Democritus, proposed to consider atoms as geometric bodies, "forms" filled at

seven levels by elementary particles - amers (electrons). Lomonosov, as the founder of Russian physics with chemistry and a follower of the ancient atomists, also represented the atoms of each element in the form of particles of standard masses, geometric sizes and shapes, considering atoms to be polyhedra, pyramids with a square base (see his dissertation "On the difference bodies consisting in the adhesion of corpuscles" "[О различии смешанных тел,состоящем в сцеплении корpusкул](#)"). Finally, Mendeleev himself connected the periodic dependence of the properties of elements on the weight of atoms, which he discovered, with their shape, the spatial structure of the atom.

The electrons in the layers should, in order to avoid repulsion, be interspersed with staggered positrons, the very ones that, being excess in protons, give a positive charge to the nucleus (as we will see, one can do without positrons if the repulsion is compensated by the attraction to the atomic core or magnetic electron interaction, § 2.14). Then, in each layer there will be an equal number of electrons and positrons, and the total number of particles: $2k^2 + 2k^2 = (2k)^2$. That is, any layer is a square with a side of $2k$ particles (if we exclude the presence of positrons in the layer, then it will be a square with a side of k particles, where in each cell there are two electrons bound in a pair by magnetic attraction). In the extreme, 6th and 7th layers, like on a chessboard, there are exactly $8 \times 8 = 64$ places: 32 black cells - for electrons and 32 white - for positrons (Fig. 105).

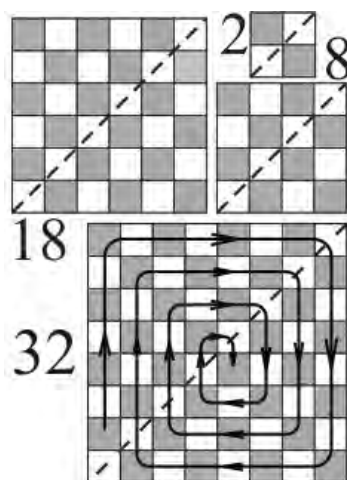


Fig. 105. Diagram of electronic layers of different capacities and the order of their filling.

Layers stacked one over others so that electrons lie above the positrons and vice versa (Fig. 106): alternation of charges, as in ionic crystals of the same NaCl salt. It is easy to understand how this layer structure is set. The nucleus of an atom should be made up of two pyramidal horns, like horn antennas, connected together. In these double horns, as in bags, electrons are stacked in layers, interspersed with positrons. Such a clear packing of electrons at each level is caused by the periodic placement of electrons and positrons in the support layers.

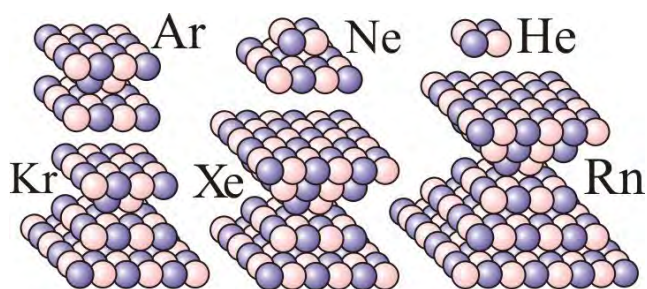


Fig. 106. Fully filled electronic layers in atoms of inert gases.

Electrons with positrons are stacked in layers, like ions in a salt crystal, in a checkerboard pattern. Each electron sticks to the layer near the positron. Thus, negative electrons and their mirror antiparticles-positrons are analogous to black and white figures of chess or checkers, located on the cells of the chessboard-nucleus assigned to them (§ 5.2).

So, electrons and positrons are the building materials from which nuclei and atomic skeletons crystallize like snowflakes. But, if the snowflakes are different, then the nuclei of the same type are identical, since they are formed by an equal number of particles, equally aligned by their own electric and magnetic fields. As Ritz showed, particles are not only elementary charges, but also magnets, sticking together in the only optimal way that sets the minimum energy. Exactly so, and floating magnets in Mayer's experiments always made up the same regular configurations (§ 3.1). It is this striving for the minimum energy of the system of magnetic particles (electrons, positrons, protons and neutrons) that gives the nucleus in the form of two tetrahedral pyramids connected by vertices. This double horn, a bipyramid in the shape of an hourglass, determines all the properties of atoms and nuclei. At the junction, the horns have a through hole, like an hourglass. Electrons pass through it like grains of sand (Fig. 104). There is also a layer common for the pyramids of two positrons and two electrons. The bipyramid, its bells - and will be the core - the structure that sets all the properties of the atom. Moreover, the most massive part of the nucleus is concentrated in the center of the atom, where the tops of two pyramids converge and all nucleons are collected. Note that the bipyramid is easily obtained from the cross magnetic model of the Ritz atom (§ 3.1) by connecting two crosses turned in space 90° around the bisector of their right angle. After all, the opposite edges of the bipyramid are just perpendicular to each other, like the magnetic rods of each cross. At the same time, the walls of the sockets (the edges of the pyramids) are probably formed by the same nuclear building material:

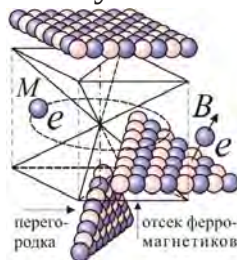


Fig. 107. Faces and partitions of the atomic core of electron-positron layers in the form of squares with triangles and two types of electrons: nodal and orbital.

positrons and electrons, which make up particles of the correct shape (Fig. 102, Fig. 107). And particles in the form of right angles (Fig. 103) can enter the nucleus as partitions dividing the pyramidal cavities in half. It is in the nodes on the faces and partitions of the pyramids that the electrons are placed, which generate the spectrum of the atom. The energy of excitation of atoms goes to impart vibrations to the electron and to pull it out of the layer.

It may surprise: how do such complex and regular shapes of atoms and nuclei arise (§ 3.6)? But there is no more strange here than in a complex and, at the same time, identical 3D-structure of identical protein molecules (say, protein envelopes of viruses in the form of an icosahedron), in an intricate perfectly regular shape of snowflakes, in exact similarity and symmetry of crystals. The common reason is the orderly alignment of their particles. Ritz also said that it is impossible to understand atomic laws, except by allowing the atom and the nucleus to have a complex spatial structure, which, from the standpoint of modern chemistry, resembles the structure of complex openwork organic molecules, such as proteins and fullerenes. In our age of nanotechnology, structural chemistry, which studies three-dimensional frameworks of DNA molecules, nanotubes and other high-molecular compounds, the openwork structure of the atoms themselves, composed of many electrons and other elementary particles, seems quite natural.

We saw above how the electron generates the spectra of atoms on the electron-positron corner-triangle (§ 3.2). There are enough such triangular faces in the bipyramid, on which nodal electrons sit, generating spectrum. In this case, each electron generates radiation of only one frequency, corresponding to its position in the atom and the magnetic field at a given point. Therefore, one atom is not capable of generating the entire set of spectral lines item: each generates its own lines and only a large group of atoms illuminates the entire spectrum of the element. Excitation of vibrations occurs, say, from collisions of atoms.

So, an atom is a crystal: a crystal core, near which electrons are stacked in the correct order. The nucleus itself is composed of protons and neutrons, in turn formed by electrons and positrons. Therefore, the basis, the skeleton, the skeleton of the atom, called the "atomic nucleus", is ultimately a crystalline complex of ordered electrons and positrons, which are almost equally divided, like the Na^+ and Cl^- ions in the crystal of the NaCl salt. Negatively charged electrons combine with positively charged positrons and, conversely, mutually neutralize. And only a small excess of positrons gives the nucleus a positive charge.

Note that a similar model was built by F. Lenard, who believed that the nucleus has an openwork structure [74] and is formed from "dynamids" - pairwise connected elementary negative and positive charges, - "electrons" and "positrons", in the current way. The mass of an atom is proportional to the number of dynamids that form it, since it is made up of their masses. The presence in the nucleus in an almost equal proportion of electrons and positrons is proved by many facts. Thus, it is known that nuclei with a certain ratio of the number of protons and neutrons are stable. With an excess of protons, β^+ -decay is common: excess positive positrons in protons leave the nucleus. If there are

not enough protons, then the nucleus undergoes β^- -decay: the excess electrons leave the nucleus, and the neutrons containing them become protons. As you can see, the number of electrons and positrons must be balanced. An electron with a positron can leave the nucleus together as well, - when irradiated with gamma rays, which tear out the e^+e^- pair from the nucleus. How can we not recall Lenard's dynamids - pairwise bound charges in nuclei? It is not surprising that another physicist, Irving Langmuir, who laid the foundations of the science of plasma, a gas of positive ions and electrons, represented the atom in a similar way. And the author of the first model of the atom, J. Thomson, who discovered electrons, believed that an atom and its mass are made up of thousands of electrons and the same number of electrons associated with them in pairs of positive charges [139]. And, the most amazing thing is that the ancient Indians (especially the Vaisesika school headed by the atomist Kánada) came to such views thousands of years before us, who even before Democritus created the doctrine of atoms and molecules, considering them to be composed of "dyads" - pairwise connected standard point particles, analogous to electrons and positrons ([Müller M. Six systems of Indian philosophy. M., 1995](#)). So in our model, the bipyramidal framework, the electron layers and the electron-positron network of the atom responsible for the spectrum are probably formed by positrons that are firmly bound to electrons in electric dipoles, dyads, or dynamids, which have very interesting properties, for example, zero inertia (§ 3.18). That is why there are no positrons in a free state in an atom. Explains the bipyramidal model of the nucleus and the connection discovered by Planck between the energy $E = MV^2/2 = hf$ and the velocity V of the electron with the frequency f of its revolution in the atom. The magnetic moment, as found above (§ 3.2), manifests itself only at the edges, edges of the structures. Therefore, the edges of the bipyramid are similar to magnetic rods. And, with the appropriate orientation (Fig. 108), their magnetic field in the orbital plane (with center O at the top of the pyramids) will be perpendicular to

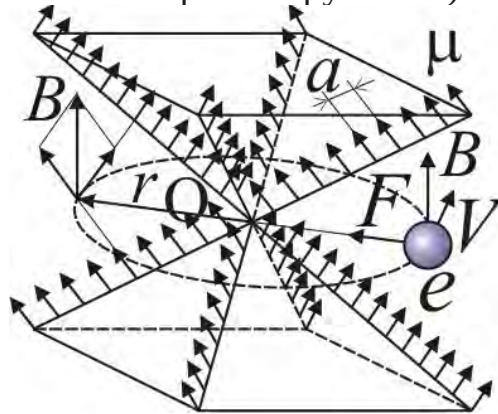


Fig. 108. The motion of an electron in the magnetic field of the bipyramid of the nucleus with a frequency $f = E/h = MV^2/2h$.

the plane and equal to $B = \mu_0 \mu / \pi a r^2$, where a is the distance between the electrons in the rod, equal to their classical radius $r_0 = e^2 / 4\pi\epsilon_0 M c^2$, $\mu = \pi e h / M$ - their magnetic moment (§ 3.1). An electron flying in an orbit of radius r with center O is acted upon by the Lorentz force $F = eVB = e^2 f \mu_0 \mu / ar$ (taking into account the

values of B and $V = 2\pi r f$), directed to O and equal to MV^2/r . Whence $MV^2/2 = f e \mu_0 \mu / a$, where $e \mu_0 \mu / a = h$. It is these electrons, trapped in the magnetic trap of the atom, that fly out of it when irradiated with light of frequency f . This explains the Planck radiation spectrum (§ 4.1), the photoelectric effect (§ 4.3) and the Compton effect (§ 4.7). So, there are three types of electrons in the atom: some sit on the edges of the nucleus and generate a linear atomic spectrum, others are stacked in layers in the sockets of the nucleus, setting the chemical properties, and still others, like a coil, wind orbital turns around the nucleus, responsible for the thermal spectrum and photoelectric effect. Electrons easily transition between these three states.

This model also predicts such properties that even quantum theory has not explained. Consider the filling of the layers and the associated physicochemical properties. In the first period, everything is simple: in a hydrogen atom, an electron occupies one of two places in layer No. 1 and, therefore, an atom can give up an electron, or take a foreign one to a vacant place, exhibiting valences $+I$ and $-I$. Helium, in which the entire layer is filled with two electrons, can neither give them away, nor absorb new ones. The same - in the 2nd and 3rd periods: electrons fill the second and third layers, each having 8 places, and the atoms exhibit valencies corresponding to the number of electrons in the layer. These periods are completed by noble gases, where all 8 places of the outer layer are occupied by electrons bound in the layer so firmly that they no longer come off, imparting chemical inertness to the gases (Fig. 106).

In the subsequent, 4th and 5th periods, the order of filling the layer is already important. First, electrons fill the layer around the perimeter, where they are held tighter (just like ice begins to crystallize first at the edges of a reservoir). There are only 10 such extreme places, respectively, and elements of this type in periods of 10, - from potassium to nickel and - from rubidium to palladium. When the perimeter is full, the electrons firmly bound in it are no longer able to detach (Fig. 109). Therefore, from filling the perimeter of nickel and palladium (as well as platinum in the 6th period), these noble metals become similar in inertness to noble gases. And, with further filling of the layer, the counting of groups and valences begins anew, just as it happens in the 2nd and 3rd periods, after the completion of the layers in inert gases. The properties of the elements therefore repeat each other, because the electrons located in the completed layers or completely occupying the perimeter do not break off and do not participate in the formation of bonds, and the remaining electrons form configurations similar to those of the previous elements. In the 6th and 7th periods, groups of lanthanides (La – Lu) and actinides (Ac – Lr) appear, each containing 15 chemically similar elements with valence $+III$, placed at once in the IIIB group of their period [145]. This number of elements is a consequence of the fact that electrons from the layer perimeter are tightly bound in it and have little effect on the properties of the atom. And, therefore, elements

6 Период и № слоя 2

4

Sm Eu Gd Tb Dy Ho Er

Ni Co Fe

гр.	I	II	III	IV	V	VI	VII
6	Cs	Ba	La	Ce	Pr	Nd	Pm
	Sm	Eu	Gd	Tb	Dy	Ho	Er
	Tm	Yb	Lu	Hf	Ta	W	Re
7	Fr	Ra	Ac	Th	Pa	U	Np
	Pu	Am	Cm	Bk	Cf	Es	Fm
	Md	No	Lr	Ku	Ns	106	107

Fig. 109. The arrangement of lanthanides and actinides in the periodic table according to Browner and Prandtl with the corresponding order of filling the layers of the 6th and other even periods with electrons.

14 places of this perimeter are being filled (La has an empty perimeter), - are chemically similar. After the perimeter is filled, further filling of the layer proceeds in the same way as for the layers of the 4th and 5th periods.

In the form of lanthanides and actinides, quantum physics has many unsolved problems. So, it is known that these elements are able to manifest, in addition to valency +III, and others - completely inexplicable. And, from the standpoint of the pyramidal model, they are natural: the electrons of the perimeter, although with difficulty, can still be torn off - then the atom exhibits the corresponding oxidation states. In addition, if the cavity of each pyramid is divided by a partition in half (Fig. 107), and the perimeter is filled first in one cavity and then in another, then the electrons of the perimeter can be divided into two equal groups of 7 electrons each. The electrons that occupy all seven places are tightly bound and, therefore, do not affect the chemical properties. Accordingly, the elements form two sub-periods located one below the other in the periodic table (Fig. 109). It was this form that was once given to the Mendeleev table, and later it was refined by his friend and colleague, the Czech chemist B.F. Brauner [145]. This original version of the table immediately explains how the elements Ce and Tb can have valency (+IV), and Eu and Yb - valence (+II): they just fall into the 4th and 2nd groups. Elements La, Gd and Lu, standing in the third group, always show only valency +III. However, due to the fact that electrons can form different configurations in an atom, the valence can be different (§ 4.14).

Another important property of this form of the table is that it allows you to select elements with ferromagnetic properties. If we consider the elements of the second row of the 6th period - Sm, Eu, Gd, Tb, Dy, Ho, Er, we will see that either they themselves or their compounds are strong ferromagnets. Such a subdivision immediately makes it possible to identify unique elements with

ferromagnetic properties in other even periods of the table. So, in the second period, the layer perimeter contains 6 electrons. Dividing them and the corresponding elements into two equal groups and taking elements from the second, - C, N, O, we find that it is their compounds that have ferromagnetic properties. The same, and in the fourth period, where the layer perimeter contains 10 electrons, the second half of the corresponding elements - Cr, Mn, Fe, Co, Ni (Fig. 109) - either themselves or in compounds - bright ferromagnets. So, the pyramidal model immediately identifies those rare elements that are endowed with ferromagnetic properties. In fact, these are atoms in which the filling of places near the edges of the right compartment of the lower pyramid takes place (Fig. 104, Fig. 107). And the elements that fill the places in the corners of the pyramid at the edges of the partition with electrons (Cr, Ti, Nd, Er, Tm, Yb) have unique optical properties and are used as active ions in lasers.

The same as for lanthanides, the construction of the table is applicable to the 7th period, containing actinides (Fig. 109). The table and the pyramidal model of the atom again explain why many actinides show, instead of the third, atypical valencies for themselves: Md - (+ I); No - (+ II); Th, Bk - (+ IV); Pa - (+ V); U - (+ VI); Np - (+ VII) [145], which cannot be explained by quantum physics. It is no coincidence that it has long been noticed that actinides, unlike lanthanides and contrary to the predictions of the quantum theory of the atom, are very little alike. For example, uranium chemically more resembles not its "brothers" from the 3rd group, but the tungsten metal from the 6th group. So the placement of actinides, as well as lanthanides, in one cell of the periodic table is considered by many to be conditional and even erroneous [13].

Even at the dawn of the formation of the theory of the structure of the atom, such scientists as Thomson, Lewis, Langmuir, Lenard, Ritz, developed atomic models in the form of geometrically regular bodies formed by ordered subatomic particles, which explained many atomic properties [49]. Such a crystalline model of the atom was not only simple, clear, but also the most natural, because the standard numbers of electrons at atomic levels, the exact identity of atoms of the same type and their spectra suggest crystals and regular geometric bodies. However, with the advent of quantum mechanics, these models were forgotten, although they explained the mysterious effects of quantum physics. **The bipyramidal crystal model will allow not only to visually and classically interpret all the properties of atoms and nuclei, to better understand the essence of the periodic table, but also to discover new patterns and properties of elements, learn to find new compounds with desired properties, including ferromagnetic alloys, semiconducting materials, high-temperature superconducting shoes (§ 5.9). Quantum theory explains, for the most part, only the already known properties, and even then, to a limited extent.** In their quest to save the erroneous planetary model of the atom, the creators of quantum physics, led by Bohr, chose to destroy mechanics rather than abandon their idol. And the ideas of Ritz, J. Thomson, Lenard, Lewis, Langmuir, Tsiolkovsky, who tried to construct an alternative model of the atom, within the framework of classical mechanics, were rejected and forgotten. As a result, for a century now, science has not had a

clear understanding of the structure of the atom and nucleus.

§ 3.4. *Spectra of alkali metals, complex atoms and molecules*

By combining, by addition or subtraction, either the serial formulas themselves, or the constants included in them, it is possible to construct new formulas that make it possible to completely calculate the new lines of alkali metals discovered in recent years by Lenard and others, and also make possible far-reaching applications to others. elements, in particular helium.

Walter Ritz, "On the New Law of Serial Spectra" [9, 50]

Above, the spectrum of hydrogen and hydrogen-like atoms, as well as X-ray spectra and Moseley's law for them (§ 3.2), were explained on the basis of the Ritz atomic model. But Ritz also found an explanation for the spectra of more complex atoms, such as alkali metal atoms. Their spectra have a much more complex structure than those of hydrogen and hydrogen-like atoms. As mentioned, this is due to the influence of the fields of additional electrons on the electron generating the spectrum. Since any electron set in vibrational motion can generate the spectrum, the complication of the spectrum is associated with the general mutual influence of electrons. With their fields, they shift each other from the previous equilibrium positions to new ones, with a different value of the field B and the frequency of oscillations in it. Moreover, since all these electrons can occupy different sites in the atom, forming different configurations, then the displacements from the equilibrium positions, leading to a change in the magnetic field, can be different and occur in different directions. Accordingly, additional spectral lines appear, generated by electrons in displaced positions: the spectrum of the atom is enriched and complicated. And, the more electrons are able to move in an atom, the more complex the spectrum will be.

Indeed, the simplest spectra are possessed by alkali metals at the beginning of periods - in the first group. This means that they have, in fact, one freely moving electron. All the rest of the electrons are firmly bound in completely filled electron layers (§ 3.3), and therefore they introduce only small standard distortions of the spectrum. That is why the spectra of alkali metals are very similar to the hydrogen spectrum, obeying almost the same dependences [74]. Elements of the second group already have two freely shifting electrons, which can form many more combinations of positions in the atom, respectively, and the spectrum of these elements is more complex. And so on: the more electrons, the more complex the spectrum becomes, unless the new electrons form stable symmetric configurations and are firmly bound in the layer, say, along its perimeter. However, as the end of the period approaches, when there are less and less free places, the electrons are more and more reluctant to detach from the layer and form fewer different combinations, therefore, by the end of the period, the spectrum may even become simpler. Finally, in inert gases, where all the electrons must be firmly bound in the layer (Fig. 106), it is necessary to separate one or more electrons from the layer to generate a spectrum at the electronic corner. This explains the relationship between the nature of the spectrum and the position of the element in the periodic table, with its chemical properties. Namely: the number of electrons that an atom can give or receive to

form a chemical bond also sets the number of electrons that can pass from the extreme electron layer to the plane where the spectrum is generated (Fig. 107), with the formation of different configurations there and the complication of the spectrum by mutual influence.

Explains the interaction of electrons and why many of the complex atoms have a multiplet spectrum: each spectral line is surrounded by close satellite lines. Probably, the reason for this is that the intra-atomic electric fields of the remaining electrons slightly displace the generating electron from the equilibrium position. Accordingly, the magnetic field near the electron and the line frequency generated by its oscillations change. Different positions of the surrounding electrons in the atom correspond to different positions of the generating electron near the site. And, therefore, instead of one line in complex atoms, we observe a group of closely spaced lines, for each of which their own atoms are responsible. The line intensity is determined by the percentage of atoms that generate it, that is, by the probability for electrons to occupy the corresponding positions in the atom [104]. Therefore, as Ritz showed, the closer to the boundary of the series, that is, the higher m in the formula $f = Rc [1/n^2 - 1/m^2]$ and the farther the electron is from the axis and origin, the lower the line intensity, since it is more difficult for an electron to stay in distant sites. For the same reason, the lines become more and more blurred: electrons and positrons in the core tremble due to thermal motion, like atoms in a simple crystal (§ 3.14). The farther away the electron, the stronger it affects, and the less stable its position, respectively, and the lines are more diffuse [104].

Likewise, forbidden lines are not illuminated by no means from the quantum rules of selection forbidding transitions, but from the low stability of the corresponding positions of the electron in the atom, and, therefore, from the low intensity of the line. As Ritz showed, in an electric spark, the spectral series contain fewer lines - the series breaks off earlier, again, because in the powerful electric fields of the spark, due to strong and frequent collisions of atoms, electrons can no longer be held in extreme, unstable positions, and the corresponding lines are not displayed [104]. And on the contrary, in the spectra of gaseous nebulae, where the gas is extremely rare and cold, and collisions are very rare and weak, forbidden lines, which are impossible according to quantum theory, are observed. After all, there the electrons are able to be held for a long time even in extreme unstable positions, highlighting the corresponding lines.

So, the intensity of a given spectral line is determined by the percentage of atoms generating this line, that is, ultimately, by the probability of an electron occupying a corresponding position in an atom, given by the stability of a given position, in which one or another number of electrons from an ensemble of atoms can happen to be. A similar probabilistic approach to determining the intensity of spectral lines was also developed in quantum theory, in particular by Einstein, again without any reference to Ritz, so now they simply talk about Einstein's coefficients that specify the probabilities of atomic transitions. Ritz, on the other hand, not only proposed this idea much earlier, but also developed it entirely within the framework of the classical approach, since his probability is associated not with physical indeterminism, uncertainty, but with the random, chaotic

movement of atoms and electrons in them, analogous to the random movement of Brownian particles (§ 4.13).

Ritz also made a huge contribution to the establishment of the law and nature of the spectral series of alkali metals, similar to the hydrogen spectrum $f = Rc[1/n^2 - 1/m^2]$, but only with small corrections [74]. The exact formula found by Ritz for the spectra of alkali metals is written as follows [50]: $f = Rc[1/(n+\mu'+b'/n^2)^2 - 1/(m+\mu+b/m^2)^2]$, where μ , b , μ' , b' - small constant corrections, individual for each metal. From the Ritz model, it is easy to understand the origin of these corrections. Recall that the integers n and m set the distances $r_1 = 2am$ and $r_2 = 2an$ from the magnetic axes, and, accordingly, the magnetic field B at the site where the electron oscillates, and, therefore, the frequency of its oscillations $f = Be/2\pi M$ (§ 3.1). The presence of corrections means that the generating electron is displaced from the previous equilibrium position and its distance to the axes becomes equal to $r_1 = 2a(m+\mu+b/m^2)$ and $r_2 = 2a(n+\mu'+b'/n^2)$. The constant displacement by $2a\mu$ and $2a\mu'$ is probably caused by a change in the configuration of the structure of the atomic core that sets the magnetic field, say, from its skew, if the lateral faces of the layered prisms (Fig. 102, Fig. 103) are beveled and they are inclined, and not straight prisms. Accordingly, the magnetic axes will be displaced from the axes of the coordinate grid of the electron at distances $2a\mu$ and $2a\mu'$, which leads to a change in the spectrum. As for the variable corrections to $r_1 = 2am$ and $r_2 = 2an$, the values $2ab/m^2$ and $2ab'/n^2$, as it is easy to see, they decrease with increasing m and n , that is, with distance from the magnetic axes. So, these corrections are most likely caused by the influence of the edges of the structure that generates the spectrum. This is an electrical effect that displaces the electron from the equilibrium position and just falls off in proportion to the squares of the electron distances from the magnetic axes $r_1 = 2ma$ and $r_2 = 2na$ and from other electrons adhered to these axes. Together, these deviations are the position of the electron or the magnetic field in which it oscillates, and lead to a change in the frequency of the light generated by its oscillations, in the form of corrections taken into account in the more accurate Ritz formula.

In his works, Ritz also analyzed the striped spectra of molecules and proved that the combination principle discovered by him also works in them. However, the number of possible combinations increases significantly due to the fact that electrons in a molecule can be located in a much larger number of ways and, in addition, various ways of adding the magnetic fields of atoms arise. Therefore, the molecules give much more spectral lines, which are so closely spaced that they merge into solid bands at a not too high resolution of the spectroscope. In addition, molecules have rotational (rotational) and vibrational spectra associated with vibrations of atoms (more precisely, their charged nuclei) in molecules. In this case, the oscillations are already guaranteed to be of a purely classical nature, rejecting once again quantum fantasies. When atoms vibrate or rotate in a molecule near the points of their bonds, these charges generate radiation with the frequency of the corresponding vibrations. For each molecule, these frequencies are rigidly fixed, like the vibration frequency of weights connected by a spring. For each molecule, there are a number of such frequencies, since,

depending on the type of vibration and the point of connection of atoms, the molecule has its own vibration frequencies. As a result, the spectrum of each substance has its own rotational and vibrational bands [19].

Note that such a mechanism for generating spectra due to elastic mechanical vibrations of atoms, molecules and charges in them was suggested by Ritz in his early elastic model of the atom, which depicted the atom as an elastic membrane [74]. In particular, Ritz asserted: "the line spectra owe their origin to the natural vibrations of two-dimensional formations" [50]. Thus, Ritz is a pioneer not only in the field of the classical explanation of the strict regularities of spectral series in line atomic spectra, including the spectra of hydrogen, alkali metals, and complex atoms, but also in explaining the striped spectra of molecules. And, after all, no one even thought about their nature at the time of Ritz, due to their extreme complexity and intricacy.

It is noteworthy that quantorelativistic physicists still cannot decipher and theoretically calculate the spectra of many-electron atoms, even as simple as a helium atom containing only two electrons. Quantum mechanics "explained" only those spectral series and regularities that were already discovered and explained by classical physicists, including Rydberg, Ritz and others, by means of classical oscillations of an electron in the field of a nucleus. On the one hand, this shows the meaninglessness and uselessness of all quantum interpretations (invented in hindsight), and, on the other hand, classical models (and especially the Ritz model) show great promise in terms of discovering new spectral laws and physical (and not mystical) interpretation of spectra many-electron atoms.

§ 3.5. Zeeman, Stark effects and frequency gravity

This model of the molecular field H_0 is not only suitable to a much greater extent than the Lorentzian hypothesis ... for representing the phenomena of the Zeeman effect in their wide variety and with their characteristic features ... Lorentz did not touch at all.

Walter Ritz, "Magnetic Atomic Fields and Serial Spectra" [9, 50]

As we have seen, Ritz, on the basis of his model, easily explained the Zeeman effect (§ 3.1), showing that the external magnetic field B_M , superimposed on the magnetic field of the atom B , changes its magnitude and, accordingly, the frequency of rotation of the electron in this field (Fig. 94). This leads to the fact that instead of one line there are several close lines (line splitting). Usually there are three lines - a triplet. The central line is created by electrons located in the initial intra-atomic magnetic field B : the external field B_M either does not affect them at all, or is imposed perpendicular to the main field B and, being much less than it, almost does not change the electron rotation frequency, which remains the same $f=eB/2\pi M$. For other electrons located in other planes of the atomic pyramid (Fig. 107) or in other atoms, the orientation of the field B turns out to be opposite to the external field B_M . Therefore, they generate at a frequency of $f=e(B-B_M)/2\pi M$. Finally, the fields of the third type of electrons will add up, and, therefore, such electrons rotate and generate light with a frequency $f=e(B+B_M)/2\pi M$. This leads to the fact that near the central line at the frequency $f=eB/2\pi M$, two adjacent ones appear, shifted to the right and left by

$\Delta f = eB_M/2\pi M$. The way in which for some electrons the fields B and B_M are summed up, and for others are subtracted, is easy to understand from the bipyramidal model. The electrons generating the spectrum sit on different faces and partitions of these pyramids, and the intra-atomic field B , as it was found out (§ 3.1, § 3.2), is always perpendicular to the plane of these faces. In a magnetic field, atoms are arranged in an orderly manner, orienting the general magnetic atomic field in the same direction as the external one. In this case, some faces turn out to be perpendicular to the external field B_M , while for others it lies in the plane of the atomic faces. Accordingly, for electrons located in the same planes, the external field, adding or subtracting from the intra-atomic one, will change the oscillation frequency, and for electrons located and oscillating in the same plane as the external field B_M , the oscillation frequency will not change. This also explains the different polarization of displaced and unbiased lines: the electrons that generate them oscillate in mutually perpendicular planes, which means that the alternating electric field they create oscillates in different planes, respectively, their radiation is also differently polarized.

Ritz also explained the anomalous Zeeman effect, which consists in the fact that each of the split lines, in turn, is split under the action of an external field. This is due to the fact that the atom precesses, rotates in an external field. Indeed, unlike a solitary electron, the magnetic moment of which cannot be established in an external field in the same direction as the field, but begins to precess due to the gyroscopic effect, the structure formed from many magnets, rotating electrons, is immediately oriented along the external magnetic field, as can be seen from the example of ordinary magnets, - complexes of elementary circular currents. However, the gyroscopic effect, nevertheless, affects here, therefore, the magnetic moment of the atom deviates somewhat from the axis of the external magnetic field and begins to precess around it. The frequency of this precession, as Ritz showed, is again added to the frequency of rotation of an electron in a magnetic field or subtracted from it, which leads to the appearance of a secondary splitting of lines. More complex cases of line splitting are also possible, especially in many-electron atoms, which, due to the presence of many electrons located in the atom in different ways and also possessing a magnetic moment, lead to the fact that the atom can be located in several ways with respect to the external field B_M . In addition, if this magnetic field is large enough, it can change the intra-atomic field B not only by superposition, but also by changing the directions of the magnetic moments of the particles generating the field B , ordering them and simplifying the line splitting pattern. Such an effect in powerful magnetic fields comparable to intra-atomic ones is indeed observed and is called the "Paschen-Bak effect" [134]. As you can see, all the features of the Zeeman effect follow from the Ritz model.

In addition to the Zeeman effect, which leads to the splitting of lines in magnetic fields, the Stark effect is also known, leading to the displacement and splitting of lines under the action of a strong electric field [82, 134]. In the Stark effect, a multiplet spectrum usually also arises: each spectral line is split into

several close ones. The reason for this is as follows. The atom, due to its own dipole moment, is oriented by an external electric field. Moreover, it can orient itself in different ways, depending on how the dipole moment is directed in the atomic bipyramid, given by different variants of the positions of the electrons in the atom. The number of possible orientations of an atom in a field is limited by a finite number of positions of electrons in the atom. Therefore, the field component acting on the electron generating the spectrum and displacing it from the equilibrium position changes discretely.

Thus, again, each line will be split into several separate ones. Moreover, as in the Zeeman effect, for some of the electrons, the external electric field is directed perpendicular to the face on which the electron that generates the spectrum sits and vibrates. Therefore, the field does not displace this electron from the equilibrium position, and it gives an unbiased line. And for other electrons, possibly of the same atom, but sitting on other faces, the field is directed along the plane in which the electron moves and vibrates. Accordingly, the external field displaces it from the equilibrium position (the atom is polarized), the electron finds itself in a magnetic field of a different magnitude and generates at a different shifted frequency. Since displaced and unbiased electrons vibrate in different planes, the displaced and unbiased lines emitted by them have different polarizations. In addition, if the electric fields are very strong, displacement and splitting of lines is possible and due to distortion, the electric polarization of the very electron-positron crystal lattice of the atom, where electrons and positrons are displaced under the action of the field in opposite directions. In the Zeeman effect, an atom also assumed different positions in a magnetic field, but the magnetic field changed the frequency of the electron's vibration not from its displacement from the equilibrium position, but from the addition or subtraction of the external magnetic field from the intra-atomic one. That is why the splitting of lines by a magnetic field is much stronger than an electric one.

Even weaker is the shift of spectral lines by the gravitational field, which is observed, possibly, in the solar spectrum and in the Mössbauer effect. The effect of gravity, firstly, shifts the electrons and protons that generate the spectrum from their equilibrium positions, thereby changing the magnitude of the atomic magnetic field in which they vibrate and the frequency of their vibrations. Second, the inhomogeneous gravitational field creates an additional tensile force, similar to the tidal force from the Moon. Acting on the charge, this force expands, stretches its orbit, decreasing the rotation frequency, which is manifested in the shift of the wavelengths and frequencies of the spectral lines of the atom and nucleus. It is possible that this shift in the frequency of oscillations of charges in atoms is perceived as an imaginary change in the rate of flow of time in a gravitational field (§ 1.18). It is worth noting that the influence of gravity will equally affect both the frequency shift of atomic spectra (atomic clocks) and the frequency shift of nuclear spectra (the Mössbauer effect), since these spectra, as we will see, are generated by a single mechanism (§ 3.7). Then it is understandable why both with the help of the Mössbauer effect and with the help of atomic clocks, the same changes in the

"rate of the passage of time" are detected, but in reality, only the frequency of oscillations in the gravitational field.

Thus, the Ritz hypothesis on the nature of the Zeeman effect makes it possible to explain not only all the features of this effect, but also the Stark effect and the gravitational frequency shift, proving their common nature and the universality of the Ritz atomic magnetic model. Proponents of the Bohr model of the atom usually argue that the Stark effect can only be explained by quantum theory. In fact, it is the classical Thomson-Ritz theory of the atom that provides the simplest and most natural explanation for the effect. And the Stark effect was predicted by Ritz's teacher, W. Voigt (a specialist in crystal physics [50, 156]) - just within the framework of the classical model of the atom, the structure of which, like crystals, is perturbed by an external field that changes the properties of atoms and the vibration frequency of its electrons. Finally, Stark himself, having discovered the effect of the same name in 1913, argued on the basis of experimental data that Bohr's theory of the atom was erroneous and that the effect had a classical interpretation. It was Stark who, having studied the intensities of the split spectral lines of atoms moving at different angles, associated the splitting with different polarization of atoms in an electric field - from the displacement of electrons in them, depending on the atomic structure (["Nobel lectures in physics. 1901-1921.", M.: UFN, 2002](#)). At the same time, Stark adhered to the Thomson model of the atom, close to the Ritz magnetic model, and he also built a theory of covalent bonds, comparing the valence of an atom with the number of electrons on its outer shell. It turns out that the static model of the Thomson-Ritz atom classically explained the Stark effect, while the dynamic planetary model did not. But, instead of accepting the static model and rejecting the planetary one, theorists, led by Bohr, simply fitted the latter, adding absurd quantum postulates and rejecting classical mechanics, which they considered to be the culprit of their misunderstanding of the Stark effect. **The real reason for the splitting and shift of lines, as classical physicists have long understood, consists in the displacement of the charges generating the spectrum from the nodal positions under the influence of external fields and fields of other charges of the atom,** which affects not only atomic, but also nuclear spectra. This influence, revealed with the help of the same Mössbauer effect, once again confirmed the deep connection between the structure of molecules, atoms and electron shells in them - with the structure of nuclei and nuclear spectra [135].

§ 3.6. *Nuclei structure*

The more nucleons should fit in the nucleus, the larger the surface area of the nucleus, where the addition of protons and neutrons occurs ... These features are best suited to the shape of the nucleus in the form of two Cheops pyramids connected by truncated vertices. Then their "soles" become those surfaces that are layer by layer filled with both protons and neutrons.

V. Manturov, "Nuclear forces - a proposal for a solution" [79]

It was shown above that it is the nucleus, the atomic core, that sets all the properties of atoms with its bipyramidal shape and is responsible for the periodicity of the properties of elements, which manifests itself in the form of the periodic law of D.I. Mendeleev (§ 3.3). Thus, for the first time, a bridge was laid between the chemical and nuclear properties of elements, which physicists have long dreamed of [139, 145]. But it turns out that the connection between chemical and nuclear properties is manifested in something else. So, the nuclear properties of elements also have a certain periodicity, in many respects repeating the periodicity of chemical properties. This can be seen from the abundance of elements, the number of their isotopes, and the values of atomic masses. Jumps in these characteristics are common at the boundaries of the periods. Therefore, the elements of the VIIIA group, - inert gases: He, Ne, Ar, Kr, Xe, Rn (Fig. 106) - are noticeably knocked out of the general sequence, at least by sharp jumps in their atomic masses. If you trace the dependence of the atomic weight on the element number, plotting it on the graph, you get a monotonic curve: the atomic weight, with an increase in the number by one, increases by an average of two units. But there are emissions on this curve, jumps - especially noticeable near inert gases. The record belongs to radon, with a jump as much as 12 atomic mass units.

The periodicity of the properties of atoms is, as found above, a consequence of the layer-by-layer filling of the bipyramidal skeleton (nucleus) of the atom with electrons (§ 3.3). When one layer is filled, the electrons firmly bound in it no longer come off and do not participate in the formation of a chemical bond, and when the next layer is filled, everything is repeated from scratch. That is why the properties of the elements are periodically repeated with the filling of each subsequent level. The same, apparently, is due to a certain periodicity of the properties of nuclei, which manifests itself in the existence of magic nuclei (especially stable combinations of nucleons, analogous to chemically stable atoms of inert gases), as well as the connection between the properties of nuclei and the arrangement of elements in the periodic table.

So, for example, for an unclear reason, the stability of the nuclei in the elements of the IA group is increased. It contains the most stable odd-numbered nuclei. Such nuclei, containing an odd number of protons and neutrons, are usually extremely unstable and therefore do not occur in nature. Only 4 stable odd-odd nuclei are known, but, of these four, two are located in the first group: ^2H , ^6Li , just like the odd-odd ^{40}K nucleus, which has such a long half-life that it was previously considered stable and until now can be conditionally considered as such. In fact, potassium-40 is classified as a naturally-radioactive isotope

with a huge half-life, and therefore still preserved in nature. The number of naturally radioactive nuclei is small, and again there are most of them in the IA group: apart from ^{40}K , they are ^{87}Rb , ^{135}Cs and ^{223}Fr . The chemical antipode of the elements of the first group is the elements of the seventh group. But in terms of nuclear properties it is also an antipode. So, apparently, due to the low stability of nuclei in nature, elements of group VIIB are rarely found or completely absent. This law, discovered back in 1924 by W. Prandtl and A. Grimm, was forgotten, like everything that contradicts the quantum theory [145]. Indeed, of the five elements of group VIIB (according to the original version of the periodic table and Brauner, Fig. 109): Mn, Tc, Re, Pm and Np, only manganese is widespread, while rhenium is extremely rare (this is the most expensive metal), and all other elements, being unstable, practically do not occur in nature and are obtained artificially.

Another example is provided by unstable odd-odd nuclei with a very long half-life. In nature, you can find only 4 such nuclei: ^{40}K , ^{50}V , ^{138}La , ^{176}Lu . But, after all, La and Lu are the extreme elements of the lanthanide series, and K and V are the extreme elements of the semi-perimeter of the 4th layer (Fig. 109). The exclusivity of elements from the lanthanum family (lanthanides), not only in terms of chemical properties, but also in terms of nuclear properties, has been noted for a long time [145]. But no one could explain why these properties are interrelated. And the reason, as we will see, is in their single mechanism, in the atomic core. It is the crystalline nuclear core of the atom that links the chemical properties of elements, their positions in the periodic table - with their nuclear properties. I. Rydberg, A. Van den Bruck, F. Soddy [139] spoke of such a connection, who laid the foundations for the notions of the structure of the atom, nucleus and defended the original form of the periodic table, where lanthanides and actinides are distributed into groups ([Lisnevsky Yu. Antonius Van den Brook. Moscow: Nauka, 1981](#)).

All of the above confirms the close relationship between the structure of the nucleus and the electron layers in the atom. It turns out that the periodic table reflects the regularities, alternation and interrelation of not only physicochemical, but also nuclear properties of elements. This means that the bipyramidal skeleton of the atom is somehow responsible for the nuclear properties of the elements. Thus, it is this geometrical structure of the bipyramid that should provide the key to understanding the structure of the nucleus. Geometry, a visual, imaginative approach, as any engineer knows, makes it easy to solve even problems that are rebellious to analytical methods. This is how Louis Poincaré - an engineer known for the discovery of a new type of regular polyhedron - solved an important problem in mechanics. An adequate understanding of the structure of the world is impossible without geometry. Thus, the spatial arrangement of atoms in molecules and crystals determines their physicochemical properties, and the arrangement of elements in the periodic table gives information about the properties of atoms and their compounds. But, ironically, it is in the microworld - the foundation of the universe - that geometry and visual models are ignored, considered unnecessary, reducing everything to formulas and

hiding behind a fog of uncertainty, absurd blurring of particles, depriving the world of a clear structure.

A clear, or, more precisely, "beloved" example of this is given by the current ideas about the atomic nucleus. It is depicted as a charged drop, then as a series of shells, then as something else, or even, at all, as a bunch of formulas [11]. As a result, physicists got so confused that they themselves admit their lack of understanding of the structure of the nucleus and the impotence of quantum theory [135]. And only the classical model of the atom gives a crystal-clear structure of the nucleus, explaining all its properties. In this model, the atomic nucleus looks like a bipyramid: two pyramids connected by truncated vertices. This structure sets the configuration of the electron layers (shells), the relationship between chemical and nuclear properties. So, like atoms of inert gases, with especially stable configurations of electrons and high chemical resistance, in some nuclei nucleons (protons and neutrons) form especially stable combinations that show inertness in nuclear reactions. Such nuclei, called "magic" ones, have increased strength and weakly react with other nuclei and neutrons.

Here are the numbers of protons or neutrons forming especially strong combinations (magic numbers): 2, 8, 14, 20, 28, 50, 82, 126 [169]. Physicists realized that magic numbers, like the periods of the periodic table, are caused by the presence in the nucleus of certain layers, shells, gradually filled with nucleons (protons and neutrons). Kernels with complete shells are magical and especially stable. But physicists did not take the last step: they did not guess that the structure of nuclear and electronic layers is given by one structure - the atomic nucleus, which is responsible for the deep analogy of chemical and nuclear properties, their periodicity.

This analogy explains the structure of the core layers. The numbers of electrons in electron shells (2, 8, 18, 32) are doubled squares of integers: $1^2, 2^2, 3^2, 4^2$ (§ 3.3). In geometry, such numbers n^2 are called "square", referring to the group of figured numbers - the number of identical pebbles, particles, layer by layer filling figures in the form of triangles, squares, etc. (Fig. 110). So, triangular numbers form a series: 1, 3, 6, 10, ..., where the n -th number is $F_n = n(n+1)/2$. And, if the number of electrons in the layers is twice the square number, then the numbers of protons

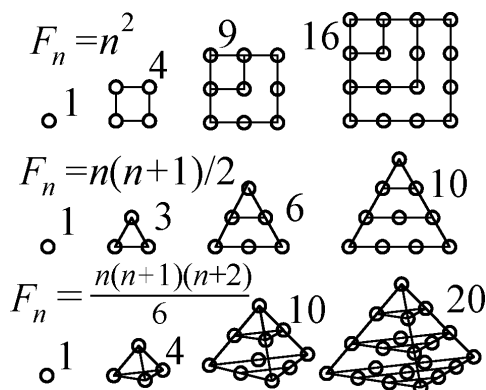


Fig. 110. Figured numbers (square, triangular) and pyramidal numbers.

or neutrons in nuclear shells turned out to be doubled triangular numbers of the form $n(n+1)$, that is, 2, 6, 12, 20, 30, 42, 56 [135]. All magic numbers follow

from here. The first number 2 corresponds to the first layer completely filled with nucleons with the number of places 2. The second magic number 8 means that besides the first one, the second layer of 6 places is also filled: $2 + 6 = 8$. The magic number 20 appears if the third level is also filled: $2 + 6 + 12 = 20$. As for the case of electronic layers, nuclear ones are stacked one above the other - in the form of a pyramid, and, therefore, these three numbers are doubled pyramidal numbers of the form $n(n+1)(n+2)/3$, forming a series: 2, 8, 20, 40, 70.

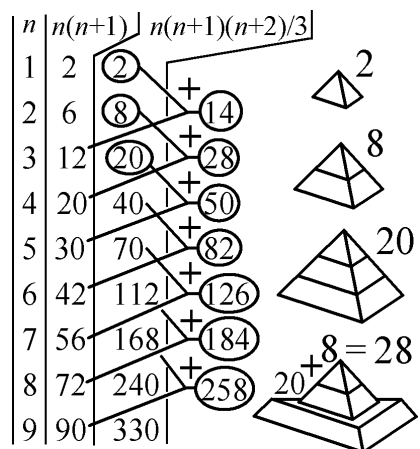


Fig. 111. Scheme of formation of magic numbers (circled) and their geometric interpretation.

Other magic numbers are found as the doubled sum of the n -th triangular number and the $(n-2)$ th pyramidal number: $n(n+1) + n(n-1)(n-2)/3 = (n^3 + 5n)/3$ (Fig. 111) [169].

All this can be easily explained on the basis of the bipyramidal model of the nucleus. Like the electron layers, the nuclear ones lie in successive square sections of the pyramids. Each section is divided by a diagonal partition into two triangles. Therefore, the number of particles in the layer is equal to twice the triangular number (Fig. 112). Protons and neutrons gradually fill the cross sections of the bipyramid, layering in layers in its sockets, like peas, seeds in pouches. In this case, the protons form separate layers, which are interspersed with layers of neutrons (Fig. 113). The pyramids are connected by a bridge formed by layers of two protons and two neutrons. In the doubly magic helium nucleus, only these two layers are filled.

Subsequent nuclei begin to gradually fill the layer of neutrons and the layer of protons adjacent to these layers on both sides, until they are completely filled, forming a doubly magic oxygen nucleus containing 8 neutrons and 8 protons. It grows overgrown with new layers (on the one hand with protons, and on the other - with neutrons), up to their filling with calcium, which contains 20 protons and neutrons each. But then such a symmetric growth of layers is violated, since in heavy nuclei the number of neutrons N significantly predominates over the number of protons Z . Therefore, it is necessary that the outermost layer of neutrons be larger than the outermost layer of protons. This means that in one pyramid there are two more layers than in the other.

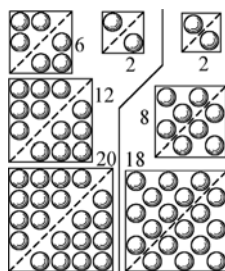


Fig. 112. The structure of nucleon layers (left) and electronic layers (right).

So, for example, the doubly magic calcium nucleus of 28 neutrons and 20 protons is arranged (Fig. 113). We also see that the model explains the magic number 14 [169], which quantum physics could not predict and explain. However, other magic numbers were not predicted by quantum theory, but were obtained there, like the numbers of electrons in the shells of an atom (§ 3.3), by the fitting method, because the transition to the next shell and level began before the previous ones were completely filled [135]. But then, why even talk about shells and levels, since their completeness is not important?

On the other hand, in the classical model of an atom and a nucleus, strong combinations of electrons or nucleons correspond only to complete layers of particles. So, the following bimagic nuclei could be obtained from configurations where both outer layers are formed by neutrons, so that in one pyramid there are three more layers than in the other (Fig. 113). But such doubly magic nuclei are unstable because they contain too many neutrons. However, it is easy to get just magic nuclei from them, if you add a few protons or remove some of the neutrons. Accordingly, the nucleus will be magic by the number N or Z . True, there is still one more doubly magic nucleus - this is the lead-208 nucleus, containing 82 protons and 126 neutrons. For such heavy nuclei, this ratio of nucleons is stable.

So, the most stable are the most symmetric doubly magic nuclei: in them the layers are fully completed and, therefore, they hardly give and absorb particles.

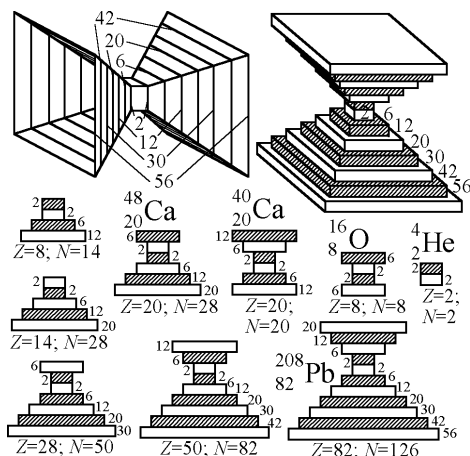


Fig. 113. Scheme and capacities of nucleon layers in a bipyramidal nucleus. Below are the layer structures in the magic cores. The shaded layers are formed by protons, the white ones by neutrons.

It's just that the magic cores are less symmetrical: one layer of them is not refilled. Therefore, the excess of their stability is less pronounced. All other nuclei are even less symmetric: both outer layers are not filled, and these nuclei are not distinguished by stability. But even among them there are more stable ones - these are nuclei with an even number of protons and neutrons. Perhaps the increased stability is due to the fact that in nucleon cells and layers, protons are fused into pairs, just like neutrons. Therefore, by the way, they usually fly out of nuclei in bound pairs, say, in α -decays, or in two-proton and two-neutron decays (the reason for this, apparently, lies in the special form of protons and neutrons, which have different protrusions and troughs that strengthen the bond of particles and explaining the "tendency" of protons and neutrons to form separate layers-shells, § 3.12).

In such stability of nuclei formed from proton and neutron pairs, the relationship of chemical and nuclear properties is again visible. Thus, chemical compounds with an even number of bonding electrons are more stable (hence the term "electron pair"). And elements with an even number of electrons are always more inert than elements with an odd number. Indeed, only an even number of particles symmetrically fills the layers. Namely, symmetry, geometric order, as shown by the example of atoms and magic nuclei, is a measure of strength and stability. It is remarkable that the visual-geometric ballistic analogy is also directly related to the structure of nuclei and crystals, since the cannon balls have long been

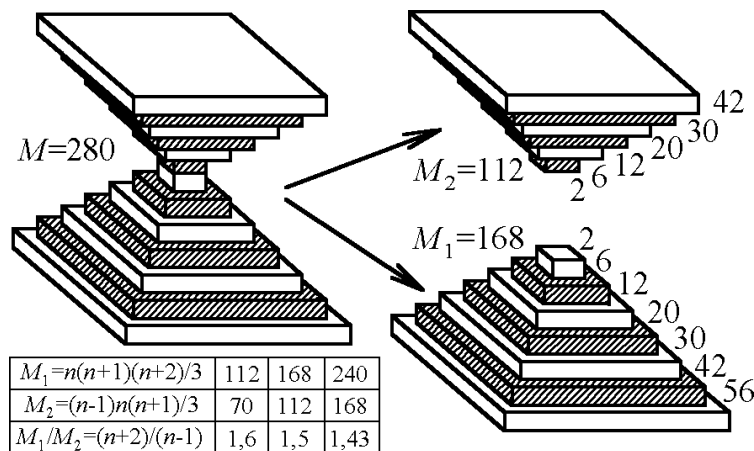


Fig. 114. Division of the bipyramidal nucleus into two fragments-pyramids with a mass ratio of 3:2. The pyramids are not equal, since the outer layers are formed by neutrons (which prevail in the core): in one pyramid there are one more layers.

folded in the form of figured nuclear pyramids. Therefore, it is the cannonballs folded in a pyramid that are usually cited as an illustration of pyramidal numbers and a model of the arrangement of atoms in crystals.

The bipyramidal crystal model of the nucleus easily explains why heavy nuclei are divided into two parts: in a ratio of three to two [135]. The bipyramid breaks along the bridge into two pyramids, the mass ratio M_1/M_2 of which is equal on average to the ratio of two neighboring pyramidal numbers: for heavy nuclei it is just 3:2 (Fig. 114). This also reveals the reason why in heavy nuclei the ratio of

the number of neutrons and protons N/Z is also 3:2. After all, if you add separately the proton (hatched) and neutron layers, they will form two pyramids, and in the neutron pyramid there will be one more layer (Fig. 114). Explains the bipyramid and the large number of isotopes of heavy elements [79], and the properties following from the droplet model of the nucleus. Nuclear forces keep the proton layers from scattering, thanks to the layers of neutrons that separate them. However, in heavy elements the repulsion of protons is so great that, starting with polonium, nuclei are unstable, and, with an increase in atomic number, their stability decreases.

Many [21, 79], including nuclear physicists [169], already assume that the nucleus is like a crystal. And, exactly, it is the crystal bipyramidal model of the nucleus that allows one to describe all the nuclear and chemical properties of elements in a unified way. Soon it will make it possible to compile a kind of periodic table of nuclei, like the periodic table, graphically setting the properties of elements.

The analogy between chemistry and nuclear physics makes it possible to understand the nature of isomerism of atomic nuclei. A nucleus from a given number of protons and neutrons can be built in many ways, by arranging particles in layers in different ways. Then, even nuclei with the same proton-neutron composition, but different structures, will have different stability. These are the isomer nuclei, which are analogous to isomer molecules of organic chemistry, which have the same atomic composition, but different order of arrangement of atoms, and, therefore, different properties. It is possible that nuclei are capable of decaying in different ways and have several different half-lives [169], precisely because it is a mixture of isomers (the percentage of this type of decay is determined by the content of the corresponding isomer).

So, the properties of nuclei are set not only by the number of protons and neutrons that form them, but also by their placement in the core. Similarly, it has long been discovered in structural chemistry that the properties of molecules depend both on the number of atoms of the constituent and on their spatial arrangement in the molecule - on its structure, as was first shown by A.M. Butlerov (§ 5.16). Such molecules with identical atomic composition but different structure and properties are called "isomers". The same is true for kernels. The phenomenon of nuclear isomerism was discovered long ago by O. Gann and studied in more detail, for example, by I. Kurchatov. There are many nuclear isomers with the same proton-neutron composition, but different half-lives. Here the organizing role of the core is manifested, where nucleons form different configurations. There is no explanation for this in the quantum model of the nucleus, just as there is no explanation for the magic numbers of nucleons, the shell model. Indeed, in the nucleus, in contrast to the atom, there is no center of force that would define a system of levels according to quantum mechanics [135]. And in the crystal model of the nucleus, there is such a level-setting structure — it is the atomic core.

The existence and number of isomers of a given nucleus depends on its mass. There are so-called isomer islands, regions of atomic masses with a large number of isomers. This is due to the filling of nuclear levels: depending on how busy a given level is, there can be more or less relatively stable variants of its spatial filling with nucleons, respectively, more or less isomers of different stability. This explains why isomeric islands are located near stable magical nuclei with their completed levels. This also explains why isomers are usually found in nuclei with an odd number of protons and neutrons [135]. An even number of nucleons breaks up into pairs: the particles are paired in layers, just like electrons. This is because the number of places in the layers, including along the perimeter, is even, and in one way or another the paired nucleons can form a stable, completed, or stage-completed configuration of the layer. On the other hand, in the presence of an unpaired nucleon, the particles can freely move in the layer, like chips in spots, forming different configurations-isomers. The connection between isomerism and the spatial arrangement of nucleons in the nucleus can be traced at least in ^{180}Hf , in which a different shape of isomeric nuclei was clearly revealed. And yet, despite the fact that even the word "isomer" itself suggests that the phenomenon is associated with different spatial distribution of nucleons in the nucleus, physicists, relying on the quantum theory of isomerism developed by Weizsacker, believe that isomers are only excited metastable states of liquid structureless nuclei.

In general, an atom is built like this: a bipyramidal framework is erected, the skeleton of an atom, and its sockets are filled layer by layer, first with protons and neutrons, then with electrons (Fig. 112, Fig. 113). And again, the minimum energy is achieved with a completely filled layer, just like in a crystal, a face completely filled with atoms provides the crystal with a minimum of energy and stability, which is why they are found in nature. So, among nuclei, nuclei with fully completed layers of protons and neutrons are more stable - magic nuclei. They are the most durable, inert and poorly interacting with neutron beams. And among the atoms of all, the atoms of inert gases, with their fully completed layers of electrons, are the most durable and chemically stable. As you can see, the analogy with crystals is complete. It is strange that scientists, realizing the high stability of completely filled electron layers, did not draw a parallel with the stability of the filled atomic layers of a crystal. However, classical scientists - J. Thomson, G. Lewis, I. Langmuir, who were the first to put forward the idea of electron shells-layers, linked their stability with the perfect, completely filled geometric shape of the cube [49]. Only later this idea was rejected and passed to abstract quantum levels that do not have a geometric interpretation: in quantum mechanics, levels and quantum numbers are introduced completely artificially and formally.

So, it is Ritz's model of the atom that plays the bridge from atomic, chemical properties to nuclear, to the properties of elementary particles. This proves once again how effective visual geometric concepts of the atom and the atomic nucleus are. Even the ancient Greeks, who discovered figured numbers, considered geometry to be the basis of the world. The great engineer Archimedes especially appreciated his geometric discoveries, although he was

the author of physical laws and amazing machines. Likewise, Plato, who surprisingly foresaw the geometric shape of the atomic pyramids, put geometry above all, making the appropriate inscription over the entrance to his Academy (§ 5.3). The current physics of the microworld has lost a lot, rejecting visual representations and drawings, figurative, geometric, engineering style of thinking, replacing it with abstract-analytical: formulas of quantum mechanics and the theory of relativity, devoid of physical meaning and image. In the course of formalization, not only was the visual adequate picture of the world lost, but also the calculations became more complicated. The analytical solution of many problems of the microworld is so laborious and cumbersome that even a computer cannot cope with them. Trying to understand with the help of a formal, non-geometric description the structure of the atom and microcosm is as hopeless as trying to understand the work of a clock without understanding their essence, mechanism, replacing them with a set of formulas reflecting the movement of the hands. That is why it is high time to return geometry to the physics of the atom, nucleus and elementary particles. As we will see below, geometry turns out to be extremely convenient for understanding the structure of elementary particles (§ 3.9).

§ 3.7. Nuclear spectra and the Mössbauer effect

With the maximum possible reliance on mechanics or electrodynamics, it is necessary to indicate physically visual mathematical operations, the interpretation of which through the oscillations of a suitable model leads for it to the laws of serial spectra; it should allow improving empirical formulas, ordering them from a unified point of view and discovering new laws.

Walter Ritz, "The theory of spectral series" [9, 50]

It was shown above that the solution to the structure of the atom immediately explains the mechanism of generation of characteristic atomic spectra of elements (§ 3.1, § 3.2). In the same way, the establishment in the previous section of the structure of nuclei should automatically clarify the nature of nuclear spectra. It was discovered that atomic nuclei, when excited, say, from rearrangement of nuclei or from collisions, begin to emit gamma radiation of strictly defined frequencies characteristic of a given nucleus. That is, like the line atomic spectra, there are nuclear ones with much higher frequencies. In all cases, the radiation spectrum is generated by vibrating electrical charges. Thus, spinning electrons generate atomic spectra. But in nuclei, electrons are in a bound state: they are part of the electron-positron lattice of the core of the nucleus. Therefore, nuclear spectra should generate vibrating protons of nuclei. Indeed, protons can also move step by step along the sites of the electron-positron lattice, each time finding themselves in a new, strictly specified magnetic field. And, vibrating in it, they emit radiation of discretely varying frequencies. The characteristic frequency of these vibrations, which can be easily calculated from this model, is in order of magnitude quite consistent with the frequencies of the gamma spectra of nuclei. And, again, since each nucleus has its own special, unique structure, these spectra will be highly individual for different nuclei and equivalent for identical nuclei. It is this property of the standard spectrum structure that is used in the

Mössbauer effect. It consists in the fact that the absorber cores effectively absorb gamma radiation from the source only if the radiation is emitted by nuclei of the same type and the receiver is stationary relative to the source.

We saw above that the electron layers in the atom and the nucleon layers in the nucleus are filled according to a similar principle and, in fact, are given by a single structure (§ 3.3, § 3.6). The similarity of atomic and nuclear structures is reflected in the spectra. Above, we considered the atomic spectra generated by an oscillating electron in an excited atom. At the same time, each atom had its own special line spectrum - an individual "barcode of an atom". Likewise, there are characteristic nuclear spectra of excited nuclei. Both atomic and nuclear spectra are emitted during charge oscillations, but if in an atom these are electrons, then in nuclei there are protons. They, too, hesitate with a tough

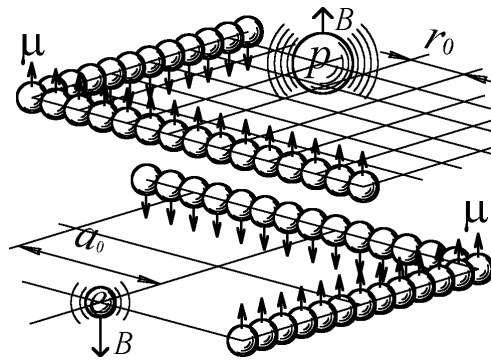


Fig. 115. Two scales of forces and spectra. Protons p at the nodes of the fine grid generate nuclear spectra in the magnetic field of the corner, and electrons e at the nodes of the coarse grid give atomic spectra.

given, individual for each type of nucleus, frequencies in the magnetic field of the atomic core (Fig. 115). As it turned out, Rydberg's constant $R = h/16\pi^2ca^2M$. Since the charges vibrate in the same atomic core, the difference will be only in the step a of the electron-positron grid and the mass M of the generating charge. Earlier it was found that the distance between the nodes in which the electrons of the atom vibrate are of the order of the size of the atom: $a \approx a_0 = 0.53 \cdot 10^{-10}$ m, that is, of the order of one angstrom ($1\text{\AA} = 10^{-10}$ m). In the same way, the distances between the nodes at which the protons vibrate are on the order of the size of the nucleus and the classical radius of the electron, which precisely sets the step of the electron-positron grid: $a \approx r_0 = 2.82 \cdot 10^{-15}$ m, that is, of the order of one Fermi (10^{-15} m). Once in the nuclei the distance $a \approx r_0$ between electrons and positrons is 10^4 - 10^5 times less than the distances $a \approx a_0$ in the electron layers, and the mass M of the proton is 2000 times greater than the electronic one, then R for nuclei will be 10^5 - 10^6 times larger.

Accordingly, the characteristic frequencies $f \sim R$ of nuclear spectra are 10^5 times higher than atomic ones. And, exactly, the nuclear spectra lie in the X-ray and gamma ranges of 10^{16} - 10^{19} Hz, while the atomic ones, lying in the infrared and optical ranges of 10^{11} - 10^{15} Hz, have 5 orders of magnitude lower frequencies. So, the similar structure of the spectra, in the form of a series of discretely varying frequencies characteristic of a given nucleus or atom, speaks

of a single mechanism of their generation. The difference is only in the scale of the grids, between the nodes of which the generating charge is displaced. And, if atomic spectra provide a clue to the structure of the atom, then nuclear ones - to the structure of nuclei.

The considered mechanism of generation of nuclear spectra, apparently, is not the only one, since nuclei emit not only from excitation by impacts, but also when excited in the process of nuclear reactions and during a spontaneous transition from one state to another. Such gamma radiation is probably no longer generated by the vibrations of individual protons, but by the vibrations of individual parts of the nucleus, which, like the vibrations of molecules or weights on a spring, have rigidly specified frequencies, which will be discussed below (§ 3.13). Radiation of nuclei can also arise from a sharp deceleration of colliding nuclei, in the case of an inelastic impact, generating huge accelerations. And an accelerated moving charged nucleus, according to the laws of electrodynamics, should emit electromagnetic energy. Then, all the kinetic energy of colliding nuclei can be converted into radiation energy, which is why such an impact is called inelastic.

Gamma radiation also appears during the restructuring of the proton-neutron structure, that is, during a spontaneous transition from a less stable structural state to a more stable one. As shown in the previous section (§ 3.6), nucleons can be located in the nucleus in different ways. At the same time, different binding energies correspond to different placement methods, so that the transition from one state to another, more stable one, is accompanied by the release of the corresponding energy in the form of gamma radiation. Indeed, with such a rearrangement of the nucleus, the transferred nucleons are mechanically shaken, starting to oscillate in the magnetic field of the nuclear core, emitting gamma rays. Moreover, for each nucleus, each reaction, again, has its own characteristic radiation frequencies. By analogy with atoms, nuclei at the same frequencies absorb radiation most strongly. Such a strict individuality, a rigid certainty of the frequencies of gamma radiation, similar to the presence of characteristic lines in atomic spectra, is used in practice, as reference frequencies, to compare the parameters of the emitter and absorber and to reveal insignificant frequency shifts caused by the movement of the source and relativistic effects. Most often, the mentioned Mössbauer effect is used, measuring the degree of absorption of gamma radiation from a source by an absorber. The Mössbauer effect allows you to reveal the subtlest frequency shifts from the movement of the source and absorber and other effects affecting the frequency.

By the way, in the Mössbauer effect we are faced with another failure of the quantum theory, which predicted that the effect could not be observed due to the large recoil momentum received by the nucleus when emitting a gamma quantum and changing the radiation frequency, excluding its resonant absorption by another nucleus [135]. But, contrary to the quantum theory, the Mössbauer effect was nevertheless discovered experimentally, once again disgracing quanta-relativists and proving that the radiation does not emanate in separate portions, quanta, but as a classical spherical wave, symmetrically diverging in all directions and therefore not causing recoil. Also, it is the Mössbauer effect that makes it possible to establish an important connection

between the structure of molecules, atoms, their electronic shells and optical spectra - with the nuclear properties of these atoms and the spectrum of their gamma radiation, which was mentioned above (§ 3.6) and will be discussed below (§ 4.16).

§ 3.8. *Composition and mass of elementary particles*

A consistent theory of elementary particles, which would predict the possible values of the masses of elementary particles and their other internal characteristics, has not yet been created.

Soviet Encyclopedic Dictionary

More than a hundred elementary particles are currently known [85, 86]. This abundance has long led to the idea that particles are by no means elementary, but consist of even simpler elements. It was believed that these elements must be quarks - hypothetical particles with incredible properties. So, any of the quarks is much heavier than the particle they form: a part is greater than a whole! Therefore, many believe that the quark hypothesis and the so-called quantum chromodynamics are a purely formal way of organizing particles. Well, and such a fundamental characteristic of particles as mass, for some reason, is ignored by scientists. And, after all, it was the masses who allowed D.I. Mendeleev to restore order in the world of chemical elements, among the many dozen of which the same chaos once reigned. On the basis of the known masses of elements, not only was their system built (periodic table), but the structure of the atom was also understood. Next, we will show that for understanding the structure of elementary particles, their mass and the law of its conservation, introduced by the BTR, can be of key importance.

First of all, it is natural to assume that the most simple and elementary particles are those with the smallest mass (and among atoms, the simplest is hydrogen). These include the electron, the mass M of which is usually taken as the unit of measurement of the masses of other particles ($M = 1$), and the smallest of the mesons [86]. Namely, a muon (μ -meson) is a charged particle that is 207 times heavier than an electron ($M = 207$), a neutral pion (π^0 -meson, $M = 264$) and a charged pion (π^+ - or π^- - meson with $M = 273$). It seems that it is from these particles, as from the details of the designer, that all other elementary particles with higher mass values are built.

And, exactly, taking these three types of mesons in different combinations, you can get the mass of any other particle. For example, two charged and two neutral pions add up to a mass of 1074.4. This coincides with an accuracy of 0.04% with the mass of the η^0 meson ($M = 1074$). So, this particle probably consists of four pions: π^+ , π^- , π^0 , π^0 . It is not without reason that the η^0 meson always decays into pions. Another example: 8 charged pions add up to a mass of $273 \times 8 = 2184$ - this is the mass of the Λ^0 -hyperon, which differs from the true one by only 0.03%. This means that the lambda hyperon consists of four positive and four negative pions: $\Lambda^0 = 4\pi^+ + 4\pi^-$.

Judging by the accuracy and frequency of such coincidences, they are not accidental and should reveal the secret of the structure of particles. To do this, it is enough to compose a simple computer program that combines the masses of three mesons ($M = 207; 264; 273$) in different ways and finds the coincidence of their

sums with the known masses of elementary particles. The program search results are summarized in the system (Table 2). The first column contains the designation of the particle, in the next three - its composition (by the number of mesons), in the fifth - the calculated mass, in the sixth - measured, in the seventh - their difference in percentage, not exceeding 0.2%.

частица	$\mu^\pm$	π^0	$\pi^\pm$	$M_{\text{расч}}$	$M_{\text{измер}}$	ΔM
	206,7	264,1	273,1	в массах электрона		%
η^0		2	2	1074,4	1074	0,04
ρ^+	2	1	3	1496,8	1497,1	0,02
ω	1	4	1	1535,7	1534,2	0,1
ρ	1	1	5	1836,3	1836,1	0,01
X^0		4	3	1875,7	1874,8	0,05
φ^0	7		2	1993,1	1994,1	0,05
Λ^0			8	2184,8	2184,1	0,03
	4	1	4	2183,3		0,04
Σ^+	1	7	1	2328,5	2327,6	0,04
Σ^0	6		4	2332,6	2333,6	0,04
Σ^-	10		1	2340	2343,1	0,12
Δ^*		4	5	2421,4	2418,8	0,11
	4	5	1	2420,3		0,06
Ξ^-	1	9		2583,6	2585,6	0,08
Σ^*		3	7	2704	2706,5	0,1
Ξ^*	8	3	2	2992,1	2992,2	0
	4	2	6	2993,6		0,05
Ω^-	12	3		3272,7	3273	0,01
	8	2	4	3274,2		0,04
			12	3277,2		0,13
τ^-	5		9	3491,4	3491,2	0,01
	9	1	5	3489,9		0,04
D^0	1	12	1	3649	3649,7	0,02
	10	6		3651,6		0,05
D^+	1	11	2	3658	3657,5	0,01
F^+	2	1	12	3954,7	3955	0,01
	5	9	2	3956,6		0,04

Table 2

The table shows that some particles (Λ^0 , Δ^* , Ξ^* , Ω^- , τ^-) can be represented by several combinations - different sets of mesons. As you can easily see, the reason for this is that the sum of the masses of 4 muons and a π^0 meson is almost equal to the mass of 4 charged pions ($M = 1092$). This means that the mesons themselves are not elementary, but compound particles. So, a neutral pion should, apparently, consist of four neutral particles with a mass of $264/4 = 66$ electron masses. And each such particle in combination with a muon forms a charged pion with a mass $M = 207 + 66 = 273$ (Fig. 116).

These particles with $M = 66$ have not yet been found by anyone, therefore, it is believed that when a neutral pion decays, its mass simply disappears, completely passing into gamma radiation. According to the BTR, this is impossible (§ 1.16), and, therefore, during decay, the pion must be divided into the very 4 particles with $M = 66$, which are not open only because they are neutral and do not leave traces in particle detectors, unless you count them traces of gamma radiation. In what follows, for convenience, we will call these particles "gamma mesons" (or "gammones"), denoting the Greek Γ , in view of

the fact that these decay products of pions have long been taken for gamma quanta. In nuclear physics, this has happened before: neutrons born by decay, due to their neutrality and elusiveness, were also initially mistaken for gamma quanta. The presence of a gammon and a muon in the composition of a charged pion is confirmed by the fact that the latter forms a muon upon decay. The remaining mass $273-207 = 66$ is said to be converted into energy. But, from the standpoint of classical physics, in which the mass is conserved, it should be assumed that this mass is imperceptibly carried away by gammon.

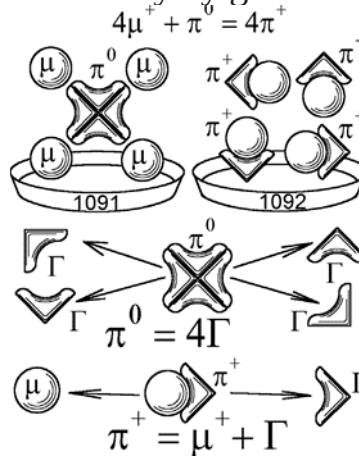


Fig. 116. Composition and schemes of decay of pions, resulting from the ratio of their masses.

In this case, different versions of the device of the same particle will be equivalent. For example, the already considered Λ^0 -hyperon consists simply of 8 muons and 8 gammon, and the extra options will disappear. For other particles, on the contrary, there was not even one exact way of representing a combination of mesons. These are the neutron n , K-mesons, Ξ^0 -hyperon and some of the particle resonances. There are, however, combinations of mesons giving a mass almost the same as that of these particles (with a difference of about 1%). However, the imperfection of such coincidences speaks of their randomness, and the program filters out these options as unlikely.

But we did not take into account another possibility. Indeed, in the world, in addition to particles, there are antiparticles, such as the positron, which may have a negative mass (§ 1.6). Since mass is the amount of matter, then antimatter has minus mass (§ 1.17). This, from the standpoint of classical physics and the law of conservation of mass, can explain the traceless disappearance of masses during the annihilation of particles and antiparticles, or, on the contrary, their birth. If the composition of the particle, along with mesons, sometimes includes antimemesons having a minus mass, then the number of mesons in the particle can also be given negative values, which will give rise to new variants. For example, 6 muons and one neutral antipion add up to a mass of $206.7 \times 6 - 264 = 976.1$, which, with an error of 0.2%, coincides with the mass of the K^0 meson ($M = 974.1$) ... And 6 muons together with a charged antipion give a mass of $206.7 \times 6 - 273.1 = 967.1$ of one charged K^+ meson ($M = 966.4$), with an error of 0.07%. Therefore, Table 2 will be supplemented with a new one (Table 3), where minus signs correspond to antiparticles with

anti-mass.

частица	μ^+	π^0	π^+	$M_{\text{расч}}$	$M_{\text{изм}}$	ΔM
	206,7	264,1	273,1	в массах электрона		%
K^+	6		-1	967,1	966,4	0,072
K^0	6	-1		976,4	974,1	0,2
ρ^+	-2		7	1498,3	1497,1	0,08
K^*	11	-2		1745,5	1745,6	0,006
n		8	-1	1839,7	1838,6	0,06
Σ^-	2	-2	9	2343,1	2343,1	0
Ξ^0	-2	2	9	2572,7	2572,8	0,004
	15	-2		2572,3		0,02

Table 3

As you can see, assuming the existence of negative mass, it is possible to represent the remaining particles as sets of 3 types of mesons. Moreover, there are no more than two antiparticles in any set. If we divide all pions into gammon and muons ($\pi^0 = 4\Gamma$; $\pi^+ = \mu + \Gamma$) and represent each particle as a set of two types of mesons (μ and Γ), then in many of such combinations negative masses will disappear. Thus, $\rho^+ = 7\Gamma + 5\mu$; $\Sigma^- = \Gamma + 11\mu$; $\Xi^0 = 17\Gamma + 7\mu$. And in the remaining cases, one can get rid of minus masses by assuming that gammon are also in the composition of muons, that is, muons are themselves composite. Indeed, as we will see later, it is quite possible to do without minus masses, which until now served only as a convenient formal device, and will be completely abolished in the future (§ 3.20). Both the positron and other antiparticles have positive inertial and gravitational masses (§ 1.17). Therefore, the mass of a particle always consists of the positive masses of its constituent particles, including electrons and positrons.

One way or another, the mass of any particle can always be represented as $M=66x + 207y$, where x is the number of Γ -mesons, and y is μ -mesons. By giving x and y different integer values - making up different combinations of Γ - and μ -mesons, combining them in different ways - you can predict new particles, at least know their masses. However, not every combination of mesons is realized in nature - not all of them are stable. Likewise, nuclei consisting of any number of protons and neutrons are theoretically possible. However, only rare combinations of them are stable and stable. Other combinations of isotopes, although less stable, also live for some time. And all other combinations of protons and neutrons are extremely unstable and decay almost instantly. The same is true for combinations of mesons: some of the elementary particles formed by them live for a relatively long time, others are unstable and immediately decay. These are, for example, particle-resonances (ρ , ω , ϕ -particles and all marked with an asterisk).

It may be surprising that in addition to mesons, larger particles appear in decays. But this is natural if the fragments into which the particle is divided consist of several mesons. After all, heavy atomic nuclei during decay are

divided not into dozens of individual protons and neutrons, but into relatively large fragments formed from them (Fig. 114). Therefore, the fission products of heavy particles are mainly other heavy, compound particles (Fig. 117). And the pions and muons arising in the decays are just additional small fragments (like neutrons emitted during the fission of heavy nuclei). Very invisible fission fragments (for example, gammon) are also formed, which causes an apparent decrease in mass in decays.

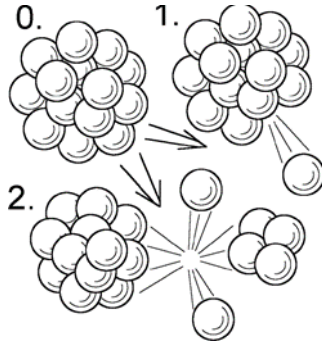


Fig. 117. Decay of a nucleus or an elementary particle into fragments of different sizes, going in two ways.

In addition to the correspondence of the mass, in the combination it is necessary to ensure the correspondence of the charge. Therefore, in the combination of mesons, representing a neutral particle, there must be an equal number of positive and negative charges. For example: $\eta^0 = 2\pi^0 + \pi^- + \pi^+$; $\Lambda^0 = 4\pi^+ + 4\pi^-$. If the number of charges is odd, then the combination can be made neutral by supplementing it with one electron or positron. But, in the composition of a charged particle, there should be one more charge of one sign than the other. In this case, combinations with an even number of charges must be supplemented with an electron or a positron. Adding of these particles with $M = \pm 1$ has little effect on the total mass of the combination, therefore, until now we have not attracted them: their purpose is to ensure, first of all, the correspondence of the charge, and not the mass. So, resonance particles (ρ , K^* , Δ^* , Σ^* , Ξ^*), having a strictly specified mass, can have a charge of 0, ± 1 , ± 2 , - it all depends on the number of electrons and positrons in combination. The fact that, in addition to mesons, several more electrons or positrons can additionally enter each particle, it is possible to explain small (of the order of unity) discrepancies between the calculated and measured masses. In general, the masses of some particles, especially resonances, are known with a noticeable error.

When a particle fissions, the mesons that form it can break up into different combinations. Such a particle breaks down in several ways: in some cases, giving some products, in others - others (Fig. 117). Physicists consider this to be proof of the transformation of particles, just like alchemists who saw the transformation of substances in chemical reactions, although in reality there was only a rearrangement of atoms. Similarly, the "transformations" of particles are caused by rearrangement of mesons: the mesonic composition of a particle can be divided into two or three groups in different ways, these groups form different particles. After all, heavy nuclei also decay in several ways. Which of the

particles appear in decay more often depends on the stability of the given combinations of mesons, on the energy of their binding in the particle, and, therefore, on the decay energy.

We found out that almost all particles are built from mesons. Even experimentally, mesons were found, say, in neutrons, in the form of the surrounding meson shell and individual point charges (partons), on which scattering occurred during probing [165]. The mesons themselves are also not elementary, and can, in turn, be formed by electrons and positrons (§ 3.9).

Now we can see how effective the classical representations of the BTR are - and in the microcosm. It is they that lead to an understanding of the structure of elementary particles, which quantum mechanics did not allow. Even J. Fox [2] pointed out the enormous potential of Ritz's theory in explaining the phenomena of the microworld. According to Fox, a large amount of empirical data: masses, lifetimes, structures of elementary particles - can be interpreted precisely in Ritz's theory. But because of the blind faith of scientists in the theory of relativity, the rejection of the law of conservation of mass, discovered by Lomonosov (§ 3.13), modern science is unable to explain the exact relationships between the masses of particles and show why the mass of a given particle is the same and not different. And for the BTR this is not a problem, just like the kinematics of high speeds, and the defect of masses, and other laws of the microworld, supposedly possible only according to SRT. And, although some nuclear experiments are cited as refuting BTR [153], they contradict Ritz's theory no more than space observations (Part 2). J. Fox showed that the discrepancy often arises not through the fault of the BTR, but from the underdevelopment of our ideas about the microcosm and space. It is possible to use phenomena to test Ritz's theory only by revising them on its basis. And if the BTR reveals the structure of particles, for example, a neutron, then new sources of energy will immediately open (§ 3.8).

§ 3.9. Crystalline structure of elementary particles and their decays

And if, in fact, protons and neutrons, as bricks of nuclear structures, are composed of electrons and positrons? ... then nucleons could have arisen in the form of cubic quasicrystalline formations, analogous to known crystals ... Electrons with positrons are not yet ether, but in any case - that intermediate the matter from which bricks are built - nucleons and nuclei of all elements, and hundreds of types of fragments from them, the so-called "elementary" particles.

V. Manturov, "Nuclear forces - a proposal for a solution" [79]

It was shown above that elementary particles are not at all elementary, but consist of a few types of simpler bricks, just as three types of particles form a hundred chemical elements-atoms: electrons, protons and neutrons. Elementary particles and atoms are elementary, indivisible, only until sufficient energy is reached for their division and destruction. Also, a brick wall looks like a monolith until you hit it so that it crumbles into bricks. So atoms, which means "indivisible", are called so in the sense that at earth temperatures they can usually be considered elementary particles of matter. Elementary, indivisibility are conditional concepts, correct only in a given range of energies. Matter is infinitely divisible - each particle can be broken down into simpler ones, in turn,

consisting of others. There is no more strange in the infinite divisibility than in the infinite extension of space and time. The world has no limits in breadth, distance and depth (§ 2.6)! This materialistic idea was developed by K. Tsiolkovsky and E. Wichert. And it was not in vain that another proponent of materialism said a century ago that the electron is just as inexhaustible as the atom, for nature is infinite.

Scientists, however, believe that particles are elementary, although even the processes of decay (say, a neutron - into a proton and an electron) prove that particles are composite. Hence the word "decay". But, for some reason, they thought that there was no decay, but a magical transformation of some particles into others, as if there were no simpler particles, and each particle consists of all the others. This absurd idea, called the bootstrap theory (the particles are laced up, closed on themselves [165]), is completely unscientific and akin to the speculations of dark alchemists, who also believed that substances transform into each other in chemical reactions, although in reality there was only fission and fusion of molecules. This was forgivable for former alchemists who did not know about the discrete structure of matter. But today's nuclear alchemists, who are engaged in the transmutation of matter and believe that in nuclear reactions, particles magically turn into each other, it is unacceptable to repeat their mistake.

However, the desire of physicists to systematize elementary particles forced them to invent quarks, from which, supposedly, particles are composed. But, first, dozens of quarks have already been introduced, and there should be few elementary types of bricks. Secondly, quarks were introduced formally, endowed with ridiculous properties: fractional charge and gigantic mass. Third, they have not yet been found [165]. Therefore, quarks are the same mysticism as the transformation of particles.

We saw above that it is much more natural to represent each elementary particle as a set of only three types of mesons. But, after all, mesons are by no means elementary, but consist of even smaller particles. And, since science has confidently determined so far only two particles with a mass less than a mesonic one - this is an electron and a positron, it is natural to assume that it is from these particles that, ultimately, nuclei, protons, mesons and all other particles are composed [123]. Moreover, we have already seen how convenient it is to represent nuclei and atoms composed of periodically arranged electrons and positrons (§ 3.2). Thus, V. Manturov suggested that electrons and positrons, being attracted to each other, are able to merge not only into pairs, but also into large conglomerates: nuclei, protons and neutrons, numbering thousands of particles and representing a kind of crystal of alternating electrons and positrons like a crystal of salt. It is not in vain that it is from nuclei that gamma radiation knocks out electron-positron pairs [85], like ordinary light that rips electrons out of a metal. That is, gamma radiation does not turn into particles, but only knocks out, separates the pairs already existing in the nuclei, otherwise the creation of such pairs would be possible in a vacuum.

Therefore, the best candidates for a building material for matter are particles with the smallest mass and charge, that is, electrons and positrons. Only these

particles-bricks have their own elementary charge, mass and magnetic moment, only their presence in the composition gives these characteristics to other particles. An electron was introduced as an elementary negative charge e^- , and a positron (antielectron) was a positive e^+ . The charges of all bodies and particles are composed of them, therefore the charge is a multiple of the electron charge. Only after a while all particles (for example, a proton) began to endow an independent charge, although it is not clear why it should be the same size as that of an electron. The model of building particles from electrons and positrons is the most simple and natural, since: 1) there are only two fundamental particles - e^+ and e^- ; 2) the charge of a particle is equal to the sum of the charges of its constituent e^+ and e^- ; 3) the magnetic moment of the particle is equal to the vector sum of the magnetic moments e^+ and e^- ; 4) the mass of a particle is the sum of the masses of its electrons and positrons (their total number is estimated to be equal to the mass of the particle, measured in masses m_e). After all, the mass of a body is the amount of matter, in fact, the number of particles of the same type (e^+ and e^-) that form it. Finally, the volume of a particle is equal to the sum of the volumes of all its electrons and positrons. It is not for nothing that the size of a proton, composed of e^+ and e^- , is of the order of the radius of an electron - 10^{-15} m. Due to the fact that elementary particles are composed of tightly linked electrons and positrons, they all have the same density, which is why the volume of particles is proportional to their mass [21]. For nuclei, this fact has long been proven [135].

The fact that all particles, nucleons and nuclei are ultimately composed of electrons and positrons is at least confirmed by their emission in particle decays or under the influence of gamma rays. So, most light radioactive nuclei undergo β^- or β^+ -decay, that is, they emit electrons e^- or positrons e^+ . Hence it follows that electrons and positrons are part of nuclei, nucleons and other particles, separating from them during decay and irradiation. However, their presence in nuclei and nucleons is rejected on the basis of quantum mechanics, according to which the magnetic moments of nucleons and nuclei, as well as the energies of emitted electrons, would differ from the measured ones [135, p. 35]. But this is only within the framework of quantum mechanics. If classical physics and the crystal model of nucleons, composed of thousands of electrons, are correct, then there is no contradiction (§ 3.15). Finally, the complex structure of the proton and neutron, formed from many point charges, is confirmed by the nature of the scattering of high-energy electrons by them. Feynman called these point charges 'partons' [156, 165], although in reality these are apparently all the same electrons and positrons in the composition of particles [79].

So, all "elementary" particles, in fact, are by no means elementary, but consist of smaller ones - mesons or electrons. What keeps all small particles-parts in the composition of large ones? How are they located in a prefabricated particle, what spatial structures do they form? It was shown above that the nucleus, protons and neutrons have a crystalline structure - they are formed from electrons and positrons periodically located in space, forming a kind of electron-positron lattice. The crystal-like structure should be characteristic not only of atoms, nuclei, but also mesons. After all, since there are crystals made of atoms,

why not crystals formed by elementary particles, electrons and positrons? Just as for atoms, electric forces can serve as the glue that cements mesons or electrons inside crystal particles. Many scientists already believe that nuclear and other interactions that confine particles are only partial manifestations of electrical interaction [19, 79], as well as magnetism with gravity (§1.16).

It also follows from such an electron-positron structure that the mass of a particle is equal to the number of electrons and positrons that form it. Let's remind: Newton defined the mass of bodies as the amount of matter enclosed in them, thereby, as it were, introducing, in accordance with the atomistic doctrine of Democritus, some primary point particles of unit mass - "amers" [31]. And if all other particles are built from them, then the mass of any of them is the number of such units in its composition. As we have seen, these particles of standard unit mass will turn out to be precisely electrons with positrons. This is how Lucretius expounds this idea of Democritus [77, p. 42]: "There is a certain limiting point of the body that is already inaccessible to our senses, then, undoubtedly, it is completely indivisible into parts ... corporeal essence ... And nature does not allow anything to either take away from them, nor to reduce it, saving seeds for things." As you can see, these single particle-seeds (amers of Democritus) are exactly like electrons, also having a standard weight that cannot be reduced (§ 1.5), and forming, when combined in the correct order, all other particles and atoms.

The correct crystalline form of particles of the microworld is not only energetically favorable, but also explains why the properties of particles of the same type, say, two protons, are the same: they are similar as crystals of one mineral. Pour a handful of granulated sugar crystals - and in this placer you will have hundreds of twins. Exact similarity of the shape of crystals, their faces, ideal equality of angles - isn't this the same identity of properties we observe in elementary particles? As a matter of fact, Democritus also came to the idea of atoms, observing crystalline grains of rocks, grains of sand. The crystalline form is the only one possible for the particles of the micro-world, the world of order, the ideal similarity of structures.

So, like nuclei and protons (§ 3.2), all other particles - mesons, hyperons, resonances, etc. are composed of electrons and positrons, as if from bricks. At the same time, electrons and positrons first make up blocks (mesons), and heavy particles are already built from them. After all, we never say that a car consists of screws, nuts, parts, welded sheets, etc. But we show that it has an engine, transmission, chassis and body. So, it is more correct to subdivide particles not into hundreds of individual electrons and positrons, but into large complexes, blocks formed by them, that is, into more complex and heavy particles. It was shown above that virtually any particle can be represented as a set of three types of mesons, combined in different combinations. Then it was possible to reduce them even to two, when it turned out that π -mesons (pions) are themselves composite. Further, it turned out that the picture can be simplified even further and minus masses can be eliminated if the μ -meson (muon) is also recognized as a composite particle, which includes several gammon. The fact that the muon is composite follows from its decay.

It is easy to see that there can be no more than three gammon in a muon. Indeed, in total, the mass of the three gammons $66 \cdot 3 = 198$ does not slightly reach the muon mass, equal to 207, or 206, if we exclude the mass of the electron that gives the muon a charge. Obviously, the remainder with a mass equal to eight electrons ($8m_e$) corresponds to a new particle. This hypothetical particle can be called "octomeson" (or "octon" - by its mass), denoting "O". Since it has not yet been discovered, it must be thought that it is as neutral as the gamma meson. Its low mass also interferes with its detection. As for the charge of a muon, since it is formed by neutral gammon and octons, it must contain, in addition, one excess electron (or a positron, if we are talking about a positively charged anti-muon). It is this electron that escapes from the muon during its decay (Fig. 118). The remaining muon mass is said to simply disappear. In fact, it is preserved in the form of three gammon and an octone - neutral, and therefore imperceptible. We recall that in the same way the mass is conserved in the form of gammon during the decays of pions (§ 3.8).

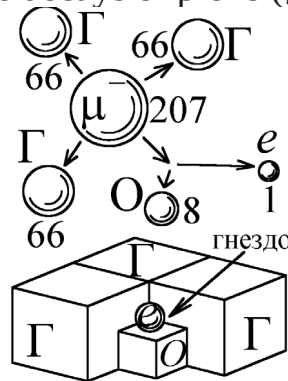


Fig. 118. Supposed scheme of muon decay, its possible structure and masses of components.

So, if a muon consists of three gammon, one octon and one electron, its mass will be $66 \cdot 3 + 8 + 1 = 207$. Then a neutral pion will consist of four gammon, and a charged pion will consist of four gammon, an octone and an electron. So, its mass is $M = 66 \cdot 4 + 8 + 1 = 273$. Thus, a charged pion differs from an uncharged one only in the presence of an octon linked to an electron. Gammon and octon should also, in turn, be composed of electrons and positrons. It is surprising, however, why exactly these combinations of elementary charges form stable blocks in the form of particles that do not decay for a long time. In the case of the octon, the answer suggests itself: after all, 8 is a number associated with high stability. It is not without reason that the figure eight plays such an important role in the periodic table, giving eight groups of elements and serving as the main repetition period for the properties of the elements, just as in music the scale is repeated every octave. Also 8 is one of the six magic numbers - especially stable combinations of neutrons or protons in the nucleus (§ 3.6). It is interesting to note that the armored personnel carriers with the "Lunokhod" were also designed with eight wheels to ensure stability on rough, "shaking" terrain (Fig. 200). A similar "shaking" operates in the world of elementary particles subjected to constant impacts (§ 3.14). And, in order to avoid an early crash, the particles need geometric stability.

The reason for the "magic" of the number eight is easy to understand. After

all, $8 = 2^3$: it is eight particles that form a cube, being located at its vertices. Apparently, this is how the octon is arranged: from four electrons and four positrons alternating in the corners of the cube. Note that even I. Langmuir admitted the ability of eight electrons located in an atom at the vertices of a cube to form a superstable structure, which explained the periodic repetition of the properties of elements and the apathy of inert gases, with their completely filled cubeshells (Fig. 106). But quantum physics never really explained why there are exactly eight groups of elements. And only the crystalline model of the atom makes it possible to substantiate the choice of the figure eight, since the eight-vertex cube and parallelepiped are the most common and simple form of a crystalline cell.

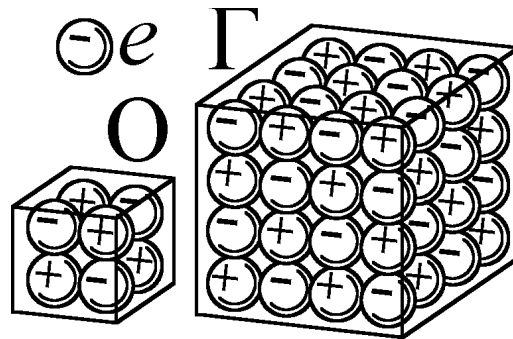


Fig. 119. The structure of octon and gammon, composed of alternating electrons and positrons.

It remains to find out why gammon is also stable - a particle with a mass of 66 electrons. If the matter is in the stability of the crystal structure, then the reason is, possibly, in the proximity of 66 to $64 = 4^3$. In other words, 64 particles make up a cube with an edge of 4 particles. And it will also be stable, since electrons and positrons would alternate in it, like positive and negative ions in a cubic crystal of salt (Fig. 119). Thus, gammon should be composed of 32 electrons and 32 positrons. True, it is not clear where the two additional mass units come from in gammon. But, given that its mass is calculated theoretically, and not measured in experiment, it may well be that the real mass is exactly 64. In addition, it must be taken into account that the interaction of electrons and positrons, their convergence and the movement of individual particles can lead to inaccurate measuring their total mass (§ 3.18).

Since muons and pions are composite, all other particles represented by their sets can also be represented as combinations of simpler particles. Therefore, using the previous tables (Table 2 and Table 3, taken into account in column I) and the fact that $\mu = 3\Gamma + O$, $\pi^0 = 4\Gamma$, and $\pi^- = 4\Gamma + O$, you can draw a more complete and accurate picture of the microworld (Table 4), depicting all particles as sets of gammon and octon (column II). In this view, the minus masses finally disappear. So, the K^+ meson consists of 14 gammon and 5 octons, which gives for it $M = 66 \cdot 14 + 8 \cdot 5 = 964$ (actually $M = 966$). K^0 - the meson is built of 14 gammon and 6 octons, whence $M = 66 \cdot 14 + 8 \cdot 6 = 972$ (actually $M = 974$). Inaccuracy arises from rounding off the masses of gammon and octon to the nearest integer and unaccounted for masses of electrons and positrons complementing the combination. But roughly, the mass of any particle can be searched for by the

formula $M = 66x + 8y$, where x and y are the numbers of gammon and octons in the particle.

частица	I			II		M
	$\mu^\pm$	π^0	$\pi^\pm$	O	Γ	
O	–	–	–	1	0	8
Γ	–	–	–	0	1	66
$\mu^\pm$	1	0	0	1	3	207
π^0	0	1	0	0	4	264
$\pi^\pm$	0	0	1	1	4	273
K^+	6	0	–1	5	14	966
K^0	6	–1	0	6	14	974
η^0	0	2	2	2	16	1074
ρ^+	2	1	3	5	22	1497
ω	1	4	1	2	23	1534
K^*	11	–2	0	11	25	1746
p	1	1	5	6	27	1836
X^0	0	4	3	3	28	1875
φ^0	7	0	2	9	29	1994
Λ^0	0	0	8	8	32	2184
Σ^+	1	7	1	2	35	2328
Σ^0	6	0	4	10	34	2334
Σ^-	10	0	1	11	34	2343
Δ^*	0	4	5	5	36	2419
Ξ^0	–2	2	9	7	38	2573
Ξ^-	1	9	0	1	39	2586
Σ^*	0	3	7	7	40	2707
Ξ^*	8	3	2	10	44	2992
Ω^-	12	3	0	12	48	3273
τ^-	5	0	9	14	51	3491
D^0	1	12	1	2	55	3650
D^+	1	11	2	3	55	3658
F^+	5	9	2	7	59	3955

Table 4

So, all types of particles can be represented as a combination of two main ones: gammon Γ (with $M = 66$) and octones O (with $M = 8-9$), sometimes supplemented with an electron or positron for charge balance. The existence of gammon is confirmed by the pion decay reactions, where a mass multiple of 66 disappears without a trace (Fig. 116). And the reality of octons follows from the decay of muons and the fact that in the families of particles (Table 4, highlighted in gray), the masses M differ on average by just 8.5 units. It seems that gammon and octons, like nucleons in the nucleus, are arranged in some spatial structures, which explains the stability of some particles and the instability of others. The measure of stability will be, as elsewhere, the degree of symmetry, perfection of the particle, its proximity to regular geometric bodies [21]. Particles whose structure is imperfect are unstable and quickly disintegrate. So, in nature: the most durable of all are bodies that have a perfect, crystalline form. Crystals with structural defects are less strong. Finally, amorphous bodies are the least durable. All this is clearly seen in the example of quartz, quartz glass and ordinary glass.

Combinations in which the number of particles is equal to the cube or square of an integer are more stable (Fig. 120). Take, for example, gammon or octons, built from 64 and 8 particles, respectively. Likewise, peonies, consisting of 4

gammon, forming a 2x2 square, live a noticeable time by the standards of the microcosm. For the same reason, the η -meson, composed of $4 \times 4 = 16$ gammon, is quite stable. The most symmetric is the proton: there are $27 = 3^3$ gammon in it. Therefore, the proton is one of the few stable particles. Another particle, whose number of gammon is equal to a cube, is Λ^+ -hyperon: $64 = 4^3$ (Table 5). Here why this particle, despite its large mass, at which the stability is usually low, nevertheless has a noticeable lifetime.

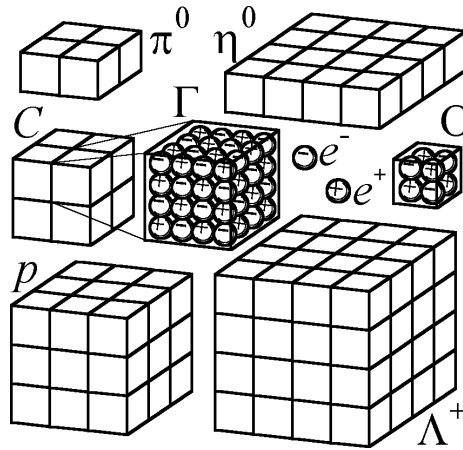


Fig. 120. Possible structure of elementary particles, consisting of gammon, in turn formed by electrons and positrons.

Using this, new particles can be predicted. Particular stability should distinguish a particle of eight gammons, forming a cube, so let's call it "cubone", denoting the letter "C" (Fig. 120). However, such a particle with $M = 66 \cdot 8 = 528$ has not yet been discovered. Perhaps the reason for this is its neutrality and stability (from a cubic structure), which prevents it from being detected, like gammon with octones. True, according to the book by D. Danin [43], in the Aragats high-altitude observatory, among cosmic rays, particles with masses of about 300, 500 and 1000 electron masses were once confidently recorded. Particles with masses of about 300 (π -mesons) and 1000 (K-mesons) were indeed subsequently discovered. However, particles with M on the order of 500 have not yet been found. So maybe they were cubones? Their existence is also confirmed by the decay of the η -meson, which, when divided into two charged pions, completely loses in weight just the mass 528. Isn't the cubone carrying it away?

This crystalline approach to explaining the stability of particles makes it possible to understand why of all particles the proton is the most stable, strong and long-lived. Table 4 immediately gives an answer to this: only for a proton the number of gammon $x = 27$ is a cube of an integer: $27 = 3^3$. Apparently, these 27 gammon add up to a regular cube, like a Rubik's cube, also consisting of 27 small cubes. As for the six octons, they probably perform a connecting function in this cube (just as in a Rubik's cube there are six hinges connecting the cubes) or are located on its six faces. Thus, light octons can play the same role inside particles as neutrons do in nuclei, being a connecting link, cement, and spacer between blocks of particles. They can also perform the functions of a nest in

which electrons and positrons sit firmly, giving the particles a charge. With this in mind, you can also recognize the structure of all other particles built from cubes, like toy buildings (Fig. 121). So, the particles should not look like balls, but have corners, edges, facets, just like crystals. **The microcosm, as well as the objects of the macro-, and even the megaworld, is characterized by a crystalline, cellular, cellular structure!**

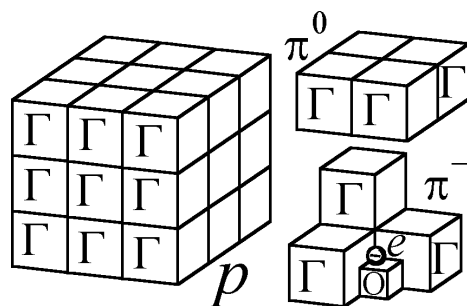


Fig. 121. Possible structure of a proton and pions, built from hundreds of electrons and positrons, like salt crystals - from Na^+ and Cl^- ions.

It is worth noting that from the same number of gammon and octons, combining them in different ways, you can make up several stable structures. Perhaps that is why particles of a given mass and charge are found in several versions. In the same way, nuclei with the same proton-neutron composition can have different properties and half-lives due to the different spatial arrangement of protons and neutrons in them (§ 3.6). Similarly, in chemistry, molecules can have an identical atomic composition, but different properties. The chemical properties of a molecule depend not only on what atoms make it up, but also on the order in which they are arranged and what spatial structures they form, as it was discovered by the Russian chemist A. Butlerov, and as predicted even before our era by Democritus and Lucretius (§ 5.16). This phenomenon was called isomerism, and particles of the same composition, but different properties were called isomers. Just like molecules, nuclei (§ 3.6) and elementary particles have isomers. Thus, K^0 -mesons consist of two types of particles: K^0_S and K^0_L [86]. The equality of their masses, charges and magnetic moments indicates the identity of their electron-positron composition, but electrons and positrons are located in isomers in different ways, which leads to a difference in their properties (lifetimes and decay types). A case is also possible when electrons and positrons form identical, but mirror-symmetric particles - mirror isomers, also known in organic molecules, for example, in sugar, as was discovered by L. Pasteur. It is possible that the existence, in different proportions, of right and left mirror isomers of particles is responsible for the predominant emission of decay products of particles in a certain chosen direction (§ 3.11).

How does the geometrically precise crystalline form of atoms, nuclei and particles arise? Shouldn't matter gather under the influence of gravitational forces into compact droplets-balls, which particles like to imagine? The nature of their geometrically clear form is the same as that of crystals, the correct facets of which once also amazed people. It can be seen that the shape of the crystals prompted Plato the idea of polyhedral particles (§ 5.3). Smooth flat faces of

crystals arise from the fact that they are built from the same orderedly folded particles, atoms. Correct placement of particles ensures the minimum binding energy that all systems strive for. It is energetically more favorable for atoms not to build on the atomic plane, but to supplement the atomic layers to even ones, in contact with the largest possible number of neighbors. This is how the regular multifaceted forms of crystals appear.

If atoms, nuclei and elementary particles really have the structure of crystals, then they must also be composed of a multitude of uniformly arranged particles of the same type. And, exactly, the atom, as it was found out, is composed of a nucleus and electrons, forming the correct configurations - layers, levels that set the clear structure of the periodic table (§ 3.3). The nucleus, in turn, is formed from protons and neutrons, arranged in the same orderly, which is confirmed by the magic numbers of protons and neutrons that form especially stable nuclei (§ 3.6). Finally, the protons, neutrons and other elementary particles themselves are not at all elementary, since they can decay. They are formed by other particles of the same type - electrons and positrons, again folded in the form of a clear lattice. It is possible to check whether all this is really so using a method similar to X-ray diffraction of ordinary crystals. By directing a beam of gamma rays with a wavelength of the order of the interelectron distance (10^{-15} m) to identically oriented atoms, nuclei and particles, it will be possible to reveal by the Laue method the diffraction of gamma rays on elementary particles arranged in the correct order. If a diffraction pattern appears on the photographic film, then this will prove the reality of the crystalline structure of the particles. Studying the resulting Lauegram, it will also be possible to accurately calculate exactly how and at what distance the elementary particles that form larger crystalline complexes are located.

So, it is the geometric, spatial approach that reveals the true structure of elementary particles and allows us to understand many of their properties. And the quantum approach is too complicated, conventional, formal and does not reflect the real structure of particles at all. Such a crystalline approach to the structure and decay of particles could have been developed a century ago by the first researcher of radioactivity - Pierre Curie. It was Curie, as a chemist and physicist, who did a lot to understand the properties of crystals and revealed the important role of symmetry. In addition, being a researcher of atomic magnetism and a colleague of P. Weiss, Curie would certainly have accepted the crystalline magnetic model of the Ritz atom and could one day apply this knowledge to the explanation of nuclear decays. But Curie died in 1906 in an accident at the age of 46, and the development of a structural, crystalline approach to radioactivity was delayed for a century. Only now scientists are gradually coming to understand the enormous role of the geometric structure of particles and nuclei. And, after all, even in Ancient Greece, Plato and Pythagoras realized the great importance of geometry and correct geometric bodies for the knowledge of the microcosm. Against the background of modern scientists, drugged by the structureless theory of relativity and quantum physics, even these ancient Greeks look not mystics, but consistent materialists.

§ 3.10. Systematization and the periodic law of elementary particles

The main interest of chemistry is in the study of the basic qualities of elements. And since their nature is still completely unknown to us, and since for them we still firmly know only two measurable properties: the ability to give known forms of compound and their property, called the weight of an atom, there remains only one way to thoroughly familiarize with them - this is the way of comparative learning elements based on these two properties.

DI. Mendeleev, "Fundamentals of Chemistry" [98]

Having understood the structure of elementary particles, one can already try to systematize them and build a table of elementary particles similar to the periodic table. Such a table is necessary not only to systematize particles, but also to establish a connection between their properties, to clarify known and predict yet unknown characteristics (masses, times and types of decay), as well as to predict new particles that will be in empty cells. To systematize particles, you need to choose a parameter by which we will make the systematization. This parameter, undoubtedly, should be, as in the periodic table, the mass of particles. And the properties of particles should be periodically repeated with increasing mass. But in the periodic table, the order of the particles is set not by the weight itself, but by the number of protons of an element equal to the charge of the nucleus (the weight can in rare cases decrease with an increase in the atomic number). As it was found out, just as the nuclei of all elements can be represented as combinations of only two types of particles - protons and neutrons, so all elementary particles can be represented as a combination of two basic ones: gammon Γ (with $M = 66$) and octons O (with $M = 8-9$) (Table 5). Moreover, gammons are analogous to protons, and octons are analogous to neutrons. And, since gammon is a kind of analogue of protons, then it is the number of gammons in a particle that should set its position in the table. As can be seen from this new, refined table, built on the basis of the previous ones, the mass of particles does increase with an increase in the number of gammons that form them.

We see that in some cases several particles correspond to the same number of gammons. These particles are combined by physicists into families, since they have similar properties and masses. And the proposed representation of particles in the form of combinations of gammon and octons allows us to understand the nature of these families. The particles of the family are united by exactly the same number of gammon - this is the reason for the similarity of their properties and masses. Particles differ only in the number of octons, therefore the masses of particles in all families differ by an average of 8.5 units. This is clearly seen from the last version of the table, where families (doublets π , K , Ξ , D , triplet Σ) are highlighted in semitones. Nuclear physics could not explain such standard mass jumps. Particles of the same family, with similar properties and masses, are similar to isotopes of the same element. Just as isotopes have the same number of protons, but different numbers of neutrons, so the particles of the family, having equal numbers of gammon, differ in the number of octons.

частица	I			II		M в m_e
	$\mu^\pm$	π^0	$\pi^\pm$	O	Γ	
O	–	–	–	1	0	8
Γ	–	–	–	0	1	66
$\mu^\pm$	1	0	0	1	3	207
π^0	0	1	0	0	4	264
$\pi^\pm$	0	0	1	1	4	273
C	0	2	0	0	8	528
K^+	6	0	–1	5	14	966
K^0	6	–1	0	6	14	974
η^0	0	2	2	2	16	1074
ρ^+	2	1	3	5	22	1497
ω	1	4	1	2	23	1534
K^*	11	–2	0	11	25	1746
p	1	1	5	6	27	1836
X^0	0	4	3	3	28	1875
ϕ^0	7	0	2	9	29	1994
Λ^0	0	0	8	8	32	2184
Σ^+	2	0	7	9	34	2328
Σ^0	6	0	4	10	34	2334
Σ^-	10	0	1	11	34	2343
Δ^*	0	4	5	5	36	2419
Ξ^0	–2	2	9	7	38	2573
Ξ^-	–2	1	10	8	38	2586
Σ^*	0	3	7	7	40	2707
Ξ^*	8	3	2	10	44	2992
Ω^-	12	3	0	12	48	3273
τ^-	5	0	9	14	51	3491
D^0	2	5	7	9	54	3646
D^+	–2	3	12	10	54	3656
S^*	0	3	11	11	56	3796
D^{*0}	6	5	5	11	58	3926
D^{*+}	14	6	–1	12	58	3931
Λ^+	20	–2	3	23	64	4423

Table 5. "elementary" particles as combinations of μ - and π -mesons (column I) or O- and Γ -mesons (column II).

Particularly interesting is such a representation of elementary particles and their masses in the form $M \approx 66x + 8y$, if you depict it on a graph with the x and y axes. Then each particle is represented on the plane by a point, the coordinates of which correspond to the number of gammon x and octones y in it (Fig. 122). This plan of the microcosm reveals many interesting patterns. So, it allows you to identify doublets and triplets - groups of particles located one above the other. Let's say a charged peony is located exactly above a neutral one, having one more octon. The same pairs, differing by only one octon, are K^+ and K^0 mesons, Σ^- and Σ^0 hyperons, D^+ and D^0 particles. Moreover, it is characteristic that particles containing an odd number of octons are usually charged in these doublets, and those in which the number of octons is even are neutral. This suggests that the

octons in the particles are coupled with electrons and positrons, and, therefore, they can be considered charged. In addition, it can be seen that the individual doublets are spaced at equal intervals of 10 gammon. The numbers of gammon in these doublets are 4, 14, 34, 54 (as well as 38 and 58). In addition, these doublets fit into a curve in the form of a ballistic trajectory. Therefore, three more doublets can be predicted (their particles are marked with question marks). In one there are 24 gammon and 8-9 octons, in the other - 44 gammon, and in the third - 48. And, indeed, particles with such numbers of gammon exist. Therefore, next to them, particles complementing the doublet may one day be discovered.

You can catch other patterns on the particle map. Thus, the particles are clearly clustered, gravitate towards certain nodes and lines, and form parallelogram cells. However, for further analysis, it is necessary to involve all other, including little-known, particles, establish their place on the map, and also clarify the location (masses and composition) of the already known ones.

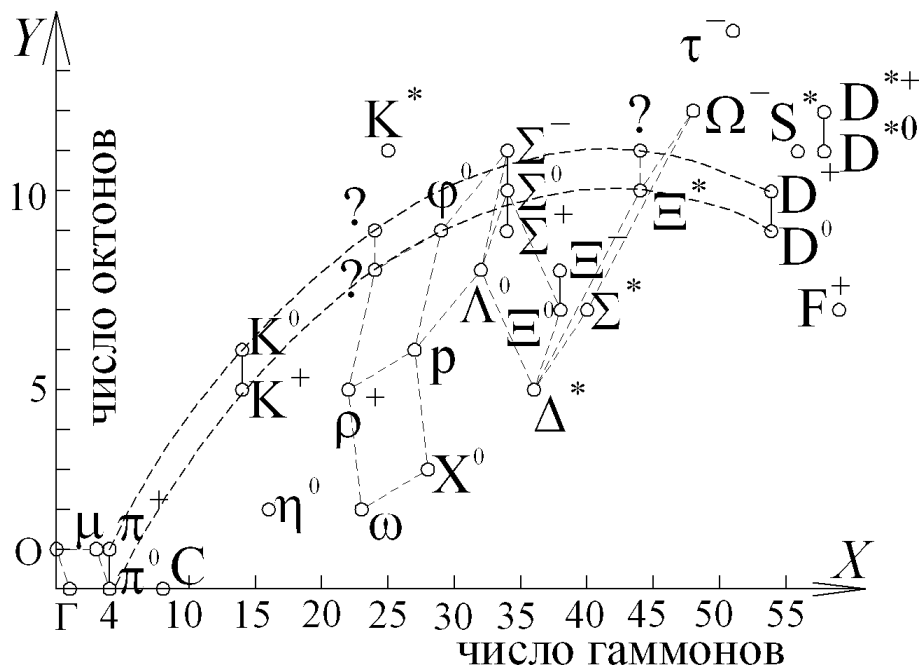


Fig. 122. Map of the particles of the microworld.

It is necessary to reveal the connection between the place of particles on the map and their properties. If this turns out to be the key to unraveling the microworld, then it will make it possible to predict and refine the masses and properties of particles in the future, as the periodic law of Mendeleev once allowed. In addition to the periodicity of doublets, the analogy here is that if according to the periodic table the mass of an atom is the higher, the more protons it contains, then in our table the mass of particles grows towards the end of the table with an increase in the number of gammon. However, exceptions are possible, which are in the periodic table (for the elements Ar and K, Ni and Co, Te and I). Well, particles with an equal number of gammons, but different masses (doublets, triplets and multiplets) are similar to isotopes, which also have the same number of protons, but different masses. And, if the nucleus of

any atom is a certain combination of protons and neutrons, then any elementary particle is a certain combination of octons and gammon. It is no coincidence that a similar map has been drawn up for the elements of the periodic table, on which the number of protons and neutrons in nuclei is plotted along the axes [11, 135]. The maps are similar in the presence of bands and islands of stability, outside of which the combinations of particles are extremely unstable. In both cases, the most stable particles are located along a monotonically increasing curve passing through zero and gradually decreasing the slope.

So, in general terms, the plan of the lower floors of the universe is built - a guide to the microworld. This is so far the first attempt at systematization based on the octogamon model of particles. Of course, this plan is still inaccurate, hypothetical, needs experimental verification, revision, and, perhaps, rejection (the reader is free to draw up his own plan). But its advantage is that, on the basis of a few natural hypotheses, the plan allows a unified description of all the properties of microparticles (mass, charge, magnetic moment, stability, types of decay), moreover, easily, visually, on the basis of classical models, in spite of quantum mech and the theory of relativity. In this regard, as Ritz desired, electrical phenomena are reduced to mechanical ones and are similar to nuclear ones.

§ 3.11. *Particles and antiparticles, symmetry and asymmetry*

Many, even after the world was born, and after the Day of the appearance of the earth and the seas and the rising of the sun, Bodies accumulated from the outside, and seeds were accumulated all around,

In a fast flight, rushing from the depths of the immense universe
... Until nature brings everything to its ultimate growth and puts things to perfection;

What happens when it collects in the veins of life The same amount of them, flowing out, emanates ... For the larger the object turned out to be at the end of its growth And the more extensive it is, the more it always releases

Bodies out of themselves, spreading them everywhere in all directions.

Titus Lucretius Carus, "On the nature of things", 1st century. BC.[77]

Carrying out mapping of the lower levels of the universe, one should take into account that the level of elementary particles must be divided into two opposite, mirror-symmetric parts: the sector of particles and the sector of antiparticles. The structure of the particles was clarified on the basis of a geometric model of their structure. Let's try to consider the problem of antiparticles in a geometric manner. If all particles are ultimately composed of electrons and positrons (§ 3.9), then, strictly speaking, only an electron has an antiparticle: it is a positron. It is these particles that will be pronounced samples of matter and antimatter. After all, an antiparticle is not exactly antimatter, but rather a particle, in which everything is the other way around: all the charges that form the particle are replaced by opposite ones. Electrons are replaced by positrons, and positrons are replaced by electrons. However, if one replaces all particles with antiparticles for a gammon or octon (instead of electrons, put positrons and vice versa), nothing will change (Fig. 119). This is why some neutral particles do not have antiparticles: the particle and the antiparticle are the same. These are the neutral pion and the η

meson. In them, as is easy to see, the inversion of the charge sign (mirror image of the world into the antiworld) gives the same thing (Fig. 120). It turns out that only electrons and positrons, which give particles a charge and a magnetic moment, distinguish particles from antiparticles. So, if in a muon or proton all electrons are replaced by positrons and, on the contrary, the particle and antiparticle will no longer coincide, being different in the number of electrons and positrons, and, therefore, in the sign of the charge. In a proton there is one more positron than electrons, and in an antiproton, which has a negative charge, there is one less. The same is in muons μ^+ and μ^- .

Let us now consider the neutron. The number of electrons in it is equal to the number of positrons. Swapping them in places, it would seem, will not change anything. But, in fact, the neutron and antineutron are different. It seems that electrons and positrons are not symmetrically arranged in a neutron. This is evidenced by the fact that the neutron has a magnetic moment, which would disappear with a symmetric arrangement of particles. The presence of a structure and an asymmetric arrangement of charges of opposite signs for the neutron was also proved by its probing. It revealed point charges in neutrons - partons, moreover, there are more positive charges in the center of the neutron, a little further from the center negative charges prevail, and on the surface - again positive ones [165]. The structure of the antineutron is reversed. But in the η -meson, as is easy to see (Fig. 120), the distribution of charges is symmetric, therefore it has no charge, magnetic moment and antiparticle.

The complex spatial structure of particles is also evidenced by the asymmetry of other decays: for many particles in a magnetic field, most of the decay products fly in a certain chosen direction. This asymmetry is a consequence of the asymmetric structure of the particle oriented by the magnetic field. Thus, experience has shown that ^{60}Co nuclei oriented by a magnetic field (directed upward) emitted electrons in β -decays mainly downward (in 60% of cases) [85, 86]. The same asymmetry was found in decays of elementary particles, such as π^- - and μ^- -mesons, Λ^0 -hyperon. It can be seen percentage decays in a given direction is determined by the shape, strength of a particle in its different parts, or by the percentage of particles of a given shape emitting decay products in a given direction. Note that W. Pauli considered such an asymmetry to be impossible, moreover, precisely because he accepted the quantum structureless model of particles and nuclei. For the same reason, he mistakenly rejected the idea of spin, the rotation of particles, which is directly related to the asymmetry of their decays (§ 3.19, § 5.7).

So, antiparticles are not antimatter yet. They contain almost equal parts of matter (electrons) and antimatter (positrons). This follows from the absence of pairs of truly neutral particles and the fact that only an electron in contact with an antiparticle leads to annihilation. So, when a neutron contacts an antineutron, they do not disappear, but form a proton and an antiproton (only the electron and positron entering them annihilate). The proton and antiproton also do not disappear upon contact, but form a cascade of pions. This is natural if protons, like many other particles, consist of large blocks in the form of muons and pions, which are ordinary decay products (§ 3.8). It turns out that since there is

no annihilation in the case of anti-protons, they should not be considered antimatter.

And, nevertheless, antiparticles from true antimatter exist: these are positrons and the arheons that form them (§ 3.20). What is the nature of this very antimatter - matter and mass with a minus sign? According to one of the hypotheses, antiparticles are the same particles, only moving backward in time. That is why antiparticles (positrons) move under the impact of the rheon flux in the direction opposite to the motion of particles (electrons). However, this question goes far beyond the scope of modern physics, so we will consider it in more detail closer to the end of the book (§ 5.6).

In the meantime, we note that it is possible that this temporal asymmetry gives rise to the asymmetry of the properties of electrons and positrons, from which electrons often meet in a free state and form shells of atoms, while positrons in a free state are absent, but predominate in a bound form inside nuclei, protons, giving them a positive charge. This asymmetry of the world can be explained by recalling the possible asymmetry of the particle parameters (§ 1.17): if the electron radius is r and it emits N rheons per unit time, then the positron has a radius slightly larger than $R = r + \Delta$, and it emits n every second arheons. Since the force $F = knr^2$ of the action of one charge on another is proportional to the number of particles emitted by the first - on the cross section (square of the radius) of the second (Fig. 45), then there are four different forces in total:

- 1) the force of repulsion of an electron by another electron $F_1 = kNr^2 = knr^2(1 + 2\Delta/r + \Delta^2/r^2)$;
- 2) the force of repulsion of a positron by another positron $F_2 = knR^2 = knr^2(1 + 2\Delta/r + \Delta^2/r^2)$;
- 3) the force of attraction of an electron by a positron $F_3 = knr^2$;
- 4) the force of attraction of a positron by an electron $F_4 = kNR^2 = knr^2(1 + 4\Delta/r + 6\Delta^2/r^2)$.

Moreover, the asymmetry, the size difference is, as found above, a negligible value $\Delta/r = 10^{-21}$ (§ 1.17). And yet, it is this insignificant difference, the asymmetry of sizes and forces, apparently, that leads to the asymmetry of the structure of our world, giving rise to atoms with positively charged nuclei - surrounded by negatively charged electrons, of which there are many more than free positrons. Indeed, with the indicated ratio of forces, a positron will always be attracted by a neutral system of charges with a specific (per unit mass of a neutral particle) force $W = F_4 - F_2 = 2knr\Delta = 2F\Delta/r$, and an electron will be repulsed with a specific force $W = F_1 - F_3 = 2knr\Delta$ (Fig. 123). That is why there are many electrons in our world that form the electron shells of atoms, and there are practically no positrons in a free state. For the same reason, atomic nuclei are positively charged: there are many protons in the world and very few antiprotons. Electrons and positrons in the Universe, as said, are equally divided (§ 1.6), but neutral particles attract positrons, forming heavy positively charged particles (protons, nuclei), and therefore there are no positrons in a free state. And electrons, on the contrary, are repelled by neutral particles, and therefore our world is full of free electrons that form the shells of atoms, and there are no free positrons: they are all bound in protons of nuclei. These forces W , breaking symmetry, are extremely small, but for the immeasurable time of the existence of the Universe, they could well have brought the systems of elementary

particles into the state with the lowest energy observed today. A similar situation takes place in the world of atoms of chemical elements: some of them are in a free state, and some are in a bound state, due to the difference in chemical forces pulling the atoms together. So, on Earth there is a lot of free oxygen in the form of molecules, atoms and negative ions, while hydrogen atoms and its positive ions are found only in a bound form (in the composition of water and its crystals).

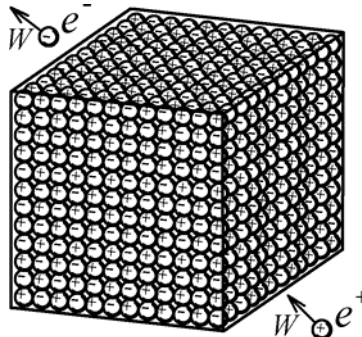


Fig. 123. The attraction of positrons with a specific force W to a neutral system composed of hundreds of electrons and positrons leads to the formation of protons, and the repulsion of electrons with a force W causes the decay of neutrons.

The asymmetry of the properties of positrons and electrons (Fig. 124) is caused by the fact that for them all processes are opposite, and both have a

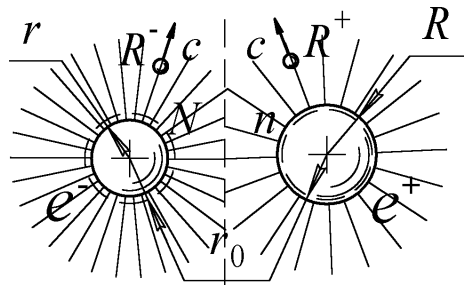


Fig. 124. Asymmetry of elementary charges. An electron and a positron tend to the equilibrium radius r_0 , having one radius deficit and the other its excess.

standard critical radius r_0 (§ 1.5). The electron, according to Ritz, is constantly pouring out rheons. On the other hand, it begins to absorb rheons coming from outside only when it becomes less than the critical radius r_0 (in the same way, nuclei absorb protons and neutrons well, only having reduced to the critical radius at which the synthesis is energetically efficient). Therefore, the electron loses mass until it shrinks to a critical size, and, upon reaching it, the influx of rheons compensates for their leakage, and the radius r_0 becomes equilibrium.

The standard positron radius r_0 is also supported. But, since positrons are the exact opposite of electrons, for them the emission of rheons corresponds to the absorption of arheons (antirheons), and the absorption of rheons corresponds to the emission of arheons (the emission of particles is equivalent to the absorption of antiparticles [139]). And therefore, positrons continuously absorb arheons, and, after exceeding the critical radius r_0 , they begin to decay, emitting arheons and losing mass with them, until they shrink again to the equilibrium radius r_0 (similarly, the nuclei have a critical radius, exceeding which, they effectively

decay). Due to the inertia of the process, the real radius R of the positron is always slightly larger than the equilibrium r_0 , since the excited state of particles has a finite lifetime, a delay, after which the positron begins to decay. Therefore, before the positron starts emitting arheons, it will have time to absorb them a little more from the external stream. The decay of a positron always lags behind fusion, which is why its radius R is slightly higher than the critical one: $R = r_0 + \Delta/2$.

The electron, on the contrary, constantly emits rheons, and absorbs them, only reducing the radius to r_0 , thereby maintaining the size near this equilibrium value. But here, too, complete equilibrium is unattainable: the real radius $r = r_0 - \Delta/2$ of the electron is slightly less than the critical one, since, due to inertia, synthesis lags behind decay. An electron and a positron tend to the equilibrium radius r_0 from different sides, and never reach it. Hence it is clear why electrons emit more particles $N=n(R/r)^2$ than positrons. Electrons emit particles continuously, and positrons - in bursts, upon exceeding radius r_0 . Above, we found $Nr^2 = e^2/\pi\epsilon_0 mc$ for electrons, and since this value is a constant, then for positrons $nR^2 = e^2/\pi\epsilon_0 mc = Nr^2$. The electron and positron, which periodically experience slight contractions and expansions, seem to breathe, absorbing and emitting streams of rheons, which maintains their standard size. Likewise, a person, despite the constant inhalation and exhalation of air, on average does not change the volume and mass, since these processes are precisely balanced. It is interesting to note that even in Ancient India, a similar idea of Eternal Breath (eternal motion) was formed, emanating from an invisible fiery embryo, and after being reabsorbed by it (see "Stanzas of Dzyan"). Since the ancients often called electricity "fire", and ether (akasha, § 3.21), emitted by a certain source, "breath", is not this a symbolic representation of an electron emitting and absorbing streams of rheons?

It is no coincidence that the idea of such a dynamic maintenance of the equilibrium size of bodies has long been put forward by the student of Indian sages, Democritus (see epigraph § 3.11), who also linked this with the directional flow of time. In fact, he outlined a model of an electron constantly emitting particles, simultaneously absorbing streams of the same particles converging to it from all corners of the Universe, which compensate for the leakage and maintain the equilibrium size of the electron (§ 1.5). Thus, the electron can be likened to the barrel of Danaids, also located in Greek mythology on the lower floor of the universe. No matter how much water you pour into this mythological leaky barrel, you cannot fill it to the top. In such a barrel, with approaching the upper critical level, the intensity of the outgoing water flow increases under the pressure of pressure. The positron, on the other hand, can be compared with another type of barrel, into which streams of rain are constantly pouring, and, despite the continuous scooping of water from it, the level cannot fall below the critical mark. It is even better to compare a positron with a floating boat (barrel), which has a wide hole through which water constantly flows in, and - the more intense, the lower the water level in the boat. Therefore, no matter how much you scoop out the water, it will not fall below a certain limiting level.

Thus, despite the fact that the antiworld (sector of antiparticles) is a mirror

copy of the world (sector of particles), such a mirror image of world objects is not their exact copy. In addition to the fact that the signs of charges change in the mirror anti-world, the right one turns over to the left, and the forward movement becomes backward, the particle sizes also differ somewhat, as if the mirror is not flat, but slightly concave, which is why the electron is displayed in the form of an enlarged reverse image (positron) attracting an electron according to the laws of electrostatics [137, p. 86]. At the same time, due to the smallness of distortions, the exact preservation of the proportions and equality of the number of objects and their images is observed. The number of electrons is exactly equal to the number of positrons. We will return to the question of the nature of antiparticles and antiworld, the reasons for the asymmetry of their properties with the properties of the world of particles (§ 3.15, § 5.6).

§ 3.12. The nature of nuclear forces

Nuclear forces have many characteristics, but they do not have a special nature. Not at all. They are Coulomb forces, electrostatic. Therefore, there is no need for theories of exchange forces, or for analogies with the rotation of nucleons or pions in orbits of the atomic type.

V. Manturov, "Nuclear forces - a proposal for a solution" [79]

The attraction of nucleons, nuclei arises, as it was found out, due to their electron-positron structure (§ 3.2, § 3.9). The charges e^- and e^+ , located like ions in a salt crystal, periodically, in a checkerboard pattern, stand opposite each other. Due to this, even neutral particles of such a structure are attracted (Fig. 125). This is similar to the attraction of two dipoles: they are neutral, but, with their mutual orientation, an attraction force arises that rapidly decreases with distance (such an electromagnetic nature of nuclear forces has long been assumed by physicists [19, p. 228]). Such a mechanism of nuclear interaction leads to the fact that it is noticeable only at distances r of the order of the period (step) of the electron-positron lattice, equal to the classical radius of an electron of 10^{-15} m. That is why nuclear forces have such a radius of action. Physicists ignored this coincidence because they could not explain it. When, during the approach of particles, the nuclear force exceeds the force of the Coulomb repulsion, the nuclei will begin to attract. From this moment, the energy of attraction is converted into the energy of a nuclear reaction, since attraction gives the converging nuclei velocity, kinetic energy, as in the annihilation of e^- and e^+ (§ 1.16).

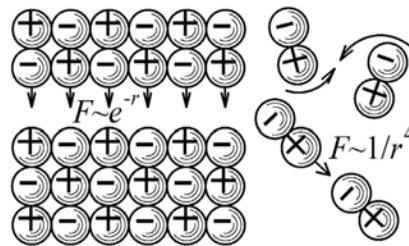


Fig. 125. Forces of attraction of particles with the structure of an electron-positron crystal (nuclear forces) and a similar interaction of dipoles.

Similar to nuclear reactions, decay-synthesis of elementary particles and the release of energy proceed. Fission of particles is not turning into new particles, but decay into components, with the preservation of their number, as in a

nuclear reaction the number of protons and neutrons is preserved. Elementary particles, which are crystalline complexes of e^- and e^+ , are held together by electrostatic forces of attraction, similar to nuclear ones. In nuclei and particles, stability is determined by the shape of these crystals (§ 3.9). The more perfect, symmetrical, closer to a regular body with flat faces, the more stable and durable the particle is. So, in life: more durable compact things, close to a cube, devoid of protrusions.

Why, then, during fission, a particle always breaks up into the same particles into fragments of a regular shape, and the decays proceed in a known way? If you beat the same type of bricks, glass cubes, their fragments each time will have different masses and shapes, moreover, they are irregular, while the particles are always broken into known elementary particles, with their strictly specified shape and mass. It's all about the isotropic (identical in all directions) properties of bricks and glass, which makes them energetically indifferent to which parts to break. But, in elementary particles, due to the crystal structure, the strength strongly depends on the direction of deformation, which is why the crystals fall apart on the cleavage planes upon impact. Let's remember that the particles built from the charges e^+ and e^- are similar to salt crystals from Na^+ and Cl^- ions (Fig. 120). So, if you hit a rock salt crystal with a hammer, it will fall apart into pieces of regular shape - into cubes and parallelepipeds [164]. The same is with the decay of particles that are divided into regular fragments - into other standard particles, moreover, with a given ratio of their masses and shapes, since the particle breaks into extremely stable parts, breaking in places of least strength. Indeed, as found above, particles, like buildings, pyramids, are built of regular bricks, blocks (mesons, § 3.8), decaying upon impact not into fine dust and crumbs, but into these "bricks" and large blocks of them. A particle can be divided in several ways. But this is no more strange than the ability of molecules to chemically divide in two or three ways. The probability of this decay path is determined by the strength of the fragments formed. The more symmetric, more stable the particles that have arisen, that is, the lower their residual energy and the higher the energy release, the more likely this decay path is, which is also confirmed by experience. The potential energy of the system tends to a minimum.

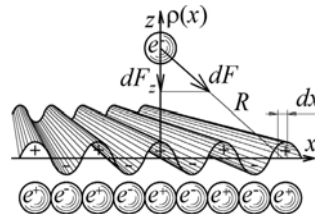


Fig. 126. Interaction of an electron with a one-dimensional alternating charge distribution.

To better understand the nature of nuclear forces and study them quantitatively, consider a one-dimensional periodic alternating distribution of charges. It can be represented by the dependence of the charge density ρ on the coordinate x in the form $\rho = (e/r_0^2)\cos(x/r_0)$, where r_0 is the radius of the electron, e is its charge. It's like a set of alternating charged filaments with surface density ρ (Fig. 126). The force of attraction of an electron to a thin

charged filament of width dx is $dF = e\rho dx/2\pi\epsilon_0 R$, where R is the distance to the element dx . We only care about the gravitational force component transverse to the x -axis $dF_z = dF(z/R) = e\rho z dx/2\pi\epsilon_0 R^2$, where $R^2 = z^2 + x^2$. Integrating dF_z within the range of x from minus to plus infinity, we find the force $F_z = (e^2/2r_0^2\epsilon_0)\exp(-z/r_0)$ from the table of integrals. Such is the force of attraction to the system of an electron placed above a positive charge (positron, Fig. 126). And with the same force it will repel itself, being opposite a negative charge (electron), as it is easy to see by changing the sign of ρ .

You can get a two-dimensional periodic charge distribution by adding two one-dimensional ones $\rho(x) = (e/r_0^2)\cos(x/r_0)$ and $\rho(y) = (e/r_0^2)\cos(y/r_0)$, as if intertwining the two systems crossed charged threads into fabric, matter, mesh (Fig. 127). Then, the force of attraction to such an electron-positron lattice, according to the principle of superposition, is simply the sum of individual forces: $F_z + F_z = (e^2/r_0^2\epsilon_0)\exp(-z/r_0)$.

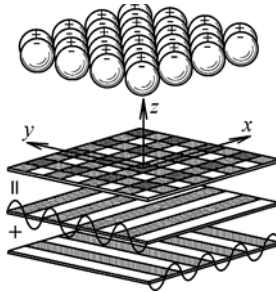


Fig. 127. Addition of two one-dimensional charge distributions gives a two-dimensional one, as in an electron-positron lattice.

Thus, the electron is attracted to the positive sites of this lattice, and the force of attraction exponentially decreases with distance z from the plane of the crystal particle. The matter of bodies and particles is "woven" from positive and negative charges, like a simple woven matter - from intertwined warp and weft threads, emerging on the surface in a checkerboard pattern, like electrons and positrons, forming a kind of checkerboard. Electrons, like magnetic chess pieces, stick to this chessboard in exactly designated cells (opposite the positrons, Fig. 101).

Protons with neutrons also adhere to the electron-positron layers. After all, they themselves are similar to crystals formed by electrons and positrons (§ 3.2, § 3.9). A proton and a neutron are pulled together by their faces so that the electrons of one particle stand against the positrons of the other and vice versa. Then the total force F of attraction of particles is equal to the sum of the forces of attraction of all electrons and positrons: $F = N(e^2/r_0^2\epsilon_0)\exp(-z/r_0)$, number of charges in contacting faces. That is, the cohesion force of two protons or a neutron and a proton decreases exponentially with distance z . It is such a law and was open to nuclear forces. Moreover, the proposed mechanism of nuclear attraction immediately explains why nuclear forces are short-range, and their characteristic radius of action coincides with the classical electron radius r_0 (on the order of 10^{-15} m), which quantum physics could not explain. It's all about the fact that the factor $\exp(-z/r_0)$ in the expression for F , with increasing distance, quickly tends to zero, making the nuclear force F noticeable only at distances z of the order of r_0 and, practically imperceptible, at distances greater than $3r_0$.

It turns out that nuclear forces, as well as magnetic and gravitational ones, are electrical in nature [79]. When two protons approach each other, they first repel, since the strength of the electron-positron interaction of their faces is small. As they get closer, this nuclear force grows rapidly and finally surpasses the force of the Coulomb repulsion. Recall: a proton is formed by about 900 electrons and 900 positrons, but one more positrons than the positive charge of protons is caused, which repels particles. The forces of interaction of other electrons and positrons are balanced. But, with the approach and mutual orientation of the protons, due to their ordered structure, the balance of forces is disturbed: there is an attraction of their crystal lattices, which holds the particles together. The influence of the mutual orientation of nucleons and nuclei on the degree of their interaction, indeed, was discovered long ago [19, p. 319], but from ignorance of the nature of nuclear forces and the structure of nuclear particles, this effect, like magic numbers, could not be explained.

Similarly, to nucleons, other particles that have a crystalline structure and are attached to each other by electrons that stand opposite the positrons, like parts of a children's designer, with their fastening protrusions and depressions, are staggered. It is interesting that a similar mechanical-geometric theory of the bond between microparticles interconnected by flat faces is the stronger, the larger the area of their contact (and hence the number N of charges forming the faces), was developed by M.V. Lomonosov. However, the surfaces with which the nucleons are in contact are not always flat faces, because they can also have a more complex, stepped shape, with large protrusions and depressions that fit into each other like puzzle pieces. In this case, the contact area of the particles and the number of bonds N charges are increased, which increases the bond strength. This can explain why some combinations of nucleons are especially strong and stable (recall the magic numbers of nucleons, Section 3.6), what happens when, when combined, they form the most regular, complete and symmetric body with a minimum of protrusions, and, therefore, a minimum of potential social energy (hence the symmetric planar faces of crystals). So, the combination of two protons and two neutrons (alpha particle, or helium nucleus) is especially stable, which is easily explained if each of their protrusions is firmly held in the reciprocal cavity, forming a complete particle, just as the four elements on the "Microsoft Office" logo make up a complete puzzle in the form of an even square.

As you can see, the crystalline, bipyramidal model of the nucleus is not only the most simple and natural, from the point of view of the identity of atoms, but also leads to an elegant explanation of nuclear forces and the nature of their change with distance. Without an ordered crystal structure of the atom and the nucleus, it is impossible to understand the nature of the shells, levels and spectra. And, it is quite natural that the famous scientists I. Kurchatov and P. Curie, who laid the foundation of nuclear physics in our country and abroad, came to this area not from quantum physics, but from the physics of crystals, to which their early studies were devoted. Of course, quantum physics is partly fair in the fact that there is discreteness in the microcosm, but its essence is not in discreteness of energy (quanta), but in discreteness of matter, atom, nucleus,

built from orderly, periodically arranged particles. This is a truly atomistic approach. In physics, in general, there are only two paths: one is atomistics, and everything else is mysticism (§ 5.14). Both quantum mechanics and the theory of relativity, which endows empty space with properties, belong to mysticism. According to atomism, there is nothing in the world except emptiness - empty space that has no properties, and moving particles and bodies that fill this emptiness and obey the laws of mechanics. This principle of construction is valid on all floors of the universe. Any body is a collection of particles, any process, impact is the movement of particles, any energy is the kinetic energy of particles. The world is arranged extremely simply and harmoniously!

§ 3.13. Nuclear reactions and mass defect

All changes in nature that occur are the essence of a state that how much is taken from one body, so much will be added to another. So, if where a few matter diminishes, it will multiply in another place ... This universal natural law extends to the very rules of motion: for a body that moves another with its power loses as much as it communicates to another, which receives movement from it.

M.V. Lomonosov [84]

Modern physicists do not consider the appearance and disappearance of mass in nuclear reactions to be something surprising: such a possibility follows directly from the theory of relativity. However, as Democritus discovered, Lomonosov substantiated, and, as shown in §1.16, contrary to SRT, in all reactions the mass is conserved. If we do not see where it goes, or where it comes from, this does not mean that it disappeared or emerged from emptiness, from energy. So, in chemistry, it was previously believed that mass disappears and is born without noticing how it flows away or enters in the form of invisible gaseous products. For example, when a lead rod is heated, its mass increases. Scientists interpreted this as if the heat (caloric or phlogiston), which entered the lead, was converted into mass, which made the weight of the rod increased. And only M.V. Lomonosov proved that the increase in lead mass is caused by the absorption of oxygen particles O from the air [84]. Combining with lead and forming scale (oxide), the particles increase the weight of the bar. If you heat the lead in a sealed flask, then although the weight of the rod will increase, the weight of the flask will not change: the oxygen absorbed by the lead comes from the air, which has become lighter, and the total weight of the rod and air in the flask will remain the same. The law of conservation of mass discovered by Lomonosov is valid always and everywhere. But modern alchemists - nuclear physicists, having forgotten the lessons of Lomonosov, again began to believe that mass is born from energy and disappears, turning into energy (this modern analogue of caloric, phlogiston), instead of recalling the lessons of history, looking for the missing mass in elusive neutral particles. Indeed, the scientists themselves - recognize their reality, but consider these particles to be weightless neutrinos, and not particles with a mass equal to the disappeared one (§ 3.15).

With his dictum, Lomonosov also approved the law of conservation of energy, indicating that energy is not an abstract substance (such as phlogiston, heat), but motion that is transmitted from one body to another without disappearing or arising. If mass is a measure of the amount of matter, then

energy is a measure of the movement of matter. Lomonosov was the first to understand that all types of energy are reduced to the kinetic energy of particles and interpreted thermal energy as a chaotic movement of atoms [84]. In SRT, the laws of conservation of mass, energy are rejected and replaced by the law of conversion of mass into energy, which explains the release of energy in nuclear reactions. As if, if SRT did not work, nuclear power plants and bombs could not work either.

This is fundamentally wrong. The energy arising in nuclear reactions is not the energy of annihilation of mass, but the liberated internal binding energy of the constituent parts of the nucleus or an elementary particle. Nuclear reactions are similar to chemical ones, the essence of which is the combination or decay of particles of a substance with the return or absorption of binding energy in the form of heat and radiation. The initial energy of the reactants exceeds the total internal energy of the reaction products - this difference is in full agreement with the conservation law and is released. Consider, for example, where the energy comes from in the fission reaction of uranium. When the uranium core splits in half, its positively charged fragments, pushed apart by the Coulomb force, gain tremendous speeds. The internal energy of the nucleus (in fact, the energy of the electric field) is converted into the kinetic energy of the particles-fragments - into heat. Fragments emitted from nuclei, including neutrons, hitting other nuclei, cause them to fission. This is how a nuclear chain reaction arises, releasing energy in the form of a nuclear explosion or quiet combustion in nuclear reactor furnaces.

Alpha-decay (emission by the nucleus of an alpha-particle - a helium nucleus) can also be attributed to nuclear fission reactions. Let us clarify the nature of the energy of these reactions using the example of the α -decay of uranium: $^{234}\text{U} \rightarrow ^{230}\text{Th} + ^4\text{He}$. The separated helium nucleus He is accelerated by the Coulomb repulsion of the thorium nucleus Th (Fig. 128). The obtained He kinetic energy is equal to the energy E of the electrical interaction of the He and Th nuclei at a distance equal to the radius R of the Th nucleus. As the α -particle moves away, this potential energy E transforms into kinetic energy - into the energy of a nuclear reaction. Energy $E = q_1 q_2 / 4\pi\epsilon_0 R$, where $q_1 = 2e$ is the charge of the He nucleus, $q_2 = 90e$ is the charge of the Th nucleus. Hence $E = 45e^2 / \pi\epsilon_0 R$ (J) = $45e / \pi\epsilon_0 R$ (eV). Substituting $R = 10^{-14}$ m, we get $E = 26$ MeV. The real energy of this and other α -decays is about 5 MeV, which is five times less, which is considered proof of the inapplicability of the classical theory of the phenomenon [135]. But this discrepancy can be explained, firstly, by the inaccuracy of the accepted value of R . Secondly, we did not take into account the nuclear forces, which, by attracting and slowing down the helium nucleus, reduce its energy. In any case, the Coulomb repulsion is quite enough to give the nuclei energy without its ridiculous transformation from mass.

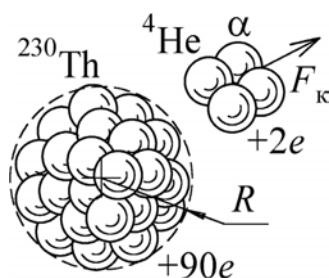


Fig. 128. The nature of the energy of alpha decay: the ejection of an alpha particle by the Coulomb repulsive force.

Nuclear fission reactions are similar to chemical ones. Take, for example, explosives - nitroglycerin, hexogen, TNT. When their molecules are divided, a lot of gas is released - nitrogen oxide. Its sharp expansion creates an explosion effect. The launched reaction goes on by itself: molecules of nitric oxide, hitting other molecules, lead to their disintegration. That is, here, too, there is a chain reaction of fission, in which the latent internal energy of molecules is converted into the energy of an explosion. Talking about the release of energy from the mass in a nuclear explosion is as stupid as in the usual explosion of a bomb that releases energy and turns into "nothing". And there, and there, the loss of mass is imaginary: the mass does not disappear, but only leaves with invisible reaction products. In a chemical reaction, these are gas molecules, and in a nuclear reaction, light, neutral, elusive particles. These are not only the explosion reactions, but also the reactions of nuclear, chemical combustion. Chemical fuel (wood), as it burns in the oven, "evaporates", turning into a gaseous state and leaving only light ash. Also, nuclear fuel in reactors gradually burns out, losing weight. In both cases, the mass does not disappear, but is carried away by the particles. A shortage, a defect of masses arose only in the minds of physicists who believed in SRT. Tsiolkovsky and Tesla [110, 159] spoke about dissolution and evaporation of matter in nuclear reactions in their works [110, 159], again, meaning by this not the loss of mass, but, like physicochemical dissolution, the decay of matter into microparticles. It is not without reason that nuclear reactions were discovered and investigated without the help of SRT and its formula $E = mc^2$ [111, 139]. And the first nuclear physicists, including E. Rutherford and F. Soddy, considered the theory of relativity meaningless and unnecessary in their research.

Let us now consider fusion reactions. In them, too, there is no supernatural loss of mass and the birth of energy from it. These reactions include the annihilation of an electron with a positron. Those, as found above, do not disappear, but form a particle of mass $2m_e$. The energy released in the form of γ -radiation is the energy of the electric field (the work of the Coulomb force of attraction), released when the particles approach each other (§ 1.16). Another example is the fusion of deuterium and tritium nuclei, with the formation of a helium and neutron nucleus (Fig. 129). And here energy is released in the same way as in chemical synthesis reactions. For example, when an explosive gas (a mixture of hydrogen and oxygen) explodes, the H and O atoms merge together, forming a water molecule, with the release of internal energy in the form of an explosion. Likewise, in the reaction of fusion of helium in a hydrogen bomb, the

latent internal energy of the electrical fusion of hydrogen nuclei is released. In this case, the reagents must first communicate the initial, ignition energy. In chemistry, this energy is called "activation energy". The same activation energy exists in nuclear fusion reactions: for the hydrogen nuclei to merge and nuclear forces to come into play, the nuclei must converge, overcoming the Coulomb repulsion. For this purpose, hydrogen fuel in nuclear projectiles is "ignited" by the firing decay of plutonium or uranium. A similar fuse (detonator with explosive mercury) is also found in conventional shells with chemical explosives.

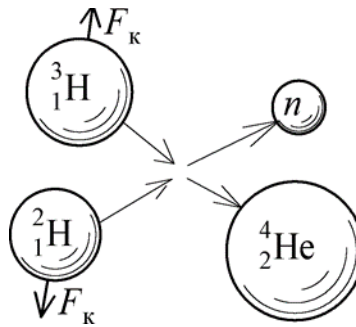


Fig. 129. Merging of deuterium and tritium nuclei into a helium nucleus. Fusion is opposed by the Coulomb repulsive forces of nuclei.

Thus, the analogy between chemical and nuclear reactions is complete. However, if in the decay reaction energy is released in the form of kinetic energy of flying fragments of the nucleus (accelerated by the field of Coulomb repulsion), and in the annihilation reaction - in the form of γ -radiation energy (converted energy of electric attraction e^- and e^+), then where does the energy come from in fusion reactions? After all, the nuclei are positively charged and repel: their rapprochement requires the expenditure of energy. It is not for nothing that fusion reactions do not proceed spontaneously, but only when heated to high temperatures, so that the nuclei, possessing sufficient kinetic energy, can converge. It is only at distances of about 10^{-15} m that nuclear attractive forces that exceed the forces of Coulomb repulsion come into play. These rapidly decreasing forces are also electrical in nature (§ 3.12). Therefore, the energy released when these forces approach in the field is also the energy of the electric field, and, ultimately, the kinetic energy of the rheons, - the particle-carriers of the electric effect (§ 1.14).

We see that the mechanism of energy release in nuclear reactions has nothing to do with SRT and mass loss. Energy and mass are different concepts. As Lomonosov discovered, mass is stored separately, energy is separately stored, they do not disappear and do not arise, but are only transmitted, respectively, in the form of particles and their motion from one body to another. Why, then, does the STR formula work, and the loss of mass m in a nuclear reaction leads to the release of energy $E = mc^2$? We have seen that the "loss" of mass, as in a chemical reaction, is associated with the escape of subtle, imperceptible particles. So, in the reaction of nuclear fusion, having gained large energies during the approach, they collide inelastically: all their energy goes to knocking out small fragments from the nucleus. These fragments-particles carry away the

excess energy of the nucleus, which is transferred to the surrounding bodies in the form of heat. If the collision is elastic, then the formed nucleus passes into an excited state - its parts vibrate: after the impact, the nuclei bounce off, then converge again, etc., until they spend all the energy on radiation that accompanies any oscillations of the charges. This provides another mechanism for the generation of γ -radiation from excited nuclei (§ 3.7).

So, the "loss" of mass is associated with the escape of neutral particles. The more energy E of collision of nuclei, the larger piece they will knock out of each other. That is, the higher the energy release E of the reaction, the greater the mass m lost by the nuclei. It is like striking a spark with two flints: the more force and speed you knock them down, the more fragments-sparks fly out and the brighter, hotter, more energetic they are. Since the speed V of light elusive particles emitted from nuclei is usually close to the speed of light c , their kinetic energy $E = mV^2/2$ is of the order of mc^2 . Hence, the correspondence between the lost mass m and the released energy $E = mc^2$, although not quite strict. But, after all, even in experience, physicists usually cannot accurately measure the energy of one nuclear reaction, when dealing with ensembles of particles, the number of which is not known, and the energy is not always precisely measurable. So, within the framework of classical physics, there is also a correspondence between the released energy E and the lost mass m in the form of the relation $E = mc^2$, but its meaning is different than in SRT, and it is by no means so strict.

In decay reactions, the release of energy is also accompanied by a loss of mass. Indeed, during fission of a nucleus, in addition to two daughter nuclei, very small fragments should also fly out. Similarly, if you break a brick with a blow into halves, then, in addition to them, small crumbs and fragments will remain. Likewise, when liquid droplets are detached, apart from the main droplet, a tiny Plateau ball is always separated in the constriction (Fig. 130). Therefore, if you really follow the drip model of the nucleus, physicists should have assumed that the same small droplet-particle is formed during the fission of nuclei. This particle carries away the "missing" mass. In the case of fission of heavy nuclei, this particle is a neutron (if its real mass is slightly higher than the accepted one, this will give rise to the illusion of the disappearance of mass in the reaction, § 3.15). In the case of α -decay, no such particles were found at all, although, according to the droplet model of the nucleus, they should also exist. It is understandable why here, too, the mass m of the lost particle is related to the decay energy: the greater the fission energy E , the more powerful the impact shaking and destroying the particle, the more massive the emitted fragments.

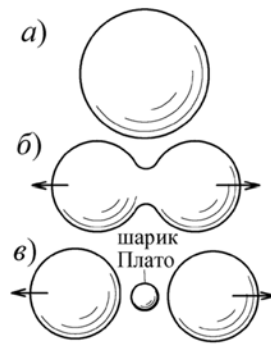


Fig. 130. Fission of drops (or nuclei) with the formation of a plateau ball (particle) from the waist [135].

However, all this related to reactions, and the nuclei have a certain mass, regardless of which way - fission or fusion - they are obtained. The weight lost in the reactions (mass defect) is only the difference in the masses of the initial and final nuclei. This means that something sets the stable mass of the nucleus, and, during fission or fusion, the nucleus only dumps the excess mass-ballast in the form of particles. What are these particles? These are probably the gammon mentioned earlier (§ 3.8). After all, a typical mass defect is about 0.04 proton masses (or a multiple), that is, about $70m_e$, and this is close to the mass of gammon in $66m_e$, which also disappears without a trace in reactions with elementary particles. Why is the same mass always lost, and the nuclei have a standard weight? The answer is simple: each nucleus consists of a certain number of standard particles with constant mass. And, exactly, any nucleus consists of neutrons and protons, but the sum of their masses is never equal to the mass of the nucleus they form - this difference was called the "mass defect". According to the law of conservation of mass, this cannot be - the particles after merging must together weigh the same as before. This means that there are other particles in the nucleus as well. Indeed, we found out that the nucleus is not just naked protons and neutrons: in the nucleus, these particles are packed, as in a bag, in a bipyramidal skeleton, a framework (§ 3.3), which probably also has a standard weight that must be taken into account. In other words, the mass of the nucleus is the gross weight (goods with packaging), and the sum of the masses of protons and neutrons is the net weight (net weight, without packaging).

In this case, the mass of the nucleus is $m = nN + o + pZ$, where n is the mass of a neutron, N is the number of neutrons, o is the mass of the core (packing), p is the mass of a proton, Z is the number of protons (Fig. 131). Then the mass of the hydrogen nucleus is $H = o + p$, deuterium $D = n + o + p$, helium $He = 2n + o + 2p$. Therefore, the sum of the masses of two deuterium nuclei D , each of a proton and a neutron, is not equal to the mass of the helium nucleus He . It is a little easier: when two nuclei D join together, one skeleton turns out to be superfluous, $D + D = 2n + 2o + 2p = He + o$. The excess core separates and flies away during the fusion of the nuclei, carrying away the mass and giving away, in collisions, the fusion energy in the form of heat. Scientists, however, attributed this mass defect to its conversion into energy, since they neglected the mass of the skeleton o , equating the weight of the bag, tare, to zero. The same causes the mass defect in other nuclei. The constructed Table 6 shows that the defect almost disappears if

each nucleus, except for protons and neutrons, also contains a core. The masses n , o , p found by the least squares method correspond not only to the nuclear mass, but also to the difference between the neutron and proton masses (of the order of the gammon mass) found by Chadwick, close to the core mass of $0.016 \cdot 1822 = 30m_e$ [55]. As you can see, the weight of the bare proton $p = 0.992$ differs from the usually measured in experiments the mass of the hydrogen nucleus $H = o + p = 1.008$, since the core of the $o = 0.016$ is still surrounded in the proton nucleus. If, during the decay, the core loses its core, it will soon restore it, since many small neutral particles (octons, gammon, etc.) are always carried in a vacuum.

	number of constituent particles			isotope mass (amu)	
	neutrons $n=1.005$	skeleton $o=0.016$	protons $p=0.992$	M_{calc}	M_{rev} of [55]
$^1\text{H}_1$	$N=0$	1	$Z=1$	1.008	1.008
$^2\text{D}_1$	$N=1$	1	$Z=1$	2.013	2.015
$^4\text{He}_2$	$N=2$	1	$Z=2$	4.010	4.004
$^{12}\text{C}_6$	$N=6$	1	$Z=6$	12.00	12.004
$^{18}\text{O}_8$	$N=10$	1	$Z=8$	18.004	18.004
$^{20}\text{Ne}_{10}$	$N=10$	1	$Z=10$	19.987	19.999
$^{35}\text{Cl}_{17}$	$N=18$	1	$Z=17$	34.974	34.980
$^{40}\text{Ar}_{18}$	$N=22$	1	$Z=18$	39.984	39.975
Table 6. Composition and mass (in atomic mass units, $1 \text{ amu} = 1822 m_e$) different isotope nuclei and their constituents.					

The remaining small discrepancies, say for inert gases, can be eliminated by taking into account, in addition to the mass of the skeleton (container), the mass of the partitions (packing material), like layers of foam and cardboard separating the nucleon layers, according to Rydberg's hypothesis. It was Rydberg, who became the forerunner of Ritz in the discovery of the spectral formulas of atoms, who suggested that the mass of the nucleus is formed not only by protons, but also by the surrounding light shells with a weight equal to the mass defect and being periodically dependent on the element number. The same point of view was developed by Van den Brook (see his biography written by [Yu.I. Lisnevsky](#), Moscow: Nauka, 1981), who for the first time discovered the connection between the element number and the nuclear charge, the number of protons and allowed the existence of particles with a mass much smaller than a hydrogen nucleus, which, when combined with nuclei, give small deviations of atomic weights from integers. This concept of shells (§ 3.6) - naturally follows not only from the law of conservation of mass, but also from the analogy of nuclear and chemical properties. Just as complex and cluster compounds have long been known in chemistry, in which the central groups of atoms are surrounded by molecular shells of standard masses and regular geometric polyhedron shapes, so are the nuclei, nucleons are enclosed in capsule shells of

standard particles.

So, according to the conservation law discovered by Lomonosov, the mass of the nucleus (particle) is always equal to the sum of the masses of the components. Any discrepancies, especially large ones, mean that something was not taken into account - some volatile neutral particles, the reality of which follows from the law of conservation of mass. Mass does not disappear and does not arise from energy. Thus, during the creation of electron-positron pairs, the experiments have shown that particles are not born from a vacuum, but are knocked out of nuclei by γ -rays. Another example: the creation of particles in collisions, say, in the collision of protons in the Large Hadron Collider. The mass m of the resulting particles is related to the energy of the colliding protons as $E = mc^2$. But this does not mean that particles were born from energy. Protons accelerated in an accelerator to tremendous speeds, during collisions, can break up other particles, pulling out large fragments, sometimes heavier than the protons themselves. Accelerators are like heavy artillery firing proton-projectiles at buildings and particles, as if from bricks composed of electrons and positrons (§ 3.9). The higher the energy of the proton, the larger the piece from the building of another particle it will splinter off. If all particles are composed of electrons and positrons bound into crystals, then more energetic protons are able to break more of these bonds. Therefore, the mass of the split off particle will be proportionally larger.

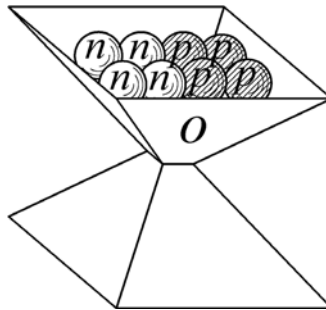


Fig. 131. The mass m of the nucleus is made up of the masses of neutrons n , a skeleton o , protons p stacked in the skeleton, like seeds, peas in a bag.

Since the binding energy of one electron and a positron is $E_1 = 2m_e c^2$ (§ 1.16), then a particle of N electrons will require energy $E = 2Nm_e c^2$ for its detachment, but $2Nm_e$ is just the mass m of the resulting particle, equal to the sum of the masses its constituent electrons and positrons. Therefore, the mass of educated particles and is proportional to the applied energy $E = mc^2$.

Two colliding protons play the role of a hammer and an anvil. Perhaps, between them there is not one large particle (nucleus), but many small ones, such as gammon, collected by protons along the way when moving in the accelerator ring. On impact, all these particles are bound together, like metal blanks on a blacksmith's anvil. The higher the energy of the protons, the more particles they can rivet, seal, the more massive the resulting particle. So, particles born in collisions are not transformed energy, but only a product of synthesis or decay from impacts.

However, the measured mass of a particle may, nevertheless, slightly differ from the total mass of its components, both due to the change in the

electromagnetic mass from the convergence of charges (§ 1.17, § 3.18), and due to the error of the "electromagnetic balance" showing different weights of the particles, depending on whether they are moving or at rest (§ 1.15). So, some merchants, in order to weigh, do not put, but throw the goods on the scales, which is why it weighs more than a motionless one. Accordingly, the particles that are part of more complex particles-conglomerates and, possibly, participating in them in a complex oscillatory motion, can weigh a little less than in a free state. Just weigh! After all, they find their apparent weight, measured by imperfect devices, and not the real mass, which should remain unchanged, being a characteristic of an unchanging amount of matter. This is how an imaginary discrepancy between the masses of a particle and its constituents is born, which is called a defect of masses, although it would be more correct to call it a defect of scales. Such a nature of the mass defect was suggested by Lorentz and Rutherford, as well as by J. Fox [2], and they also obtained a correspondence between the disappeared weight and the released energy $E = mc^2$ from the standpoint of classical electrodynamics, which is quite natural, since nuclear forces and nuclear energy are electromagnetic nature (§ 3.12). However, the current physicists believe that the "disappeared" mass actually turns into energy and that its release in nuclear furnaces and bombs proves the validity of the theory of relativity, as if they owe their existence to it.

But, with the same success, as we have seen, it can be stated that chemical reactions of fission, fusion of molecules, simple furnaces and bombs owe something to the theory of relativity. In reality, in any reactions, only the internal energy of movement and interaction of parts in atoms and elementary particles is released. Nuclear reactions were discovered and investigated without the help of SRT [139]. And the "loss" in the reactions of large masses is associated with the presence of not yet found neutral particles or particles with anti-mass. Let the classical approach lead to the rejection of some formal laws of particle transformation, but the law of conservation of mass, rejected by physicists, will return, which has a fundamental meaning for science.

§ 3.14. The hypothesis of induced decays of nuclei and particles

Radioactive decay is not caused by the destruction of the atomic nucleus, but rather is a secondary effect of external radiation, which can be divided into two types: stored energy and energy coming from outside.

Nikola Tesla [110]

In the light of the previous analysis of nuclear reactions, the last question remains: what causes the decay and synthesis of particles? As is known, the fusion of nuclei occurs only in the interiors of stars due to their gigantic temperature. On the other hand, the decay seems to proceed by itself, and it is very strange: a particle, a nucleus decay suddenly, - at a random moment in time, only the probability of decay is known. From the point of view of determinism and classical physics, this is impossible. From the analogy of chemical and nuclear reactions, since the decomposition reaction of an explosive cannot begin without a jolt, a fuse, then the decay of nuclei is not spontaneous. When one physicist explaining how a nuclear bomb works was asked what causes the decay of the first nucleus that triggers a nuclear chain reaction, he replied that this is a great mystery of

nature. Indeed, let us consider α -decay - the emission of a positively charged α -particle from the atomic nucleus. Of course, the α -particle is accelerated by the force of the Coulomb repulsion of the nucleus, releasing the reaction energy E_r , but for this to happen, it is necessary first to initiate the decay reaction: to break the nuclear bonds between the α -particle and the nucleus. That is, it is necessary to inform the nucleus with the activation energy E_a , which is analogous to the activation energy of chemical reactions and nuclear fusion reactions (Fig. 132). Nuclear decay reactions cannot spontaneously proceed. However, they are coming! Quantum mechanics, with the suggestion of G. Gamow, explains this by the tunnel effect.

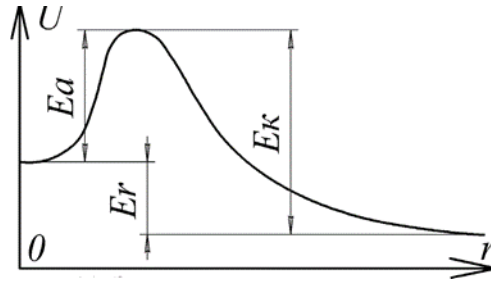


Fig. 132. Dependence of potential energy U interactions of nuclei from the distance r between them.

Due to the ambiguity of the position, the α -particle can briefly leave the potential barrier (tunnel through it). Then, the forces of Coulomb repulsion will be able to overcome the nuclear ones, and the particle will begin to move away from the nucleus faster and faster. But in classical physics, where determinism reigns, this is impossible. And, therefore, there must be an external source that imparts activation energy to the particles. And there is such a source - these are cosmic rays, that is, - coming electromagnetic and corpuscular radiation emanating from space, which also has a powerful penetrating component, for which earthly obstacles are not an obstacle. This radiation, apparently, causes the decay of radioactive substances and is created by super-energetic neutral particles, the flow of which is constant and very uniform in directions. Therefore, regardless of the time of day, temperature and other conditions, whether the decaying isotope lies in a lead container or in air, the decay always proceeds at a constant rate. The decay frequency is determined by the probability of getting enough energy into the particle nucleus - the activation energy. The impact of the particle leads to the excitation of the nucleus and its fission, if this energy is sufficient to break nuclear bonds. The stronger the particle or nucleus, the less often this will happen - the longer the particle lifetime and the half-life of the isotope. The strongest nuclei with high activation energy (less than the energy of incident particles) are stable.

Neutral particles coming from space, unlike super-energetic charged ones (§ 5.10), have a natural origin, probably being born in the bowels of stars - these natural nuclear reactors. The fact that nuclear decay is not a spontaneous process, but an induced one, given by external factors, is proved by the experiments of S. Shnoll [167]. It is quite possible that the particles that excite the nuclei are just rheons and arheons, striking the charges of e^+ and e^- nuclei and, just, possessing a

huge penetrating power, with a high constancy of the flux (§ 1.5). In addition, the electron itself emits rheons and twitches, trembles due to the recoil when fired by rheons and from the blows of other rheons. That is, like the thermal vibrations of atoms in crystals, e^+ and e^- vibrate in the lattice of nuclei. When the range of these oscillations accidentally exceeds the width of the potential barrier, the nuclei divide. Just as the thermal motion of atoms sometimes causes their decay - the detachment of an electron (ionization), so the thermal vibrations of electrons in the nucleus can lead to the decay of nuclei - the separation of their fragments. Thus, the impacts of rheons, thrown by some electrons to others (Fig. 7), serve as a kind of ignition spark, provoking an explosion of the nucleus, like cannon explosive nuclei with a fuse. Rheon strikes, shaking the nucleus, now and then unbalance it, sooner or later leading to an explosion of the nucleus, just as from accidental small impacts and sparks, sometimes, "spontaneously" detonates bomb fuses and ampoules with nitroglycerin.

Such a tremor, a thermal tremor of particles, is analogous to the quantum uncertainty of their position, but has a classical nature. It is interesting that such vibrations of elementary particles, reminiscent of the random throwing of dust particles in a ray of light, were described by Democritus, who anticipated the discovery of Brownian motion (§ 4.16). Moreover, Democritus noted that such a motion can arise not only due to external impacts of other particles, atoms, but also under the influence of internal causes, which can now be understood as the emission of rheons by electrons [31]. Later, such thermal vibrations of atoms, nuclei and electrons - under the influence of impacts of microparticles scurrying at the speed of light, were cited by Maxwell and Poincaré as an argument against the theories of LeSage and Ritz [107]. But, as it turned out, if the size of the rheons is small enough, these fluctuations will be insignificant, due to averaging. In addition, the electron, under the impact of the rheons, does not increase its "thermal" vibrations infinitely, since not only absorbs their energy together with the rheons, but also gives up the same amount when it emits them back (§ 1.5). However, the "thermal" electron vibrations predicted by the BTR are quite sufficient to explain the natural width of spectral lines, tunneling effects and nuclear decays, through the classical explanation of the uncertainty principle (§ 4.13).

It turns out that the "uncertainty", "randomness", "spontaneity" of nuclear decays are only apparent, and are of a classical probabilistic nature, and therefore decays are strictly determined and predetermined. Similarly, if you build a lot of the same type of pyramid houses of cards on the floor, then over time they will fall apart, one after another, seemingly spontaneously, at a random moment in time, according to the same exponential law as the nuclei. However, each such decay of a house (as well as decay of a nucleus) is associated with external influences (vibrations of the floor or wind blows), which are of a random nature and, at the time of strong fluctuations (exceeding the strength of a house of cards or a nucleus), destroying it. More durable types of houses have a longer life time and a "half-life", and in a calm environment can stand for years, but still eventually collapse from rare but strong fluctuations, say, from earthquakes, hurricanes. The same is with atomic nuclei, subject to "accidental" blows of fate.

Particle impacts may not impart activation energy, their meaning is in bringing nuclei out of equilibrium, while rupture is produced by Coulomb repulsive forces. After all, the nuclear forces that keep nuclei from rupture depend strongly on the ordered arrangement of electrons and positrons. Their vibrations, displacements under the impact of particles reduce these forces, making them temporarily less than the Coulomb forces. The trembling of electrons in the lattice nodes leads to division not in a direct, but in a roundabout way, - a longer one, but with less effort. The e^+ and e^- bonds in an electron-positron crystal are broken gradually, one at a time, and a lesser force is enough to break. Thus, the force on shear or rupture of a real crystal is less than the calculated one, since the bonds break alternately from distortions and dislocations [164]. Likewise, a solid brick wall can be shattered with little but sustained force if the bricks are loosened and removed one at a time. Here is the trembling of the bricks-electrons, although it does not reduce the work E_k of the Coulomb force for the separation of nuclei, but it allows the electric repulsion in places to exceed the attraction, reducing the height of the barrier. The destruction of the nucleus goes not uphill, and not through the barrier (tunnel effect), but - bypassing, through the pass (Fig. 132).

So, decay is not spontaneous, but is always associated with the emission-absorption of rheons or other particles, - with electromagnetic and corpuscular radiation. Many scientists put forward a similar hypothesis about the triggering of nuclear reactions by an external source that unbalances the system. Thus, a recognized specialist in nuclear physics, F. Soddy, noted that, according to Kelvin, nuclear reactions cannot proceed on their own, but are caused by an external influence that serves as an ignition spark [139]. Similarly, Tesla, as we see from the epigraph, considered radioactive decay not to be a spontaneous process, but to be induced by cosmic radiation [110]. It is the external radiation that causes, according to Tesla's hypothesis, nuclear decay, imparting the activation energy, and already in the started process, additional internal energy is released, stored in the particles and the nucleus. Likewise in life, in chemical reactions, in order for a stone to roll down a mountain, and firewood to catch fire, releasing the energy stored in them, they need to be told the initial activation energy: push or set fire with a match.

§ 3.15. The Mystery of Neutrinos and the Weak Interaction

The properties of neutrinos considered on the basis of the emission theory should differ from our current ideas about them. For example, Ritz proposed possible qualitative explanations for the continuous spectrum of β -decay [9, p. 418]. The main idea was that if an electron has an axis of symmetry, then the electromagnetic force that knocked it out of the nucleus should, according to his theory, change depending on the orientation of the electron. In other words, the energy of an electron would change depending on its polarization. (This fact was recently discovered.) It is clear that with such a view of things, the "Ritz neutrino" could be different from what we know. Therefore, our interpretation of meson decay experiments could be different.

J.G. Fox, "Evidence Against Emission Theories" [2]

At present, many are questioning the reality of the neutrino, discovered by Wolfgang Pauli, an omnipresent and flying with the light speed of a neutral particle with a mass much less than the mass of an electron. This hypothetical particle looks too strange, elusive, like quarks that no one has observed. And, just like for quarks, several kinds of neutrinos were invented when it became clear that one couldn't do it.

Consider what led scientists to the neutrino hypothesis, for which we will study the structure and decay of the neutron. Indeed, the reason for the discovery of neutrinos was precisely the reactions of neutron decay and β -decay of nuclei, where one neutron, emitting an electron, turned into a proton. From this decay it follows that the neutron n consists of a proton p and an electron e (Fig. 133), just as the decay of a water molecule into hydrogen and oxygen during electrolysis means that water consists of these elements. However, scientists deny that there are protons or electrons in neutrons, stressing that the magnetic moment of an electron is much greater than that of a neutron and a proton: the sum of the moments e and p does not give the moment of the neutron.

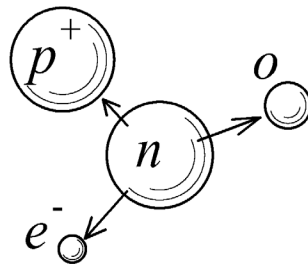


Fig. 133. Fission of a neutron n into a proton p , an electron e and a residual particle o , which was assumed to be a neutrino.

But, in fact, if the proton (and neutron) consists of many electrons and positrons (§ 3.9), their magnetic moments may well extinguish each other, almost nullifying the moment of the proton. Just as the charges e^+ and e^- are neutralized when they merge, their opposite magnetic moments almost disappear. An electron may well be a part of a neutron, if the proton is also a composite particle of hundreds of e^+ and e^- (Fig. 120, Fig. 121, Fig. 123).

It should also be taken into account that during the decay of a neutron, in addition to a proton and an electron, another particle appears with its own magnetic moment. This follows from the fact that the electron energy in β -decay takes on different values, although, according to the law of conservation of momentum, the decay energy should be divided between a proton and an electron

in a constant proportion [135]. Therefore, Pauli assumed the formation of an unknown neutral elusive particle that carries away part of the energy. It was believed that this is a neutrino - a neutral particle with a mass much less than the mass of an electron. But, if the neutron is composed of elementary bricks e^+ and e^- , then the fragments into which it is divided must consist of the same bricks and have a mass $M \geq m_e$. Such are the electron and the proton, and so is the particle emitted from the neutron. It turns out that this is not a neutrino, but, probably, another, often appearing in decays, neutral and elusive particle - a gamma meson, or gammon Γ , which has a zero charge and a mass of 66 electrons.

And, exactly, as seen (§ 3.9), in reactions where, as physicists believed, a neutrino appeared, - when a pion decay into a muon or a muon into an electron, gammon were born (Fig. 134, Fig. 135). It was the invisible, elusive neutral gammon that secretly carried away mass, which is a multiple of $66m_e$, in these reactions. But the neutron's mass is almost equal to the proton's mass: their difference is not $66m_e$, but only $2.5m_e$. However, it is possible that the neutron mass was found incorrectly. After all, neutral particles cannot be weighed by electromagnetic weights – the masses are found indirectly, from the balance of

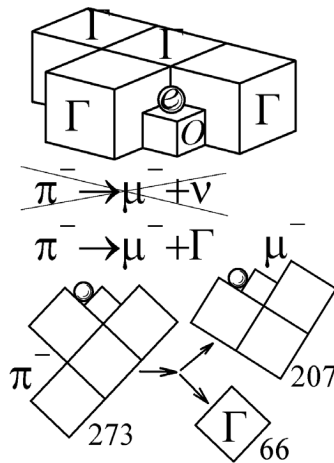


Fig. 134. The structure of the pi-meson and its decay with the indication of the masses of the particles.

energies in decays. At the same time, they use false formulas of the special theory of relativity (SRT). It turns out a vicious circle: SRT formulas give an erroneous neutron mass, which gives a mass defect, which again confirms SRT. And, after all, before, when the neutron mass was calculated by directly measuring the velocity of nuclei after collisions with neutrons, the found mass turned out to be equal to 1.15 proton masses, with a maximum error of 10% [55, 135]. That is, even within the error limits, the direct method did not agree with the neutron mass found from SRT. They could not explain this discrepancy, although its reason is obvious: the theory of relativity is erroneous, like the neutron mass found from it.

If the mass of the neutron is about 1.15 masses of the proton, then the neutron is heavier by $0.15 \cdot 1836 = 275m_e$. But this is the mass of the π^0 meson, which is equivalent to four gammon. So, in all decays, where the production of

massless neutrinos was assumed, in fact, gammon with a mass of $66m_e$ arise. They carry away the missing mass (Table 7). As many as three types of neutrinos were invented: electron ν_e , muonic ν_μ and taon ν_τ [135]. The fact that a new kind of neutrino was invented for each reaction proves their artificiality, unreality. It is easier, instead of three different ones, to admit one particle - gammon. In reactions with a muon μ , one gammon appears, with an e electron - three or four Γ , and with a taon τ - tens. Therefore, experiments have given for the masses of "neutrinos" $m(\nu_\mu) < m(\nu_e) < m(\nu_\tau)$ [135]. The gammon hypothesis explains both this and the "interconversions" of neutrinos.

non-classical decay scheme	classic decay scheme	lost mass (m_e)
$\pi^- \rightarrow \mu^- + \nu_\mu$	$\pi^- \rightarrow \mu^- + \Gamma$	66
$\mu^- \rightarrow e^- + \nu_e + \nu_\mu$	$\mu^- \rightarrow e^- + O + 3\Gamma$	206
$\tau^- \rightarrow e^- + \nu_e + \nu_\tau$	$\tau^- \rightarrow e^- + 14O + 51\Gamma$	3490
$\pi^0 \rightarrow \gamma + \gamma$	$\pi^0 \rightarrow 4\Gamma$	264
$n \rightarrow p^+ + e^- + \nu_e$	$n \rightarrow p^+ + e^- + (1 \div 4)\Gamma$	30 ÷ 300
Table 7. Decay patterns and mass loss.		

Conclusion about the reality of gamma mesons (neutral particles with a mass in $66m_e$) in the classics follows from the decay reaction of the π^- meson. In Wilson's chamber it can be seen how, during the decay of a pion, a muon μ^- with a mass of 66 units escapes from it. the smaller one (Fig. 134). It flies in a different direction than π^- (particle tracks diverge at an angle). Hence, according to the law of conservation of momentum, there also appears one particle. Physicists considered that these are neutrinos with almost zero mass. But, from the classical law of conservation of mass, - once the mass disappears in the reaction at $66m_e$, then it should be carried away by a particle of this mass. That is, it is not formed a ghostly neutrino, and a weighty gamma meson. Similarly, in the decay μ^- - meson, you can see how the ejected electron changes its course, which means that there is hidden particle (Fig. 135). Times the mass of an electron is 206 units less than the mass muon, then the invisible particle is not an empty neutrino, but a heavy conglomerate of three gammon and an octon O, having such a weight in the sum (§ 3.9). The complete loss of mass during the decay of the π^0 pion is also an illusion: the pion is simply divided into 4 gammon. Colliding with nuclei, gammon transform them into an excited state, and they emit γ -radiation observed in decays of π^0 . There is no loss of mass and during annihilation - the fusion of an electron and a positron - only a neutral particle is formed.

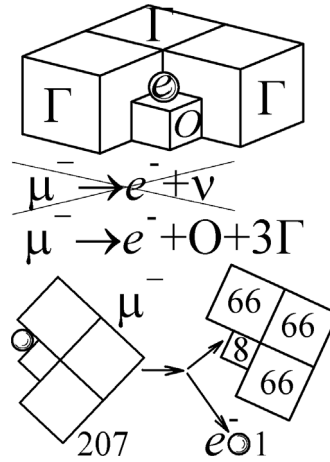


Fig. 135. The structure of the mu-meson and its decay with the indication of the masses of the particles.

If the Pauli neutrino is a fiction, then what, in this case, is the neutrino radiation discovered in experiments coming from space and nuclear reactors? What causes the decay of a neutron and what is the nature of the weak interaction that causes this decay? We will answer everything in order. First of all, about neutrino radiation. We found out that in β -decay, not weightless neutrinos are formed, but completely material neutral particles. Neutrinos, on the other hand, in their properties (enormous penetrating ability, mass much less than the mass of an electron and light velocity of propagation), most of all resembles rheons. They also have an insignificant mass, in comparison with an electron, they are always thrown out by it at the speed of light and, at the same time, easily penetrate even through the thickest layers of matter, carrying electric, magnetic and gravitational effects to them. Interestingly, even on the basis of Mendeleev's calculations, proposed by him in the framework of the molecular-kinetic theory to describe particles-carriers of light and electric impact, some physicists came to the conclusion about the equivalence of these particles (rheons) and neutrinos [99].

Neutrino interacts very weakly with matter, therefore the interaction causing the neutron decay is called "weak". But the similarity of the properties of neutrinos and rheons, or, even, their identity, suggests that neutrino radiation is also electromagnetic radiation carried by the same particles-rheons. That is why the speed of neutrino radiation is equal to the speed of light. In particular, this was found in optical supernova explosions, which are accompanied by simultaneous bursts of neutrino radiation recorded by neutrino telescopes, which suggests that the radiation reached the Earth at the same time, moving at approximately the same speed. Apparently, the mechanism of generation of neutrino radiation in neutron decay is in many respects similar to the mechanism of γ -radiation during nuclear decay. However, the frequency of neutrino radiation is many orders of magnitude higher. Therefore, even if gamma radiation has a very high penetrating power, passing through thick sheets of lead, then neutrino radiation has an order of magnitude greater penetrating

power.

It is interesting that even Victor Franz Hess, having discovered cosmic rays, assumed that it also contains some ultra-gamma radiation, thereby anticipating the discovery of cosmic neutrino radiation [163]. However, this and other hypotheses of Hess were forgotten, as well as himself, and the glory of the researchers of cosmic rays went to the scientists-quantorelativists, who had nothing to do with the discovery of cosmic rays. For the sake of fairness, it should be noted that neutrino radiation was originally considered to be electromagnetic radiation, believing that it is precisely this radiation that carries away part of the energy in β -decay [135]. But then, under the influence of Pauli and other physicists, this hypothesis was rejected. However, in the end, physicists, nevertheless, returned to it (physics itself forced them) and created a theory of electroweak interaction, combining the electromagnetic and the weak into one. This was, in fact, a return to the hypothesis of neutrino-induced neutron decays (§ 3.14). What forces cause the decay of a neutron and some other particles? These forces are called "forces of weak interaction", but no one knows their nature.

It was shown above that magnetic, induction and gravitational forces are only partial manifestations of electrical ones. Likewise, nuclear forces have been found to be electrical in nature, being caused by the interaction of electrons and positrons in nuclei. In addition to the electromagnetic, gravitational and strong (nuclear) interactions, the latter is known - the weak one, which is responsible for the decay of a neutron and other particles [45]. Apparently, these decays are also caused by electrical forces. First, electrons and positrons, experiencing impacts of rheons and arheons and recoil, when they are emitted, twitch, like Brownian particles (§ 3.14). At times, the forces of impacts of individual rheons, when added, can exceed the average forces of attraction of electrons to positrons and cause decay of particles. Secondly, there is a very weak force W of repulsion of electrons by neutral particles (Fig. 123, § 3.11). Apparently, this weak repulsion is responsible for the weak interaction, leading to the decay of neutrons, with the formation of electrons and protons. That is why there are so many protons and electrons in our world, while antiprotons and positrons are extremely rare. In full accordance with the experiments, the force $W=2F\Delta/r$ of weak interaction in intensity will be average between the electric forces F and gravitational forces $G=4F\Delta^2/r^2$.

§ 3.16. Unified theory of interactions, or the Grand Unification

Nature is simple and not luxurious with unnecessary reasons.

M.V. Lomonosov [84]

As seen above, **Ritz's ballistic theory turns out to be the most universal and general of all physical concepts, since it allows one to reduce all types of interactions - electromagnetic, gravitational, weak and strong (nuclear) - to one, namely, electric.** That is, it is Ritz's theory that leads to a unified theory of interactions and the Great Unification, which physicists have long sought to implement, but have so far failed. So, Einstein fought in vain to create a unified field theory for the last 30 years of his life. All attempts to achieve such a

unification were of an artificial, speculative nature and were carried out by introducing a mass of abstract, unsubstantiated, inventions and hypotheses. This is why they were unsuccessful. This also applies to Maxwell's theory of electromagnetic interaction, which artificially combined electricity and magnetism. This also applies to the quantum theory of electroweak interaction, in which S. Glashow and S. Weinberg tried to reduce the electrical and weak interactions - to one common one.

And in Ritz's theory, such a unification is achieved immediately for all types of interactions and it does not arise in the form of additional complex hypotheses, but as a natural consequence of the only original Ritz's hypothesis about the mechanism of electrical interaction of charges, through rheons (§ 1.4). Earlier it was shown how magnetic (§ 1.7), induction (§ 1.8) and gravitational forces (§ 1.17) are obtained from this model. It is also demonstrated how nuclear forces are obtained from the Manturov model of the structure of particles and electric forces (§ 3.12). Finally, reduced to electrical and the last - the weak interaction (§ 3.15), arising as a simple consequence of the Ritz model of the interaction of electrons. In turn, the electrical interaction of elementary charges is reduced by the Ritz model to a purely mechanical one. **Thus, all types of energies are reduced to mechanical energy - to the kinetic energy of moving particles of matter.** It turns out that it is Ritz's universal kinetic electrodynamics that synthesizes all interactions, reduces them to one, electrical. So, from the Ritz hypothesis about the structure and decay of the electron - naturally follow four types of interactions and the relationship between them. In turn, these ratios automatically set the scales of particle sizes, energies of their decay-fusion, and emission spectra. So, the ratio of magnetic and electrical interactions sets the sizes of atoms and molecules: electrons repulsed by the Coulomb force are kept close at an equilibrium distance due to the interaction of their magnetic moments and the attraction of the nucleus. The ratio of the electrical interaction and the strong nuclear one sets the characteristic size of nuclei, including their limiting size and mass. And the ratio of electrical interaction and weak nuclear one limits the size of elementary particles - complexes of electrons and positrons. Finally, it can be assumed that the ratio of electrical and gravitational interactions determines the characteristic sizes of planets and stars.

In the future, more subtle manifestations of electrical and gravitational interactions caused by the movement of particles and bodies may open. Interactions of this kind will already determine the sizes and energetics of subelectronic particles and star clusters, galaxies. Thus, all the diversity of nature, within the framework of Ritz's theory, is reduced to one interaction, to one model.

It is precisely this reduction of many phenomena, interactions - to a few primary causes, principles that the most progressive scientists achieved, thanks to this, who came to their discoveries. Thus, Democritus, having created an atomistic theory, indicated the way of reducing the entire variety of substances to combinations of a few (less than a hundred) types of atoms. Likewise, Copernicus built his theory based on the principle that "nature is afraid to

produce something superfluous and therefore enriches one thing with many actions." Occam, Newton, Lomonosov spoke about the same. Tsiolkovsky formulated this principle of unity, the single nature of all processes in the Universe most fully and globally in his works, in the form of the principle of monism [159]. It is interesting that a similar principle of the universal unity of essences, reducing them to one universal principle, is found in Indian beliefs, where numerous gods (forces, elements) appear only as different manifestations-hypostases of one basic (§ 5.3). Likewise, interactions: strong, magnetic, gravitational, weak - these are just different "hypostases" of the electric.

Note that even Democritus, who built the atomistic theory of matter and light, explained the electrical, magnetic and gravitational effects on the basis of a single, mechanical model. Indeed, in the popular exposition of the teachings of Democritus-Epicurus, given by Lucretius, light, electricity, magnetism, gravitation are equally explained by the outflow and impact of the smallest particles (rheons in the terminology of the BTR) [77]. Under the influence of the impacts of these particles, currents converging to all bodies, not only magnets are attracted (§ 4.19), but also atoms knock together, forming planets and other cosmic bodies. Likewise, muscular efforts, which are electrical in nature at the molecular level, are caused, as Democritus guessed, by the compression of muscle fibers under the impact of the same particles. Lucretius calls these particles either "air atoms" or "ether particles" in order to reflect their smallness, subtlety, imperceptibility, and all-pervasiveness. And, indeed, these rheon particles, which are responsible for all known interactions, have, according to Ritz's theory, negligible dimensions.

Ritz's theory not only brings together all four types of field interactions, establishing their common mechanical basis, but also unites the field with matter, which until now were considered different manifestations of matter. All field effects are created by streams of microparticles - rheons and arheons, of which electrons and positrons are composed, and, therefore, all other elementary particles, atoms that form matter. It turns out that the physical fields are simply a disintegrated substance, dissociated to rheons with arheons, - matter scattered over space from microparticles. This is exactly how, in the form of dissociated matter, the field effects were presented by Tsiolkovsky and Tesla [110, 159]. They also noted that such dissociation, evaporation of a substance, in the process of its disintegration, is accompanied, even with an insignificant loss of mass, the release of gigantic energy associated with the tremendous speed c and the kinetic energy of microparticles (rheons and arheons), to which the decay takes place. Thus, they naturally interpreted the "disappearance" of mass m in nuclear reactions, associated by the formula $E = mc^2$ with the released giant energy E , unlike Einstein, who considered mass to be the equivalent of energy (§ 3.13). Tsiolkovsky showed that a deeper dissociation of matter, down to even smaller particles, should be accompanied by the release of even higher energies. The specific energy of the decay of matter grows rapidly during the fission of first molecules, then atomic nuclei, then electrons, and, later, possibly, rheons, which will open up unprecedented sources of energy (§ 5.8).

Finally, it is Ritz's theory that brings all physical constants into a single system: the charge e and the mass m of the electron, the speed of light c and Planck's constant h , the constants of all four interactions, the entire set of masses and lifetimes of particles, as Fox believed [2]. The BTR will allow us to understand the physical essence, the nature of these constants, to link them with each other, to explain why they are so and not different, to unravel the meaning of a number of amazing proportions and ratios between constants, including the mysterious number $1/137$ (fine structure constant) or 10^{40} . And, if until now scientists, starting with Eddington, were only guessing about the nature of these numbers, then the ballistic theory reveals the mechanism of this harmony of numbers and geometry, which, as Pythagoras and Plato noted, rules the world.

Like Lomonosov, Mendeleev, Tsiolkovsky and other progressive thinkers, Ritz saw a deep similarity of all natural phenomena, the unity of its laws - on all levels of the universe. Therefore, Ritz purposefully sought, on the basis of his theory, the interconnection of the principles of mechanics, optics, electrodynamics, thermodynamics, chemistry, nuclear physics and astronomy, trying to develop a single, comprehensive description of them. In part, he managed to achieve this, in many respects his ideas were confirmed by the further course of the development of physics, and an even greater triumph awaits Ritz's theory in the future, when the complete unity and interconnection of all physical processes will be revealed, which have simply different manifestations at different levels of the universe. It was these views that existed in antiquity, especially among the ancient Slavs, whose worldview is reflected in the "Veles book". It tells about the trinity of reality, navi and rule, that is, the field, matter and the law governing them: the field arises from the substance, is generated by it, affects it and again turns into substance, according to the laws of physics, given in turn by the substance and the field.

So, the universal kinetic electrodynamics of Ritz, built in 1908, firstly, clearly explains all the electrodynamic effects. Secondly, it reduces magnetic, gravitational, nuclear and other interactions - to electrical ones, and those in turn - to purely mechanical ones. Thirdly, it opens up hitherto unexplored directions in the development of science, allows one to know the structure of particles, electrons, solve the riddles of antimatter, space, and build a unified theory of interactions. It is the ballistic theory and Ritz's alternative electrodynamics that will help bring science out of the impasse in which it currently resides, through the fault of the theory of relativity and quantum mechanics. Only the untimely death of Walter Ritz on July 7, 1909 at the age of 31, shortly after the publication of his theory, prevented him from achieving recognition and development of the BTR. Ritz's ideas were ahead of the development of science for a whole century and only now have found a rigorous substantiation, both in space and in the microcosm. Ritz's electrodynamics is the most general of the theories, explaining the entire universe.

§ 3.17. Checking BTR using nuclear physics

Ritz's theory would affect the entire picture of nuclear forces known to us and, consequently, nuclear energies ... From the

standpoint of logic, before using the experiment as a refutation of Ritz's theory, it is necessary to prove that it demonstrates time dilation if it is interpreted entirely on the basis of Ritz's theory ... We must be careful in choosing the evidence we use to resolve the dispute between two such fundamental theories with as different conceptual bases as those of Ritz and Einstein.

J. Fox, "Evidence Against Emission Theories" [2]

Now, when the structure of nuclei and elementary particles has become clear in general terms, we can consider experiments on testing BTR in the field of high-energy physics [153]. The fact is that in the microcosm, as well as in the megaworld (§ 2.9), disagreement with the Ritz theory arose only from an incorrect presentation of the picture of phenomena and a lack of understanding by scientists of the essence of Ritz's theory [2]. Consider, for example, an incorrect attempt to check the BTR and the second postulate of the SRT using the decay of fast-moving pions. In such experiments, the arrival times of decay gamma rays were compared to two counters installed at an equal distance from the moving source. Since the speed of the pions reached $0.2c$, it was believed that, according to the ballistic principle, it would increase the speed of one gamma ray and subtract it from the speed of the opposite one. This would lead to a delay in the registration of the second signal, although in reality the signals were recorded simultaneously, contrary to the BTR [153]. But, according to the BTR, π^0 -mesons decay not into gamma quanta, but into gamma-mesons (gammon), - neutral particles with a mass of 66 electrons (Fig. 116). Therefore, the source of gamma rays is not flying pions, but stationary target nuclei (§ 3.7), excited by the collision with gammon (Fig. 136). So, gamma rays do not inherit the speed of pions, but, escaping from the nuclei with a speed of c , simultaneously arrive at the counters. The BTR and other nuclear experiments, where the velocities of the sources were found incorrectly, do not contradict.



Fig. 136. Bombardment of a hydrogen target, emission of pions, their decay into gammon and emission of gamma rays.

It is not surprising that incorrect conclusions are drawn from the incorrect representation of the decay picture based on SRT, which contradict the BTR and confirm the theory of relativity. In the same way, to test the ballistic principle, they tried to use the annihilation process [2, 136, 153]. This experiment measured the difference between the time of arrival to two receivers - gamma-ray pulses, from the annihilation of a moving positron with an electron (Fig. 137). The receivers were placed in different directions, which were chosen in

such a way as to capture gamma quanta produced by electrons flying at a certain speed. In a frame of reference moving with the speed of the center of mass of the annihilating particles, gamma quanta would scatter in exactly opposite directions. But, in the laboratory frame of reference, due to the movement of the annihilating pair and the addition of the speed of gamma quanta with the speed of the source, these directions change and form an angle different from 180° . If the speed of the gamma rays depended on the speed of the annihilating pair, then the radiation would reach one receiver earlier than the other, which was not observed. At the same time, it was believed that the positron crashes into the electron at full speed, and the vapor emitting gamma quanta will move at a speed of $V \sim 0.6c$. But this, just - is doubtful, since only a hindered positron is capable of annihilating with a stationary electron, and one flying with a speed $V \sim c$ simply does not have time to react with the electron and rushes past. In the same way, only slow neutrons interact with nuclei, for which they are decelerated in the moderators of reactors.



Fig. 137. Comparison of the times of registration of gamma rays.

In addition, in the BTR, annihilation looks very different than in the SRT. As shown above (§ 1.16), annihilation is not a process of annihilation of an electron and a positron, but only their convergence in a spiral - up to a distance equal to the classical radius of an electron, with the formation of an electron-positron dipole. This rapid movement of charges in a spiral and generates annihilation γ -radiation, which has the form of an ordinary spherical wave, and not a pair of gamma quanta flying in opposite directions (Fig. 42). If we take into account that the speed v of the electron-positron pair should be almost zero, the speed of gamma rays will remain equal to c .

Therefore, receivers located at any angles will record the simultaneous arrival of gamma radiation within the BTR. Experience does not contradict Ritz's theory. Thus, only a misunderstanding of nuclear processes leads to an alleged confirmation of the theory of relativity and a refutation of the BTR. Other nuclear experiments are also known (partially considered in the articles of J. Fox [2]), where the speed of γ -radiation of rapidly flying nuclei and particles was measured and compared with the speed of light from stationary emitters, but each time they decided that the speed of the rays did not depend on source speed. And yet the ballistic principle was fulfilled, just physicists either greatly overestimated the speed of radiation sources (indirectly and erroneously found from the theory of relativity), or underestimated the re-radiation of

stationary nuclei of the medium through which the γ -radiation passed (as in optical experiments on the BTR, § 1.13, § 2.9). It was believed that high-energy gamma radiation, unlike light, interacts very weakly with the medium, and therefore its scattering allegedly did not affect the radiation rate. But, if we take into account the presence in each nucleus of many thousands of electrons and positrons (§ 3.9) serving as scattering centers, as well as the appreciable absorption of γ -radiation by matter, then the interaction of gamma rays with the medium and their refractive index may turn out to be significantly higher than it was believed. Therefore, even a thin layer of matter can effectively re-emit gamma rays, reducing their speed to a value of c relative to the medium according to the Fox principle. This is confirmed in experiments using the Mössbauer effect, where the influence of intermediate layers of matter on the radiation rate is manifested (§ 1.18, § 1.19). So, the presence of air or plates on the path of gamma rays may well extinguish the excess speed of the rays imparted to them by rapidly flying sources. Therefore, experiments that did not reveal this excess of speed do not contradict Ritz's theory in the least.

Explains the BTR and the kinematics of high speeds, for example, why protons, when colliding at high speeds, diverge at completely different angles than predicted by classical mechanics. As Fox notes, this can be understood outside the relativistic interpretation [2], it is only necessary to take into account that in the BTR the forces of interaction of two rapidly converging protons are directed not along the line connecting them, but, due to the delay of interactions, slightly at an angle (§ 1.7). After all, the transferring interaction rheons and arheons, emitted by protons, borrow, according to the ballistic principle, their speed, coming from a different direction (a phenomenon similar to the aberration of light from the motion of the Earth, § 1.9). But, even more importantly, the protons, at the moment of approach and a sharp change in course, have huge accelerations, which, according to the Ritz effect, leads, due to the delay, to an unequal change in the forces of action and reaction, and, therefore, to an apparent violation of the classical law conservation of energy and momentum. But, in fact, energies and impulses are conserved, and the movement of protons obeys classical laws, it is only necessary to take into account that at the moment of collision and a sharp change in speed, protons emit electromagnetic waves. If we take into account the momentum and energy of this radiation carried away by the rheons, and also correctly determine the velocities of the protons (§ 1.21), then there will be no disagreement with the classics. On the other hand, in the theory of relativity, the radiation arising in such reactions and its impulse are not taken into account, and therefore formulas of relativistic kinematics appear. If a rigorous calculation takes into account the pulses and radiation energies, it turns out that the formulas of the theory of relativity are wrong.

As J. Fox has shown, having considered the totality of nuclear experiments cited to prove the fallacy of the BTR, none of them convincingly refutes the ballistic principle, because in each case some important aspects are ignored. Is it possible to check the BTR using nuclear experiments, when there is no clear and adequate understanding of the microworld, there is no understanding of the true

structure of particles and decay mechanisms? All concepts of nuclear physics were formed under the influence of the theory of relativity and quantum mechanics, which reject the usual mechanics. Therefore, there is nothing strange in the fact that the experiments, interpreted within the framework of non-classical models, contradicted classical physics and "confirmed" SRT. This is another example of cyclical justification - a kind of "vicious circle" that took place with a similar non-classical interpretation of cosmic phenomena, which also allegedly contradicted Ritz's theory. So, before using any phenomenon to test the ballistic theory, you must first build a classical theory of this phenomenon. This is the only way to check the agreement of experiment with Ritz's theory. Otherwise, scientists are likened to the supporters of the geocentric theory of Aristotle-Ptolemy, who rejected the heliocentric theory of Copernicus on the grounds that, according to Aristotle's mechanics, objects could not hold on to a moving Earth. And, nevertheless, it was Copernicus's theory that turned out to be correct, because, together with Aristotle's cosmology, his absurd mechanics should be rejected, replacing Galileo's mechanics. So, in order to analyze the phenomena of the microworld, one should first draw their classical picture, rejecting the absurd mechanics of Einstein and Heisenberg.

§ 3.18. The structure of electrons and positrons

Perhaps these electrons are worlds where there are five continents, Arts, knowledge, wars, thrones and memory of forty centuries! ... Their sages, putting their endless world as the center of being, Hurry to penetrate the sparks of mystery and ponder like I do now ...

Valery Bryusov, 1922

Somewhat earlier, following classical physics, ballistic theory and the law of conservation of mass, they found out that all elementary particles consist, ultimately, of ordered electrons and positrons (§ 3.9). It turns out that it is these two elementary bricks that should be assigned the role of those units of matter from which the world is built. It is no coincidence that in the microcosm the mass of an electron was taken as a unit, as was once the mass of a hydrogen atom in the world of atomic weights. As the history of science has shown, it is quite natural to take the mass of the lightest particle as a single one. The same hydrogen atom is, in fact, a proton, but all atoms are made of protons!

However, the fact that an electron is the lightest particle known, and that all particles are composed of electrons, does not mean that an electron is the simplest particle. Deep in our world is as unlimited as the breadth of space and time. Therefore, an electron with a positron must have an internal structure and be built from even smaller particles. Earlier it was found that electrons emitting rheons, and should be built from these particles, just like positrons - from the arheons emitted by them (§ 1.6). They also found out that the masses of all particles are made up of the electron masses that form them, taken as a unit (§ 3.9). But what then is the mass of the electron itself, what is its nature? In classical physics, it was believed that its inertial mass m is a measure of the electrical effect of an electron on itself. And they represented the electron in the form of a charged sphere of radius r , during the acceleration of which the action of the front part, the charge of the sphere on the back exceeded the opposite (§

1.17). The difference in forces creates a force of inertia that prevents the acceleration of the electron.

This made it possible to calculate the so-called "classical electron radius" r . Indeed, if, for simplicity, the electron sphere is divided into two charges $e/2$ separated by a distance r , then at rest or with uniform motion, the forces of their interaction $F = e^2/16\pi\epsilon_0 r^2$ balance each other. But, when moving with acceleration a , the balance of forces F and F' of interaction of charges is disturbed (§ 1.17). Their difference $\Delta F = F' - F = 4Far/c^2 = ae^2/4\pi\epsilon_0 rc^2$ - this is the force of inertia $F_{in} = ma$ (Fig. 138). Hence, we can express the inertial mass of an electron $m = e^2/4\pi\epsilon_0 rc^2$ and find its radius $r = e^2/4\pi\epsilon_0 mc^2 = 2.82 \cdot 10^{-15}$ m. This is how the classical radius r of an electron is determined [82].

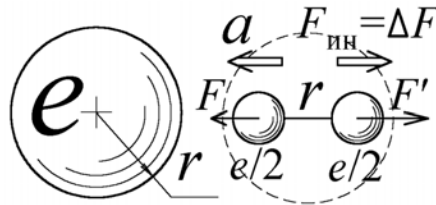


Fig. 138. Dividing the sphere of the electron into two charges, one can express the force of inertia, which prevents the acceleration of the electron, through its radius r .

Let us explain what meaning we mean in the term "classical electron radius" and the value 10^{-15} m, which physicists call "Fermi". Presumably, it expresses not so much the size of the electron as a certain scale of the microworld - the distance at which the electrical interaction disappears, just as the force of gravitation loses its dominant importance in the transition from cosmic to microscopic scales. Thus, the Coulomb force at distances of the order of 10^{-15} m becomes vanishingly small - either by itself or in comparison with forces of a different nature that manifest themselves at such distances. As a result, it is on such spatial scales that deviations from the Coulomb law can occur [60, 137]. It is not without reason that the sizes of atomic nuclei are just about 10^{-15} m: at such a distance, the Coulomb repulsion of protons in the nucleus no longer prevents them from approaching. One way or another, the attraction and repulsion of charges at distances of the order of 10^{-15} m disappears (or changes sign), and this distance a becomes equilibrium.

Perhaps for the same reason, due to the general nature of electric and magnetic forces, at such a distance, differently than ordinary magnets, elementary "magnets" of neighboring particles in the crystal structure of the atom interact (§ 3.1). Instead of establishing themselves in the opposite direction, their moments in the external field are oriented in the same direction. Is this the reason for the strange behavior of particles that establish spin and magnetic moment not only along, but also against the external magnetic field? And quantorelativist physicists "explain" this by abstract quantization of spin directions [82]. It is quantum mechanics and quantum electrodynamics that have become an insurmountable barrier to understanding the structure and interaction of particles, especially electrons. Therefore, in modern physics, serious difficulties arise in explaining radiation friction, bremsstrahlung of electrons.

But all these effects qualitatively and quantitatively follow from the classical theory constructed by Lorentz and Ritz, representing an electron in the form of a charged sphere. The accelerated motion of this sphere generates not only a decelerating force for the electron (associated with its electromagnetic mass), but also bremsstrahlung, radiation friction, which prevents the electron from accelerating.

So, the classical radius of an electron is, rather, not the real radius of the particle, but the critical distance at which the Coulomb's law is no longer applicable, which is recognized by modern physicists, although they cannot explain [60]. And, within the framework of the BTR, an explanation is easy to find. Ritz considered the electron to be a particle emitting rheons, like a Bengal fire scattering sheaves of sparks. But it can be assumed that the electron does not shoot out individual rheons, but - collected taken in packs, blocks, clips, having the form of more massive particles. At some distance r from the electron, these particles explode, decaying into separate rheons. Therefore, let us call these particles "blastons" (from the English blast - explosion, charge for an explosion) and denote it in Latin B . It is the radius of the decay sphere r , at which blastons, like explosive fragmentation projectiles, explode with rheon cascades, and will be the classical radius of an electron. Then the electron should be likened to a rocket launcher, firing charges, as in a salute, scattering hundreds of fragments (Fig. 139).

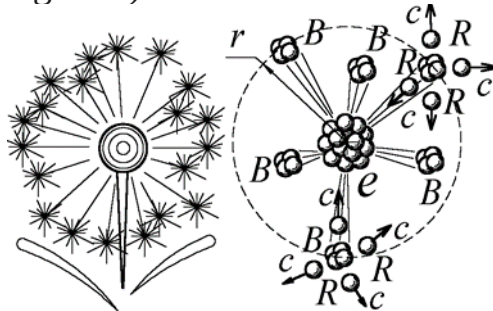


Fig. 139. As if in fireworks, blastons B , fired by electron e , explode at a distance r in cascades of rheons R .

Some of these rheon fragments fly away at a speed c away from the electron, creating a Coulomb repulsion, and some return to it, with their impacts generating the electron inertial force, since the sphere of decay of blastons, emitting rheons, is equivalent to a uniformly charged sphere of charge e (according to its definition, given in § 1.6). It is clear that as soon as a pair of electrons or positrons come close to a distance less than r , the repulsion between them will disappear (Fig. 140). An electron inside a uniformly "charged" sphere of decay is not affected, just like any electric charge inside a uniformly charged sphere [60]. It is possible that this, in part, is the reason for the nuclear interaction (strong and weak), which manifests itself only at such a distance. The charges (electrons and positrons), which are part of the elementary particles of the nucleus, being brought together to a distance r , cease to be attracted or repelled, contrary to the Coulomb law, which determines the characteristic size of nuclei and elementary particles, as well as the scale of distances between them and the electron-positron lattice. It is this distance r that is called the "radius of

action of nuclear forces", and it is precisely this size r , of the order of 10^{-15} m that the nuclei have.

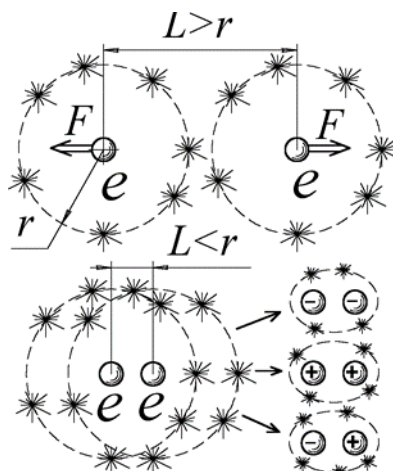


Fig. 140. Disappearance of the Coulomb interaction of electrons and positrons when they approach each other to a distance $L < r = 3 \cdot 10^{-15}$ m.

Generally speaking, the sphere of blaston decay has no clear boundaries, it is blurred, in the classical sense, since these discontinuous particles ejected by an electron only decay on average at a distance r . Like sparks, some of them live a little longer and, like stray bullets, manage to fly away far from the electron, and the short-lived ones explode close. Accordingly, at small distances the Coulomb force generated by the impacts of rheons randomly changes not only its magnitude, but also its direction, and, therefore, Coulomb's law has only an average statistical meaning and is fulfilled only at distances noticeably greater than $r = 10^{-15}$ m [60]. This can, for example, explain the tunneling effect - the ability of protons to merge - even at distances greater than r (when repulsive forces should prevail, § 5.8), or, on the contrary, - the ability of protons and α particles to detach from the nucleus in nuclear decays at distances smaller than r , when nuclear attraction should prevail (§ 3.14, § 4.12).

Next, consider the attraction of a positron and an electron. When approaching to a distance r , they should also stop interacting. As V. Manturov showed, the energy released during the annihilation of an electron and a positron is not at all the energy of annihilation of their mass, but, only, the potential energy of their electrical interaction, released when particles approach a distance equal to the classical radius of an electron r (§ 1.16). Further, the energy is not released, since the particles no longer come closer and do not interact. In this case, when the electron with the positron are inside the common sphere of decay, they will cease to resist acceleration: their total mass, like a charge, will be zero (which is natural if their masses are of different signs, § 1.6). Perhaps that is why such particles cannot be detected: from the slightest impact, such pairs of zero mass are instantly accelerated and fly away, leaving no trace. It is these electron-positron pairs, possessing the properties of an electric dipole and zero inertial mass, that can form bipyramidal frameworks that are responsible for the properties and spectra of atoms and, at the same time, do not contribute to atomic weights (§ 3.3). Note that we are talking here only about the inertial mass, and if the decay spheres of particles do not overlap, then their masses are

summed up in absolute value. And, with a partial overlap of the spheres of disintegration, a partial decrease in the inertial mass is possible, which possibly explains the mass defect and can find practical application (§ 5.7).

Thus, what is usually called the classical radius of an electron $r=2.82 \cdot 10^{-15}$ m, perhaps only its outer radius is the radius of the spherical decay shell, while the electron itself (its main, massive part) is enclosed in a small central areas of this sphere, a kind of electron nucleus, or core. It is the diameter and area of this electron nucleus that determines the absorption cross section of the flux of rheons flying up to it by the electron. Apparently, this is one of the reasons why rheons have a very long path in matter. Due to the small size of the electron nucleus, the probability of collision of rheons with it is negligible (§ 1.4), and only a high flux density of rheons leads to the fact that some of the rheons are still absorbed, and there is an electrical interaction between the electrons. In approximately the same way, the elusive all-pervading neutrino radiation can be detected only due to the high neutrino flux density.

However, if we take into account that the decay sphere is blurred, its parameters can determine two scales of electron sizes at once. Recall that the electron, and, accordingly, the step of the electronic grid, lattice, has two characteristic scales: one $r = 2.8 \cdot 10^{-15}$ m, and the second $a = 5.3 \cdot 10^{-11}$ m (§ 3.7). The first, small scale r_0 , is intranuclear. It is it which determines the size and structure of the nucleus, protons, elementary particles, the distance between electrons and positrons in them and the distance between protons and neutrons in the nucleon layers. It is also responsible for nuclear spectra and the magnitude of nuclear forces. The second, larger scale a_0 is intra-atomic. It is it which sets the size of the atom and the structure of its electron shells, the distance between electrons at levels and between levels. Accordingly, this scale, which determines the size of the cells of the electronic grid, determines the atomic spectra and the magnitude of the forces and energies of ionization, attraction and separation of atoms (§ 4.14). Now consider how the sphere of decay can define both of these scales. First of all, it is obvious that the regions of the decay sphere closest to the electron are decisive for the electron inertia, since the inertia force $\Delta F = ae^2/4\pi\epsilon_0 rc^2$ increases with decreasing radius r of the sphere, from which rheons converge to the electron. That is, the most significant contribution to the force of inertia and to the inertial mass of the electron will be from the nearest layers of the decay sphere. Likewise, nuclear forces (in fact, the Coulomb forces of attraction between electrons and positrons, § 3.12) rapidly increase with decreasing distance. Thus, the classical electron radius r_0 should be specified by the distance at which the first blastons begin to explode and at which the electrical forces can be considered significant. This radius is comparable, probably, with the true size of the electron - the electron nucleus. The second scale, on the contrary, is set by the characteristic distance, at which deviations from the Coulomb law already begin to affect, which allows the charges to form stable configurations, contrary to Earnshaw's theorem [137].

Thus, this radius is equal to the limiting range of blastons - the distance over which almost all blastons exploded, and, therefore, at large distances, Coulomb's law can be considered valid. That is, the region within which the

decays of blastons occur is rather not a sphere, but a spherical layer, the inner radius of which sets the nuclear scale r_0 , and the outer one sets the atomic scale a_0 . This spherical layer, in its action, is equivalent to a spherical charged layer, within which the electron charge is, as it were, smeared, - each point of the spherical layer serves as a source of the field, being a source of rheons (§ 1.6). But this "smearing" of an electron in space has an essentially classical character (this is the region within which blastons, generating a field - a rheon flux - decay) and is not associated with the quantum uncertainty of its position. So, like a galaxy, Earth, a biological cell or an atom with an outer size and an inner (nucleus size), an electron has two characteristic sizes. It is this outer and inner dimensions that determine the characteristic dimensions of the atom and atomic nucleus.

Deviations from Coulomb's law at distances of the order of a_0 are small, since we are just entering the decay sphere. However, this is what leads to the fact that electrons and positrons can form stable configurations in the electron layers of the atom (§ 3.3). So, an electron in the electron-positron layer should approach the positron, under the influence of attraction, only up to a distance equal to the outer radius of the decay sphere, after which their interaction weakens, therefore the electron freezes at an equilibrium distance from the positron, since it experiences, in addition to its attraction, - repulsion of an electron located behind the positron (Fig. 95). When the Coulomb attraction weakened by the overlap of the decay spheres is balanced by the Coulomb repulsion (in the case of the Coulomb law, exceeding the attraction by a factor of 4), an equilibrium configuration of equidistant electrons and positrons is formed, contrary to Earnshaw's theorem. This is how the electron-positron layers of the atom are formed, which define its level system and the grid that determines the spectrum. In order for this grid to change its scale, and the electrons with the positrons come closer together, it is necessary to apply some energy to seal them with an impact (§ 3.13), so that the nuclear forces come into play. Thus, the idea of blastons and their decay within a globular layer is not just a guess, but a hypothesis explaining a wide range of facts. So, not only an atom, but even an electron has its own rather complex structure.

Truly prophetic were the words "the electron is as inexhaustible as the atom" of the famous proponent of materialism - V.I. Lenin. Under the floor of elementary particles, to which the electron belongs, there was also a floor of subelectronic particles, which should include rheons, arheons, blastons and, possibly, neutrinos. One day we will be able to get even deeper and understand the structure of the rheons themselves, but even on the already open floors there is enough space for research, which will be enough for many more years to come.

§ 3.19. Spin and quantization of the magnetic moment of an atom

But we are still not at the limit; after electrons or atoms of electricity came the magneton or atom of magnetism, which now enters in two different ways: through the study of magnetic bodies and through the study of the spectra of elements ... Ritz imagines an oscillating atom formed from a rotating electron and from a multitude of magnetons located one after the other. In this case, it is not the mutual electrostatic attraction of electrons that governs the wavelengths, but the magnetic field created by these magnetons.

Let's move for a while from the subelectronic to the more familiar level of the microworld - the level of electrons and heavy elementary particles. As shown above, and, as many suggested earlier [79], it is electrons and positrons that are the building blocks of which all other particles are built. Then a neutron weighing 1838 times more than an electron must consist of about a thousand (919) electrons and the same number of positrons, so that the total charge of the neutron is zero. The proton has the same structure, but there are one fewer electrons in it, with which its positive charge is associated. Then, in general, the atom and, in general, the world will be built from an equal number of electrons and positrons.

However, such a view leads, at first glance, to contradictions. First, the magnetic moment of the proton and the neutron is noticeably less than that of the electron, which is believed to prove its absence in the neutron. But, if a neutron or a proton is composed of many charges, then their magnetic moments may well be oriented so that they almost completely extinguish each other. The fact that the small magnetic moment of neutrons and protons is due only to the mutual compensation of the moments of the particles forming them was confirmed by the experiments of V.V. Korobkina, R.V. Serov and G.A. Askaryan. In the 1980s, this group managed to smash nucleon bodies with a powerful laser pulse, while recording powerful magnetic fields, in the millions of Gauss. This can be easily explained by the fact that when a nucleon is divided into parts, their magnetic moments cease to compensate each other and are clearly manifested, proving that the local magnetic fields inside atoms and nuclei are much greater than their external, compensated fields. So, the presence of hundreds of electrons and positrons inside a neutron or proton is not excluded. Moreover, it seems that only electrons and positrons have their own electric charge and magnetic moment, and already their presence gives these characteristics to other particles (§ 3.9).

Interestingly, it was Ritz who was the first to predict the existence of a standard magnetic moment (magneton) in elementary particles - the building blocks of which the atom is composed, the atomic core. These particles, as it was found out, should include electrons and positrons. However, no one now connects the discovery of the magnetic moment of the electron with the name of Ritz. Everyone is talking about either the Weiss magneton or the Bohr magneton. Only A. Poincaré mentioned the magneton and the Ritz atom. Being a very deep and courageous thinker, he saw well the prospects and ways of development of science. Poincaré was not only a remarkable mathematician and philosopher of science (who personally visited Ritz to present him with an award and discuss mathematical problems), but also a pioneer in many areas of physics and astronomy. It seems that it was he who could carry out the development and substantiation of Ritz's theory. After all, it was Poincaré who was the first to accept the principle of relativity of the phenomena of optics and electrodynamics, which is key for the BTR. However, these thoughts of Poincaré really turned out to be the last for him, since in 1912 he died, like Ritz, without having time to complete his work. Only after his death were his

thoughts on the magnetic model of the atom and Ritz's magnetons published. Weiss and Bohr magnetons, in contrast to the Ritz magneton, are associated not with the intrinsic magnetic moments of elementary particles, but, more, with the properties of atoms and matter as a whole. The Weiss magneton is, in fact, the elementary magnetic moment of the atom, which is responsible for the interaction of atoms in ferromagnets. And Bohr's magneton is a unit of the magnetic moment of the microworld, associated with its quantum properties and calculated for the first time not by Bohr, but by Langevin. The magnetic moment of the atom is quantized, discretely changing by a multiple of Bohr's magneton. However, from the standpoint of classical science, this nature of the change has nothing to do with the quantum properties of the field, but is due to the presence of a standard moment of the electron. Since the electrons in an atom are arranged in an orderly manner, their elementary moments add up, giving the sum of the magnetic moment of the atom. The change in the total moment by a discrete value is due to the fact that the moments are always oriented either in the same direction or in the opposite direction, extinguishing each other.

In addition, the atom also has a magnetic moment associated with the orbital motion of the electron around the core. How easy it is to calculate, this moment does not depend on the radius of the orbit of the electron and is always equal to the same value - just the same, notorious Bohr magneton. Indeed, an electron of charge e and mass M , rotating in an orbit of radius R with frequency f , is similar to a loop with current $I = ef$, which has the same radius and magnetic moment $m = I\pi R^2 = ef\pi R^2$. From Planck's laws and the photoelectric effect, which give the relationship between the electron energy $E = M(2\pi Rf)^2/2 = hf$ with the frequency f of its revolution in the atom, it follows that $f = h/2\pi^2 R^2 M$ (§ 4.3). Substituting the value of f in m , we find that the orbital magnetic moment does not depend on the radius and frequency of revolution: $m = ef\pi R^2 = eh/2\pi M$. But this is exactly equal to the doubled magnetic moment of the electron $m = 2\mu$. And precisely, the experiment has long confirmed that the magnetic moment of an electron caused by its orbital rotation is twice the moment from its axial rotation. Thus, the orbital magnetic moment of an atom and a substance is indeed quantized, changing discretely, but this is not connected with abstract quantum-mechanical laws, but with a discretely changing number of atoms and electrons spinning in them. Thus, both the Weiss magneton and the Bohr magneton are, in the final analysis, just a consequence of the Ritz magneton and his magnetic model of the atom. It is the Ritz model that allows one to describe all the magnetic properties of substances.

The only question arises about the nature of the magnetic moment of the electron itself and about what determines its magnitude - the value of the Ritz magneton. Has long been understood that the magnetic moment of an electron is created by its rotation: any rotating charge, as was said, is like a loop with a current that generates a magnetic field, a moment. This is exactly how the electron becomes like an elementary magnet (Fig. 95). It is interesting that the first to put forward this idea was the same Ritz, who linked the anisotropy of the electromagnetic properties of the electron with the presence of its axis of rotation [2]. He also put forward the hypothesis of rotation of intra-atomic

particles, like a top, to explain gravity (§ 1.17) and the features of the splitting of spectral lines (§ 3.5). However, later physicists began to deny the rotation of the electron, and the word "spin", meaning "rotation", began to be understood in a completely different way, believing that for an electron blurred according to quantum laws, it is inappropriate to talk about such mechanical properties as rotation. For example, Pauli, who considered particles structureless (§ 3.11), opposed the hypothesis of spin, electron rotation, and again got into trouble. But, since here we follow the classical theory of particles with a specific spatial structure, geometric shape and size, it is quite legitimate to talk about the rotation of an electron. Since all electrons have the same magnetic moment, then their rotation frequency should be the same. Why does the electron rotate and what keeps its rotation frequency at the same level?

Apparently, the rotation of the electron is associated with the emission of rheons. If we recall the analogy of an electron with pyrotechnic projectiles (Fig. 7, Fig. 139), then the simplest mechanism of electron spin-up by jet streams of rheons suggests itself, as in rotating fireworks wheels of fire, or fiery mills (Fig. 141). Heron's steam ball, the Segener wheel, is also spinning - a sprinkler for lawns in the form of a spinner, spun by jets of water [75]. Finally, if we are looking for electrical analogies, we can recall the one described in "Physical Fireworks" [148, p. 163] an ancient spectacular toy - an ion-windmill, called "Franklin's wheel" [137]. This device is a cross - in the form of a charged solar swastika, balanced at the tip of a needle and rotated due to the recoil reaction of ions flowing down from the needles, - jet streams of an ionic wind blowing from all charges (Rowell G., Herbert S. Physics. M., 1994, p. 410).

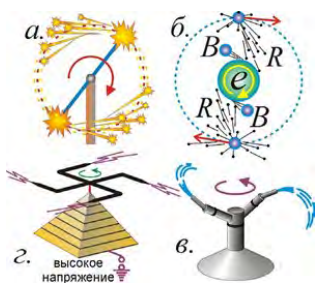


Fig. 141. Reactive spinning: a) the fiery wheel; b) an electron e , launching blastons B , exploding with cascades of rheons R on the decay sphere; c) water sprinklers for lawns; d) ion windmill.

It is possible that a charged electron rotates in the same way, emitting jet streams of rheons - the rheon wind. But, perhaps, the rotation of the electron, again like that of a mill, is created by a stream of rheons converging from the sphere of decay, striking the electron and spinning it. If the electron accidentally receives a slight rotation, it will accelerate, since the blastons ejected by the electron acquire the circumferential speed of this rotation and transfer it during their decay to the rheons, which is why those with a higher frequency and speed hit the side of the electron that is removed during rotation (Fig. 141. b). Thus, rheons further accelerate this rotation. And so - until the force of reactive recoil from the emission of blastons balances the effects of the stream of converging rheons accelerating the rotation. At this stage, the speed of rotation of the electron is stabilized and automatically maintained near this value, ensuring the constancy of the magnetic moment of the electron. In approximately the same way, the wings of the mill in the wind flow, water and fireworks

spinners, increase their rotation speed until their peripheral rotation speed reaches an order of magnitude or two less than the speed of this flow, after which it is automatically maintained at this level.

It is interesting to estimate, on this basis, the speed of rotation of the electron. If the magnetic moment of the electron $\mu = eh/4\pi M$ is created by its rotation, then, as found, $\mu = m\omega r^2$, where r is the radius of the electron. That is, $ef\pi r^2 = eh/4\pi M$. Hence the circumferential velocity at the equator of the electron is $V = f2\pi r = h/2\pi rM$. If we take as r the classical radius of an electron $r_0 = 2.8 \cdot 10^{-15}$ m, we get $V = 4.1 \cdot 10^{10}$ m/s. This is two orders of magnitude higher than the speed of rheons with $c = 3 \cdot 10^8$ m/s. If, as it was found out, the circumferential speed of rotation should be, as in a mill, comparable to the light speed from the flow of rheons that cause rotation, then we get that it is much more natural to take $r = a_0/2 = 2.7 \cdot 10^{-11}$ m - half the interelectron distance (§ 3.1), which gives the speed $V = 4.3 \cdot 10^6$ m/s, - just two orders of magnitude less than the light speed of the rheon flux. As you can see, the radius of the decay sphere, from the surface of which rheons are ejected and which can be conventionally considered the outer boundary of a rotating electron, in reality, is not equal to the classical radius of the electron, but to the interelectronic distance comparable to the radius of the atom. The same conclusion about the value of the outer radius of the electron decay sphere was reached in the previous section (§ 3.18). If the inertial mass of an electron and nuclear energy, proportional to $1/r$, are specified by the more significant, in this case, the inner radius r_0 of the electron (more precisely, its decay sphere), then for the magnetic moment $m = ef\pi r^2$, proportional to r^2 , on the contrary, the outer radius will be decisive a_0 . In fact, it is along this outer radius that the circular current of the electron circulates, since it is there that most of the field sources, blastons, are located at the time of their explosion by rheons.

As you can see, the Ritz model, which represents an electrical effect - through the decay of an electron, in the process of emitting rheons by it, in addition to the nature of the charge, automatically reveals the nature of the electron's spin, its standard magnetic moment, as well as the reason for its "quantization" and, in general, the quantization of the magnetic moment in atoms and bodies. Usually the discovery of the spin magnetic moment of the electron is associated with the names of S. Goudsmit and J. Uhlenbeck, and the discovery of the spin of the nucleus - with the name of W. Pauli. And no one will remember that for the first time the elementary magnetic moment of the particles that form the atom and the nucleus was predicted by Ritz back in 1908, long before these theoretical "discoveries" made in 1924-1925. It was Ritz who was the first to suggest a distinguished axis for the electron, based on an analysis of the continuous spectrum of β -decay (§ 3.15). It was Ritz who predicted in 1908 quantization, a discrete change in the magnetic moment of the nucleus and the spinning particles that form it, proceeding from the analysis of atomic spectra and the splitting of their lines in an external and intra-atomic magnetic field. And, therefore, it is quite possible that the discovery of the spin, like other discoveries of Ritz, was simply stolen from him by quantorelativists. Indeed, when "opening" the spin, they, repeating Ritz, proceeded from the analysis of spectral lines and their splitting in the magnetic field of the nucleus, which no one had ever imagined before Ritz. In addition, the "opening" of the spin took place at

the suggestion of P. Ehrenfest, who communicated with Ritz more than others and was aware of his ideas. It was Ehrenfest who was the consultant and leader of Goudsmit and Uhlenbeck, who sent their note to the press [154, p.140]. At the same time, the idea of electron rotation was submitted by Uhlenbeck, who was a pure classic, not familiar with quantum mechanics, while the supporter of the quantum approach Goudsmit, according to Ehrenfest, simply signed the finished note. In connection with all of the above, the question arises: was at least one discovery made by the quantorelativists themselves, or was each one stolen from Ritz and other classical physicists?

§ 3.20. *Rheons, arheons and plus or minus mass*

As far as modern science is concerned, here we must completely abandon the thought that, penetrating deeper and deeper into the realm of the small, we will someday reach the last frontier. I am sure that we can abandon this idea without regret. The universe is infinite in all directions, not only in the big world around us, but also in the smallest.

E. Wichert, 1896

Let's make reconnaissance of the lowest, subelectronic floor of the universe, inhabited by rheons and arheons. It is this, as we will see, that makes it possible to understand the nature of mass and anti-mass. Recall that electrons and positrons have masses of opposite signs (§ 1.6). But in this case, the neutron, and other particles formed from an equal number of electrons and positrons, would seem to be weightless. This is certainly not the case. The fact is that the minus mass, as noted earlier, is a convention that takes place only when a substance comes into contact with antimatter, antimatter, the amount of which is measured by the minus material mass. If we are talking about the inertial and gravitational mass of particles, then the electrons and positrons taken separately behave like particles of plus mass, equally resisting acceleration and equally attracted by the Earth. Therefore, in particles, say, in a neutron, the masses of electrons and positrons are added in modulus: each of them opposes a change in the speed of the neutron, contributing to its inertial mass.

It's the same with gravitational mass. As shown above (§ 1.17), it is proportional to the number of charges that make up the body. Therefore, the Earth attracts a proton as many times more strongly than an electron - how many times there are more charges in it, that is, - in 1836, since it equally attracts each of them. Just the fact that all bodies, atoms are entirely composed of electrons with positrons and leads to the equality of the inertial and gravitational mass of the body, verified with great accuracy [26]. And, therefore, the proton and the electron must fall with equal acceleration. In this regard, the experiment proposed by V. Petrov is interesting in comparison of their accelerations of gravity, which, according to his estimates, are thousands of times different, since, having the same charge, an electron is 1836 times lighter than a proton [96]. But a similar experiment has already been carried out, and the acceleration of gravity of an electron measured in it was the standard $g=9.8 \text{ m/s}^2$ [170], and not the $919g = 9000 \text{ m/s}^2$ predicted by V. Petrov. However, this does not refute the idea supported by this author about the electrical nature of gravity, proportional to the number of elementary charges of

the body, put forward by I. Zöllner and W. Ritz. On the contrary, experience only proves that the proton and neutron are not elementary, but contain thousands of charges that mutually neutralize each other. This structure allowed Manturov and V. Cheplashkin to assume that nuclear forces have an electrical nature (§ 3.12), since the Coulomb repulsion of protons can be overpowered by the attraction of thousands of electron-positron dipoles that make up these protons [79].

A similar model of the proton makes it possible to understand the mechanism of the Coulomb attraction of a proton to an electron. It would seem that since the positive momentum carried by the impacts of rheons is directed away from the electron, then, according to the law of conservation of momentum, a proton with a positive mass must repel - move from the electron. But, in fact, the electron effectively acts in the proton - only on the extra positron (having anti-mass), and already that, being attracted and moving to the electron, drags along with it all the other particles that form the proton and equally interfere with its acceleration.

However, this is a simplified model, and the electron should, apparently, emit not individual rheons, but - collected in standard groups that form other particles blastons B , as if exploding in fireworks at some distance (within the decay sphere) with cascades of rheons (§ 3.18). By means of blastons and the sphere of decay, one can not only explain the process of fusion of an electron with a positron, but also understand the nature of mass, inertia of particles.

And, most importantly, it allows you to clearly describe the nature of the negative mass. Recall that it is easy to explain the repulsion of charges by the impacts of rheons, while the attraction of an electron to a positron can be explained only by the minus mass of the latter, which is quite natural for minus-matter (antimatter). But how to imagine this negative mass introduced by Dirac and the movement of the positron towards the rheon stream striking it? It turns out to be easy! Let us recall the decay sphere that surrounds the electron. From each of its points, - from the explosion of blastons B , rheons emanate in all directions, some of which fly away, causing the electric impact of the electron by blows, and some converge back, generating the force of inertia, which prevents the acceleration of the electron. The same force, but born of the returned arheons, prevents the positron from accelerating (Fig. 142).

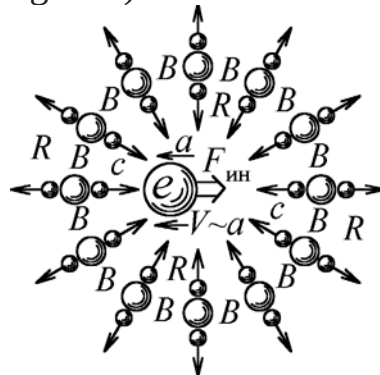


Fig. 142. Accelerated moving electron or positron, gaining speed V inside the sphere of decay, formed earlier, experiences the action of the inertial force from the converging rheons.

Now let us consider the arheons $\bar{R}$ emitted by the positron - at the moment of their

approach to the electron. Since the concentration of rheons R in the sphere of electron decay is enormous, arheons collide and annihilate with them: the rheon and arheon disappear (Fig. 143). And, as in the case of electron-positron annihilation, only particles with almost equal velocities interact (§ 3.17). Arheon simply would not have had time to act on the rheon, rushing towards at the speed of light. But arheons act on rheons with which they are on the way. That is, rheons disappear, flying towards the electron at the same speed and from the same direction as the arheons. As a result, the number of rheons converging to the electron from the positron side will be less than from the opposite one. And the flow of rheons from the opposite side pushes the electron towards the positron. The attraction of the positron by the electron also arises, with the only difference that the sphere of decay of the latter emits arheons, the flux of which, converging from the side of the electron back to the positron, thins out from annihilation with the flux of rheons emitted by the electron (Fig. 143.b). It is interesting that Democritus and Lucretius, having created the first theory of electromagnetic interaction, through the streams of the smallest particles (rheons) emitted by all bodies, explained the electromagnetic repulsion of bodies - by the impact of these particles, and attraction - by clearing the space between bodies, emanating from the attracting body by a stream of particles, which is why external streams of particles push bodies towards each other (epigraph to § 4.19). In this theory, there are much less contradictions than in the theories of gravitation by Newton and LeSage that arose in its footsteps two millennia later.

And, most importantly, this theory eliminates the apparent violation of the law of conservation of momentum from the movement of electrons towards the impacts of arheons. After all, arheons carried an impulse $p=mc$ directed from the positron, and the electron acquired the opposite motion - to the positron. However, the conservation law is still observed if we take into account the impulses of all bodies in the system, including rheons. So, a sailing yacht goes tacking against the wind (blows of air atoms), in accordance with the laws of physics, if we take into account the momentum carried away by the water. And in Coquerel's experiment, the load is drawn into the pipe, in spite of the pressure of the oncoming air, due to the rarefaction created by the flow in front of the load and the air pressure from below, pushing the load upwards - against the force of gravity. Here, too, the conservation law is observed, if we take into account, in addition to the impulse of the load and the pressing air, the impulse of the downward flow.

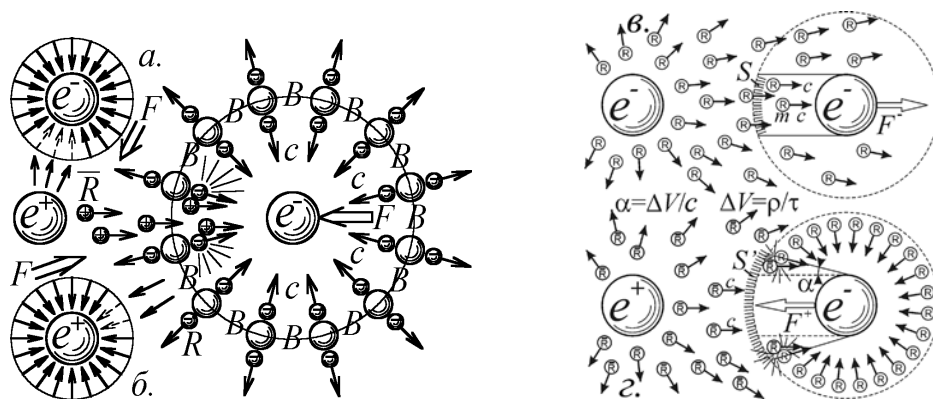


Fig. 143. The annihilation of arheons $\bar{R}$ and rheons R , converging to an electron from the decay sphere, gives rise to the force of attraction $F = F^+$ from the excess of collisions of rheons from the opposite side (a, b), equal to the repulsion force F^- of two electrons (c).

The same is true for the effect of the flow of arheons (arheon wind) on the electron. In addition to the impulse of the arheons and the electron, one must also take into account the impulses of the rheons, which upon contact with the arheons, flying by, carry away an impulse equal to the doubled momentum p of the electron. As a result, the overall momentum remains. A similar mechanism of attraction of bodies from the emission of particles clearing the space between bodies was theoretically and experimentally substantiated by Doctor of Technical Sciences. K.P. Stanyukovich, who constructed an alternative theory of electricity and gravity to Maxwell-Einstein's. As a recognized expert in combustion theory and explosion gas dynamics, he relied on ballistic models consonant with Ritz's ideas (see the collection ["Universe", Moscow: Kultprosvetgiz, 1955](#)). But criticism of Einstein's theory and the theory of the Big Bang based on it was negatively perceived by relativist scientists, as if they were afraid of the revival of Ritz's ideas. Therefore, the work of Stanyukovich was forgotten, and he himself was removed from fundamental physics. And, nevertheless, the works of this and a number of other scientists are convincing that the flow of particles can create a thrust force directed against the flow - a thesis that was initially substantiated using the concept of negative mass (§ 1.6).

As we can see, in the end, the concept of negative mass turned out to be conditional, because it is not gravitational and not inertial mass, but, namely, material mass, - the relative amount of matter (for which the plus sign can be compared to matter, minus to antimatter, but it is possible vice versa). Therefore, it is quite possible to consider electrons, positrons, rheons and arheons as particles of positive mass, and the attraction of opposite charges can be considered a consequence of the annihilation of matter and antimatter. Nevertheless, minus masses are convenient for describing the interaction of matter with antimatter (minus-matter). It should be added that annihilation should not be considered as the process of annihilation of two interacting particles. Their disappearance may be the result of merging into a pair, which cannot be detected (as in the case of the annihilation of an electron and a positron § 1.16), and a consequence of a sharp departure of particles from the observation area (§ 3.18, § 5.7). So, rheon and arheon hardly disappear upon contact, but, rather, they scatter as a result of the rejection of matter and antimatter, their fundamental incompatibility.

This interaction occurs between rheons only at ultra-small distances ρ (components of the order of the rheon radius). Probably, it is precisely this that leads to their escape from the electron with a tremendous speed, just as the Coulomb repulsion gives a tremendous and standard speed to α -particles escaping from nuclei (§ 3.13). It is interesting that even Ritz compared the emission of rheon particles by an electron - with the decays of radioactive substances - with the β -decay of radium grains that emit a constant stream of electrons. In all other cases, rheons and arheons can be considered practically non-interacting with each other - freely moving material points. The interaction of rheons, - the rejection and attraction that binds these particles in an electron,

speaks of the existence of forces of a new nature and even smaller carrier particles that make up the rheons themselves. But this, for now, is the sub-rheon floor of the microworld completely inaccessible to our eyes. And the found interaction model is just one of the possible hypotheses, which has only the advantage over others that, on the basis of a few assumptions (about rheons and blastons), it explains a lot: electrical, magnetic, gravitational and relativistic effects, moreover, - clearly, based on classic mechanical models.

The mutual influence of rheons, arheons at small distances ρ allows a deeper understanding not only of the nature of the elementary forces of electric attraction F^+ and repulsion F^- , but also the reason for their insignificant difference, leading to the appearance of gravity (§ 1.17). Recall that the BTR, in a first approximation, leads to the equality of these forces F^+ and F^- . Arheons emitted by the positron remove as many rheons converging to the electron as would come to it from the second electron located at the same distance. Only arheons, flying through the area S (shaded in Fig. 143), equal to the electron cross section, annihilate with rheons. Therefore, the lack of rheons going to it from the decay sphere from the positron side is almost exactly equal to their excess going from the second electron through S , whence $F^+ = F^-$. We say "almost", since this equality is imprecise, because of the finite time τ and the radius ρ of the interaction of the rheon with the arheon, annihilating not only in parallel motion, but also when approaching at a small angle α . The main thing is that during the interaction time τ they do not have time to disperse a distance greater than ρ , that is, they have a vector difference of velocities that is less than $\Delta V = \rho/\tau$. This will slightly expand the area S' , within which arheons "acting" on the electron arrive (Fig. 143.d). So, the attraction F^+ is slightly more than the repulsion F^- , for which the effective cross section for the interaction of rheons with an electron is exactly S . This imbalance of the forces F^+ and F^- the charges of the body and generates gravity.

The proposed imbalance model is simpler than the one considered in §1.17, because it allows the exact similarity of an electron and a positron. It is only necessary to accept the hypothesis about the electron decay sphere, which simultaneously eliminates one of the difficulties of the previous model, namely, the revealed inequality of the effects W of a neutral system of charges on positive and negative charges (§ 3.15). But then a neutral system, such as the Earth, would begin to attract electrons and repulse protons with positrons, although, in reality, only attracts, imparting a standard acceleration g (recall the Petrov experiment). Consequently, at large (in comparison with the size of an electron or atom) distances, the action of the neutral system on the electron and positron is the same, which means that the fluxes of rheons and arheons from the neutral system at such distances are also the same: the productivity N of the electron and n of the positron are equal ... But $N > n$ at small distances (comparable to the radius of an electron), which can be explained by the different radii of the decay spheres of an electron and a positron (both particles emit an equal number of blastons every second, which explode at different distances from the center). Then it is understandable why a compact neutral system of charges pushes an electron with a force W , but attracts a positron, so that neutrons emit electrons, and protons hold "extra" positrons (§ 3.15). But at

large distances (noticeably exceeding the size of the nucleus and the radius of the decay spheres), where all the blastons emitted by electrons and positrons have already exploded, the streams of rheons and arheons formed in this case exactly compensate each other and are able to create only gravitational attraction, as shown above.

Speaking about blastons (§ 3.18), we note that these particles should, like rheons with arheons, inhabit the same lower, subelectronic level of the microworld. Other subelectronic particles, neutrinos, can be classified in the same category, if only they really exist (§ 3.15). However, it is quite possible that neutrinos are rheons, judging by the similarity of their properties: negligible mass, much less electron mass, huge penetrating ability and almost unlimited free path in matter, the absence of tangible interactions with other particles and the light speed of propagation. Perhaps other particles will also be found on this floor, but one can only guess about their properties and reality, this floor of the universe has been so little explored.

So, we have described, in general terms, the lowest floor in the world available so far. **The universe at all levels is arranged similarly, the same laws of mechanics operate everywhere. And it is foolish to introduce for each floor of the endless chain of worlds its own laws - quantum or relativistic. There is nothing in the universe except particles or, let's say, "building blocks", the movements and contacts of which in empty space give rise to the entire visible world, all conceivable forms of energy and matter.** In fact, any energy is, in the final analysis, kinetic energy - the energy of particle motion, just as thermal energy is simply a random movement of atoms. All types and transformations of energy mean only a change in the nature of the movement of bodies and particles, the transfer of motion from one to another. And it is truly amazing how even Democritus and Lucretius, realizing this, guessed that all phenomena, energies and influences are rooted in the microcosm, to the lower floors of the universe, representing the movements, connections and decays of the smallest particles. Only by knowing the structure of particles, the lower floors of the universe, you can discover hitherto hidden inexhaustible sources of pure energy that will allow you to ascend to the upper floors of the world - to conquer the Cosmos (§ 5.11). But so far modern science reliably blocks access to these floors - heaps of absurdities.

§ 3.21. *Ether and Rheons*

In optics, two different ways of representing phenomena have been successfully used: through emission (light moves) and through ether (light propagates in a stationary medium). The second introduces absolute motion, while the first leads to the movement of light in a vacuum exactly as required by the principle of relativity: at time t , light particles scatter in all directions, moving at a constant radial speed and forming a sphere with a center moving at a speed v , which point P had at the moment of emission. If v is constant, then this center continues to coincide with P .

Walter Ritz, "A Critique of General Electrodynamics" [8]

Going down to the lowest, so far accessible, subelectronic floor of the

universe, we find that all space, all infinite emptiness is filled with particles rushing at light speeds - rheons and arheons, through which electric, magnetic, gravitational, nuclear influences and light are transmitted (§ 3.16). It may seem that these particles form a kind of environment - a kind of analogue of the ether, which was previously assigned the role of a carrier of all influences. Indeed, in part, this dynamic environment of particles resembles ether, but, nevertheless, it is fundamentally different from it. First of all, rheons and arheons fly freely in all directions - with approximately the same speed, equal to the speed of light c , while in ordinary gaseous media, the Maxwellian distribution of particles in speeds is established. Secondly, rheons and arheons practically do not interact, do not collide, moving independently and in a straight line, which fundamentally distinguishes them from particles of the medium, where particles collide or vibrate near their mean positions. With a huge flux density of rheons, their free movement becomes possible due to the absence of interactions between the rheons and their small, almost pointlike, sizes, which make the probability of collisions negligible, and the free path very large.

Due to the absence of particle interaction in such a medium, wave processes cannot arise. Namely, the waves in the ether were used to explain the light, the electromagnetic waves, in which the impact was transmitted by the relay from point to point - by the particles of the ether, during their collisions. Therefore, in the ether, the speed of propagation of an electromagnetic wave was associated with its elastic properties. Moreover, the ether was endowed with tremendous rigidity to ensure a high speed of light signals. And in the Ritz model, the rate of transmission of electrical influences, including light, is related to the light speed of movement of rheons. Such high velocities for microparticles arising in the course of decays are common, in contrast to relatively slow waves in media. Scientists of the past who did not know this, such as Huygens and Euler, rejected the corpuscular hypothesis precisely on the grounds that they could not imagine how material bodies, particles can move with such a high speed, and, therefore, considered the movement of light to be a disturbance propagating in a motionless environment. Surprising against this background is the insight of Galileo, who noted in *Conversations* that just such high speeds should be inherent in luminiferous microparticles (rheons), accelerated by even an insignificant force and by their impacts in a focused beam of light melting metals, breaking their bodies into atoms. Likewise, Kepler (the discoverer of the laws of planetary motion and the founder of scientific optics) defended the theory of the outflow of light and believed that its particles in space move at a gigantic speed. And long before Galileo and Kepler, the ancient atomists, Democritus and Lucretius, said the same [77]:

Light, firstly, things, consisting of small bodies, more often than any other, speed, obviously, is inherent, Sunlight, like heat, refers to these objects, since they consist of small initial particles;

... First of all, because of a rather insignificant reason, what would push them from behind, carry them far away and drive them away.

However, many scientists criticized the corpuscular theory of the outflow of light - precisely on the grounds that the speed of light was not a universal constant

of the medium, but was determined by the speed of ejection of particles. Therefore, it was believed that light rays of different colors would move at different speeds, since they would be composed of different particles. Such an objection was raised against Newton's theory of light, and in the 20th century by Einstein against Ritz's theory [6]. According to Einstein, Ritz, rejecting the postulate of the constancy of the speed of light and admitting its dependence on the speed of the source, actually denied the existence of the constant c , since it was not clear what it was connected with. This proves that Einstein did not even understand the essence of Ritz's ballistic theory. In Ritz's theory, in contrast to Newton's, light of any frequency, of any color is carried by the same standard rheon particles. And the color, that is, the frequency and wavelength of light, is set by the repetition rate of the clusters of rheons and the spatial period of the periodic distributions they form (§ 1.9, § 1.11). Therefore, in a vacuum the speed of rays of all colors turns out to be the same and equal to the speed of the ejection of these rheon particles by electrons. Moreover, this speed must be standard with great accuracy, just like the speed of alpha particles emitted by the same nuclei, or the speed of shells fired by the same cannon (§ 1.5). It is this "muzzle velocity" of the ejection of projectile particles that sets the constant c in the frame of reference associated with the source and the electron. The existence of such a standard speed does not contradict the fact that in systems moving relative to the source, this speed is different.

Note that even from Democritus and Lucretius, from whom Newton borrowed many of his ideas (including the atomistic theory, the hypothesis of corpuscles and the idea that white light is composed of all the colors of the rainbow [77]), it was said that light is carried by particles of the same type, and color is determined only by their spatial characteristics. This idea was fundamentally different from the later Newtonian idea of the difference in the masses and sizes of light particles, and more in line with Ritz's idea of standard particles-carriers of light. Thus, Ritz's concept that the standard of the speed of light is set by the rate of emission of rheon particles looks much more natural than the hypothesis of the speed c as a measure of elasticity of the entire filling medium. After all, the density and elasticity of the ether can change from point to point, as the elasticity of air, water, soil on Earth changes, and, accordingly, the speed of propagation of sound or light in them changes.

So, in media, the speed of waves is determined by the interaction and collision of particles, while in rheons the speed with which they transfer light is set by the speed c of the particles themselves. And light owes its wave properties not to wave processes in the medium (perturbation diverging in a stationary ether), but to the motion of the medium itself, - rheons, which form periodic rarefaction clots in space, wave-like distributions of the concentration and velocity of particles, carried at the speed of light, together with the flow particles (§ 1.9). Such free movement of particles and the transfer of light waves by them makes it possible to understand why waves do not scatter, do not lose energy in a vacuum, even when they travel gigantic cosmic distances.

The greatest problem of Maxwell's aetheric theory is that the aether could not carry light over huge cosmic distances without energy loss and scattering. Indeed,

in any material medium, including ether, the energy of waves is gradually spent, turning into heat. Dissipative processes take place, since the wave process, involving new particles in motion, constantly gives these particles a part of its energy, because in a material environment there can be no complete reversibility of processes, there is always hysteresis, even if it is negligible. This is how, for example, a sound wave in air gradually dies out. However, contrary to Maxwell's electrodynamics, we see distant stars and galaxies, practically without attenuation and scattering of the light coming from them. Unlike ether particles, rheons do not interact with each other, they fly freely and in a straight line, and, therefore, the light carried by them, in principle, cannot fade and dissipate, since there is no energy exchange. It is the exchange of energy (its interconversion during the collision and interaction of particles, fields), which is necessary for the transfer of wave disturbance in a medium such as an ether, that leads to friction, irreversible loss of energy.

Therefore, the theory of the ether, as a material medium that conducts vibrations, failed: any material medium is not ideal. Any movements and vibrations in them are accompanied by friction, loss of energy. It is the collisions of the particles of the medium, which are necessary for the propagation of the wave process, that lead to the dissipation of the wave energy and an increase in entropy. There is no such problem in BTR: rheons, from the moment they are emitted, have no collisions and interactions, right up to the moment they hit the receiver - that's why there are no losses inevitable in material environments. But in Maxwell's ether theory, this problem cannot be eliminated in a rational way. Therefore, physicists, who realized the viciousness of the ether, had to invent, in order to save Maxwell's theory, an idealized, immaterial, weightless medium-carrier - an abstract electromagnetic field: a state of empty space, given at each point by a set of four numbers. Of course, nothing can be said about its physical properties and it is impossible to detect the field by itself, in view of its unreality, immateriality. This field, given and studied in a purely analytical way, cannot be described mechanically, although, despite its weightlessness and immateriality, it interacts in an incomprehensible way with weighty material bodies. And this is mysticism, mathematical formalism. Therefore, if Ritz's electrodynamics can be called "ballistic", then Maxwell's - "cabalistic", based on mystical, unrelated to reality, operations on letters and numbers. No wonder Maxwell, like some non-materialist-minded scientists, was fond of the supernatural, including demonology. So, in physics the term "Maxwell's demon" is widely known. As if it really was the devil himself, in the person of Maxwell, who directed science along the wrong path. After all, as we have seen, both the theory of relativity and quantum mechanics are only consequences of the equally abstract, formal and irrational theory of Maxwell.

And, on the contrary, the search for simple, rational explanations of natural phenomena noticeably moves science forward. So, the secret of the success of the atomistic theory of Democritus, who was able to correctly understand many phenomena, was that he rejected mysticism, immaterial essences (this is the essence of the field) and recognized that in the world there are only atoms with properties, and - emptiness (nothing), which has no properties [31]. So, there is no

place for the physical field (non-material ether) in the materialistic atomistic concept. If we consider, within the framework of the atomistic concept, the ether formed from independently flying particles, then we come to the ballistic theory of Ritz, where these particles are represented by rheons. It was this corpuscular view of the ether that Newton, Lomonosov, Mendeleev, Tsiolkovsky, Tesla adhered to. Yes, and Democritus himself and Lucretius did not deny the ether in this form. All these scientists spoke about ether in their works, as about the smallest particles that fill the world, outer space, as about the fundamental principle from which matter is built. It was in this form that ether was introduced by the ancients. It is not for nothing that Plato, who took a lot from the ancient sages, considered the ether to be composed of particles in the form of a dodecahedron [144]. Only the one accepted by the physicists of the 19th century is wrong. Aristotelian solid stationary ether, filling all space without gaps and staying in a stationary state or vortex motion, like Descartes, in contrast to the direct-firing independent movement of rheon particles that transfer all influences. In his [Dialogues](#), Giordano Bruno also criticized the false understanding of the ether as an immobile continuous medium by the scholastic physicists, who showed that the ancients meant by ether precisely the fast particles-runners that carry impacts, as already indicated by the translation of the ancient Greek word "ether". So, ether, according to Plato and Democritus, is the thinnest atmosphere of the cosmos, what remains in space if it is cleaned by removing all the atoms and the particles that form them.

The motionless continuous ether is also inadmissible for the reason that it introduces an absolute frame of reference associated with it. But the introduction of such an absolute is equivalent to the introduction by Aristotle of the absolute center of the world and the absolute boundaries of the Universe. It is no coincidence that it was Aristotle who was at the same time the author of the hypothesis of the absolute motionless ether and the geocentric model of the world closed in a sphere. It is no coincidence that Aristotle of the 20th century, Einstein, delayed the collapse of Maxwell's theory based on ether (field) and revived Aristotelian cosmology (of a closed, limited Universe). But the world, as Democritus, Bruno, Tsiolkovsky showed, cannot have a center and boundaries, being unlimited (§ 2.6). And, therefore, the concept of rest or movement is inapplicable to unlimited space, which manifest themselves, just like centers and boundaries, only as relative, having a local, conditional character. That is why, absolute motionless and continuous ether is absurd. If we admit that the ether is not continuous, but has parts, then these parts, the ether atoms, must move relative to each other. Thus, the absolutely resting frame of reference disappears, because we no longer have attachments, we do not have a body to which the absolute frame could be attached. Both absolute time and absolute space should be tied to some bodies and their uniform motion. But, since there are no such bodies that are absolutely at rest or move strictly uniformly, without being influenced by other bodies, it must be admitted that there are no absolutes: they are pure idealization.

So, the main advantage of the BTR over the previous theory of aether is that rheons and arheons fly in a vacuum freely, without collisions, and the same

particles participate in the transfer of the wave distribution, which do not exchange energy in the process of motion, and, therefore, do not lose it. That is why light and other radiations always move in the boundless expanses of space in a straight line, without scattering and loss of energy. A similar model of the ether was built by Tsiolkovsky and Mendeleev, who considered the ether not as some abstract, continuous medium, but as an extremely rarefied gas, the subatomic particles of which practically do not interact with each other. These ubiquitous and pervasive elementary particles have a mass much less than the mass of an electron and the speed of light [99, p. 42]. It was the light speed of such particles that determined, according to Tsiolkovsky, the speed of light. He expounded this concept in his work "The kinetic theory of light" [159], now forgotten and, perhaps, forever buried in the archives.

The greatest expert on electricity, Nikola Tesla, came to the same views on the nature of light carriers long before Michelson's experiment, who, as can be seen from his works, accepted Ritz's theory and rejected the ether with Maxwell's theory, both experimentally and on the basis of theoretical analysis. He wrote: "When Dr. Heinrich Hertz conducted his experiments in the period from 1887 to 1889, his goal was to demonstrate the theory that the medium that fills all space, called ether, does not have a structure, is very thin, but at the same time extremely strong ... Many years before that, I had established that such a medium could not exist, and we must accept the point of view that all space is filled with gaseous matter." [110] Such a corpuscular approach to the problem of light transport in a medium not only solved all theoretical problems of the ether, but also explained the result of the Michelson experiment and stellar aberration (§ 1.9).

Note that the description of the electric and gravitational interactions of bodies by means of rheon impacts given by Ritz is very similar to the well-known hypothesis of another Swiss physicist, J. LeSage, invented back in the middle of the 18th century and repeatedly mentioned in Ritz's works. According to LeSage, the attraction of bodies is caused by ether microparticles randomly floating in space, which, striking the bodies, push them towards each other. At the same time, LeSage, relying on the ancient atomistic theory of interactions between Democritus and Epicurus about particles scurrying in emptiness [106], showed that Newton's law of gravitation immediately follows from it (just as from the Ritz's rheon model - the laws of Coulomb and Newton directly follow, § 1.4, § 1.17). It is interesting that LeSage, unlike his followers, called these particles not "ether atoms", but simply "ultra-world particles", noting their insignificant size and tremendous speed. By this he explained their high penetrating ability and the absence of collisions with each other. Likewise, Ritz a century later substantiated the free movement of rheons and the almost unlimited mean free path - their small size, which allows one to consider rheons as material points.

In addition, LeSage guessed long before Rutherford that the main volume of matter is emptiness, while the entire mass of bodies and atoms is concentrated in small regions periodically scattered throughout the body [107]. Representing bodies and atoms in the form of hollow cells and cells, the bulk of which is collected in thin rods of constant cross-section, LeSage not only predicted the

existence of nuclei and electrons of standard size, but also the crystalline, lattice structure of bodies and elementary particles (§ 3.1, § 3.9). Due to this structure, even dense bodies represent an insignificant barrier for ultraworld particles (and rheons), like rare rods of a cage - for grains of sand caught by the wind and flying through the cells of the lattice. This explains why the substance practically does not delay, does not screen the gravitational effect. The atoms of the screen retain only an insignificant part of the particle flow, which exerts a gravitational effect on the obstacle, and the main, passed part of the flow acts on the bodies located behind the screen. Similarly, the BTR explains the thesis put forward by Ritz that rheons freely fly through dense bodies without changing direction and speed (due to the insignificant point sizes of electrons, electron nuclei that form matter and absorb rheons, § 1.4, § 3.18), and therefore inform electrical and gravitational action to the deepest layers of matter.

Nowadays it is really known that microparticles - electrons and protons flying at a speed close to the speed of light (with which the rheons move) easily pierce relatively thick layers of matter. So, what can we say about the ultra-world LeSage particles (or rheons), which, having much smaller sizes and not being exposed to the fields (carried by them), should easily pierce gigantic layers of matter, like the notorious neutrinos. All this characterizes LeSage and Ritz, these glorious sons of Switzerland, as brilliant visionaries who guessed the properties of nuclei and elementary particles, as well as their structure. However, unlike the BTR, LeSage's hypothesis had a number of disadvantages. So, if we take into account the reflections of the LeSage particles by bodies, there will be no impact at all. The theory of rheons is devoid of these shortcomings, if only because they are not reflected, but only emitted and absorbed by charges. Therefore, the Ritz theory is more reminiscent of not LeSage's theory, but the original theory of Democritus, Newton, Riemann and Pearson, where particle flows are simply absorbed by the centers of gravity (charge), dragging the bodies that they permeate with their motion [77, 99, 107]. However, LeSage refined his theory, assuming that ultra-world particles stick to particles of matter upon impact, and, after a while, they fly out again, already in a different direction. This brings LeSage's theory even closer to Ritz's theory, where rheons are absorbed by an electron, and then again separated from it (§ 1.5).

Maxwell and Pearson also proposed a somewhat similar mechanical model, considering positive charges as sources of the ethereal liquid, and negative charges as sinks, which explained the interaction of charges and masses [107]. But, firstly, the experiment rejected the continuous motionless ether, confirming the classical principle of relativity for electrodynamic phenomena and Ritz's theory. Secondly, the Ritz model is more natural, since it does not introduce intangible, imperceptible liquids, but describes everything through the movement and decay of elementary particles, - well-known phenomena that do not require the multiplication of entities. Third, the Ritz model is free, as we have seen, from all the vices of the ether. In particular, the medium of rheons explains the transverse nature of electromagnetic waves, static electric and magnetic influences (Part 1), which was beyond the power of the theory of the ether, which was alternately considered either infinitely solid or infinitely light

and permeable. Numerous shortcomings of the ether concept have been pointed out by many scientists, and especially by Ritz.

Finally, one more essential problem of the ether consisted in the fact that bodies moving in it with cosmic velocities would have to experience resistance, slowing down the motion of the planets, and they would fall on the Sun. It may seem that bodies moving in a space filled with rheons will also slow down. After all, any body moving in a stream of rheons must experience resistance. But, besides the rheons, the same number of arheons are worn in space, which have the opposite effect. These influences are mutually neutralized, and, therefore, braking forces do not act on the body, charge, even if they are carried in a vacuum with great speed. On the other hand, the presence of rheons and arheons in space, although it does not affect mechanical and optical phenomena, nevertheless sets a certain selected frame of reference. This is a system in which the average flows of rheons (and arheons) in all directions are the same. All these rheons are emitted by bodies from the observable part of the Universe (§ 2.5). Therefore, such a frame of reference will not be absolute: in it we will only be able to find the speed relative to our nearest environment in the infinite Universe, just as astronomers now determine the average speed of the Earth relative to the nearest stellar and galactic environment or the relict background, based on the Doppler effect. In other parts of the Universe, other frames of reference, tied to the rheon medium, can move relative to ours at high speeds.

Thus, although the dynamic environment of rheons and arheons is in many respects similar to ether in its properties, it still differs significantly from it, providing an adequate mechanical description of all phenomena and interactions on a single basis. The reason why sometimes they mistakenly try to associate ether with rheons is as follows: It has long become clear that action at a distance does not exist: bodies cannot directly act on each other at a distance - in the space between them there must be some material mediator (intermediate environment or agent) that transfers the impact from one body to another. Its reality is evidenced, at least, by the delay of light and influences coming from the source to the receiver. Consequently, this effect exists in some form in the space between the source and the receiver, and, due to the materiality of its carrier, it is transferred with a finite speed, which is also recognized by modern physicists [60]. That is, the carrier-medium has a mass. This environment was called "ether". In this sense, the streams of rheons can also be called ether, penetrating all bodies, all space and also transferring all types of interactions. But this is not at all the ether, which is understood as either an abstract continuous non-material medium-fluid without physical properties (field), or a medium such as liquids and gases, where the impact is transmitted in the form of waves propagating in the medium from point to point, without the transfer of the medium itself.

Therefore, in order to avoid confusion, we do not speak of rheons as a medium such as ether, but consider them simply as independently moving particles, such as particles of cosmic rays, which also penetrate all space and rush at near-light speeds. Note that it was in the form of freely floating particles that fill outer space and serve as the fundamental principle of everything, feeding all bodies with matter and energy (forces, light), that Democritus and Lucretius Carus were

introduced in their works [77]. Like rheons, they represented ether as streams of high-energy particles filling the cosmos; they considered ether to be the primary source of all bodies, interactions and simply a cosmic environment, free space from which matter and energy comes. Something like this, and we now use the word "ether" in the expressions "broadcast on the air", "we are on the air" in the sense of receiving and transmitting signals into space, although we know perfectly well that there is no ether.

So, following the concept of Ritz, it is necessary to reject the continuous motionless ether, as well as the electromagnetic fields and waves, in their usual sense. The BTR requires either a complete abolition of these concepts, or their radical revision, since a certain analogue of ether (§3.21), fields (§1.8) and waves (§1.11) arises here too. Although Ritz's theory contains common points with the ether models, quantum electrodynamics (QED) [106], to assert their equality is like equating the models of Ptolemy and Copernicus, as if it does not matter whether the Sun revolves around the Earth or the Earth revolves around the Sun. Also, similar models - but what's the difference! So, the Ritz model is simpler and more natural than the Maxwell and QED models. If Maxwell's model is erroneous, inadequate to reality, then Ritz's model meets both physical and life experience (common sense). Since Ritz reduced all electrical effects to the emission and collision of particles, his model was for the electrodynamics of the same as molecular kinetic theory (MKT) - for thermodynamics. MKT reduced pressure, thermal, diffusion, and sound processes to the motion of atoms. And Ritz explained electrical, magnetic and light processes by the movement of rheons. Thus, it is rheons and arheons that are so far the smallest particles and perform the functions of ether not only as the quintessence, - the fundamental principle, the building material of the universe (elementary bricks from which all bodies and particles are composed), but also as a primary source, a carrier of all known types of interactions (strong, electromagnetic, weak and gravitational, § 3.16), being, in fact, also cement, which binds to each other and separates from each other the particles-bricks of the universe.

KEY IDEAS OF PART 3

1. The magnetic model of the Ritz atom back in 1908 classically explained all the features of the spectrum of hydrogen and alkali metals as a result of oscillations of electrons in the magnetic field of an atom near stable positions. This makes it possible to abandon the planetary and quantum model of the Bohr atom.
2. The classical Thomson-Lenard model of the atom, representing the atomic skeleton as a set of charges coupled into pairs, forming a bipyramidal structure, makes it possible to explain the structure of electron layers and chemical properties of atoms, their relationship with spectra and position in the periodic table.
3. The Ritz magnetic model of the atom, being combined with the Thomson model of the atom, classically explains the splitting of lines by the Zeeman and Stark effects, as well as a number of subtle features of the spectra.
4. The classical model of the atom establishes a connection between the structure of the

atom and the structure of the nucleus, thanks to the general principle of packing electrons and nucleons in the bipyramidal framework, naturally explaining the magic numbers of nucleons.

5. Thomson's idea of the crystal structure of the atom makes it possible to establish the structure of protons, neutrons and other elementary particles formed from two or three types of mesons, in turn formed from electrons and positrons bound into a crystal lattice. Hence, the values of the masses of elementary particles, their lifetimes and other properties naturally follow, as well as a certain analogue of the periodic table for them.
6. The crystal model of particles and Ritz's theory explains nuclear (strong and weak) interactions as particular manifestations of the electric. That is, all types of interactions (including gravitational) are reduced to one - electrical, which in turn is reduced to mechanical.
7. It follows from Ritz's theory that matter is conserved in nuclear reactions, and the decays of particles turn out to be not spontaneous, but induced by an external source, for example, by the impact of rheons. This allows us to revise a number of nuclear experiments, which were considered to be a confirmation of the theory of relativity and a refutation of Ritz's theory, in favor of the latter.
8. The Ritz model of the electron allows for the first time to investigate the subelectronic stage of the universe, to find out the nature of the inertial mass of the electron, the mechanism of generation of its magnetic moment and spin, to establish the structure of the electron and positron, the nature of matter and antimatter, as well as the reason for their asymmetry.

Part 4.

ELECTRONICS AND PHYSICAL CHEMISTRY IN BTR

The day we learn what electricity is will probably be an even greater event in the annals of mankind than any other occurrence reflected in our history. The time will come when comfort, perhaps even the very existence of a person, will depend on this wonderful phenomenon.

Nikola Tesla [110]

Having visited the mega- and microcosm, we will return to the usual terrestrial macrocosm in order to explain the phenomena and patterns discovered here on the basis of Ritz's Ballistic Theory. Part 3 showed that the classical theory of Ritz clarifies the geometric structure and properties of elementary particles, atoms. Now, it's time to apply this knowledge to large associations of atoms and explain the structure of matter, the properties of material media, in order to create not a quantum, but a purely classical theory of a solid, especially for the phenomena of radiation, photoelectric effect, heat capacity, electrical conductivity and superconductivity. As we will see, the classical picture of these phenomena is not only possible, but also the most natural, simple and accurate.

In particular, the absurdity of the hypothesis of particle-wave dualism and the Heisenberg uncertainty principle, which make a fog into our ideas about the microcosm, will be shown. The fact that in quantum mechanics the atomic world, electrons are blurred, clouded, and allows scientists, taking advantage of such uncertainty, to "create" in the microcosm whatever they want, accepting the most absurd hypotheses and pictures of phenomena. It is in the muddy water of quantum darkness and blur, in the fog of mathematical formulations "good fish is caught", manipulations, manipulations and substitutions, which initially contradict common sense, are less noticeable - you can create complete chaos, and no one will grab the scientist by the hand. Therefore, in the micro-world, they strive to accustom us to the idea that our common sense is useless here, to which we usually appeal when resolving controversial issues and contradictions. For this reason alone, the quantum theory should be recognized as false. And only the absence of a classical picture of phenomena so far did not allow rejecting their quantum picture.

Nevertheless, as we will show in this part, all the effects, supposedly proving the principle of uncertainty, the wave properties of particles and the corpuscular properties of light, have a simple classical explanation, often even more accurate and comprehensive than their quantum interpretation. Only the classical theory of matter and radiation makes it possible to correctly understand their properties and control them, creating materials with the desired properties. There is no quantum fog and blur in the microcosm, but strict, classical determinism reigns. No wonder our famous physicist A.A. Vlasov, an expert in optics, thermodynamics, electrodynamics and plasma physics, who wrote the kinetic equation of the same name [25], argued that the triumph of quantum theory, praised by ignoramuses, in explaining the phenomena of the

microworld, the properties of gases, liquids and crystals, is greatly exaggerated. Quanto-relativists only guessed or imitated some phenomenological laws and rules of thumb that did not reveal the nature of phenomena and did not allow one to advance further by the methods of "typing", selection and plagiarism. Therefore, it is urgently necessary to establish the true, deep, classically determined laws of what is happening.

Such a classical understanding of electrical and other phenomena in environments turns out to be important not only in theoretical and worldview terms, but, most of all, in practical terms. As Tesla correctly noted, it is the understanding of the nature of electrical phenomena that is of paramount importance for humanity. And, just, the ballistic model adopted by Tesla makes it possible to achieve such an understanding. It is not in vain that ballistic terminology is so widespread in the macrocosm of electrical devices: a battery, an electron gun, a ballistic galvanometer, a Gauss gun, an inertialess ballistic transistor, a bolometer. The word "battery" also came to us from artillery, where a battery (from the French "beat", of the same root and the word "battle") refers to a group of periodically located artillery pieces of the same type. Likewise, periodically dislocated power centers - atoms of the same type in a crystal, or electrons with positrons in an atom, are lined up in batteries that shoot rheons and areons. Finally, all vacuum and microwave electronics: lamps, klystrons (§ 2.11), gyrotrons, magnetrons, etc., also work on ballistic principles, that is, on the free or controlled flight of an electron beam fired by an electron gun. It is ballistics that turns out to be the key to electronics. It is no coincidence that V. Gaponov's well-known course "Electronics" opens with the chapter "Electronic ballistics and electronic optics" [36]. It remains to introduce ballistic mechanical principles into the very theoretical foundations of phenomena, which will lead to a tremendous breakthrough in this area. So, the most important task now is to create high-temperature superconductors for the transmission of electricity over long distances and the construction of economical transport. There is an urgent need for cheap efficient and environmentally friendly power generators, such as solar panels. In solving these problems, it is Ritz's ballistic theory that offers, in spite of quantum mech, an adequate classical picture of phenomena, invaluable help. And, after all, there is nothing more practical than a **good** theory.

§ 4.1. Ritz and the problem of blackbody radiation

Fundamental difficulties in the theory of black body radiation lead us not so much to introduce, together with Planck, a particle of energy-time, but rather to the requirement to restore, using the principle of least action, the principle of determinism of natural processes violated by modern electronic theory in the spirit of classical mechanics so that the known finite number of specified factors was sufficient to determine the process of motion of the system of electrons at any moment of time.

Walter Ritz, "On the foundations of electrodynamics and the theory of radiation of an absolutely black body" [9]

The history of quantum physics began with Planck, a scientist who was a supporter of classical views and did not expect that his ideas would lead to the abandonment of classical physics and become the foundation for absurd

quantum mechanics. Planck came to the idea of light quanta by investigating the mechanism of radiation of heated bodies. Planck first empirically selected a formula to describe the emission spectrum of a black body, which was in good agreement with the experimentally measured dependence of the spectral intensity on the frequency of light. Trying to give a physical interpretation of this law, Planck came to the idea of the quantum structure of light. However, Planck's law can be easily explained also classically, within the framework of wave concepts of light, if the process of thermal radiation is correctly interpreted.

Indeed, Planck's original idea did not contradict classical physics. Planck simply showed that the law of thermal radiation discovered by him is easily obtained if we assume that the energies E of atomic oscillators (electrons vibrating in atoms) do not take on all possible values, but are rigidly related to the frequency f of oscillations of an electron that emits, like any vibrating charge, light of the same frequency f . This relationship is expressed by the well-known formula $E = hf$, where the quantity h , called Planck's constant, was called the elementary quantum of action. Previously, it seemed that within the framework of classical physics it was impossible to obtain such a connection, because the energy of an oscillator, say, a load on a spring, as is known, can take on very different values at the same frequency of oscillations of the load. Therefore, a quantum hypothesis was put forward, according to which light is emitted in portions, in the form of energy quanta $E = hf$. But, in reality, such a relationship between frequency and energy, as seen (§ 3.3), is easy to obtain in the framework of classical physics, if we accept the Ritz magnetic model of the atom. In the magnetic field of the bipyramid atomic core, an electron spinning with a frequency f has just the energy $E = hf$, where the value of h , based on the data on the radius and magnetic moment of the electron, is exactly equal to Planck's constant. And, therefore, the Planck law of radiation naturally arises in classical physics, since it directly follows from the relation $E = hf$. Let us examine in more detail the mechanism of thermal radiation and Planck's law.

Thermal radiation, as it was found out, arises from the absorption of electrons by atoms. When an atom of a metal or gas captures an electron, it begins to rotate in the atom, emitting at the frequency of its rotation $f = E/h$, where E is the energy of the electron absorbed by the atom.

Electrons, like any other particles at temperature T , obey the Maxwell distribution. That is, the fraction, the concentration of electrons with a velocity V is $n \sim E e^{-E/kT}$, where $E = MV^2/2$, and M is the electron mass. The spectral energy density u (the energy emitted at a given frequency f) is proportional to NE , where N is the frequency of electron capture of energy $E = hf$ by atoms. For fast, high-energy electrons, the frequency of collisions and captures is determined by their concentration n and velocity V , much higher than the velocity of atoms: $N \sim nE$. As a result, the energy radiated by an atom at frequency f will be $u \sim E^3 e^{-E/kT} = (hf)^3 e^{-hf/kT}$, which coincides with Wien's law of radiation and with Planck's formula for high frequencies. Low frequencies arise from the impact of slow electrons with low energy. The velocities of these electrons are less than the average velocity of the atoms, and the frequency of

their collisions and captures no longer depends on the energy E , but is determined by the velocity, the energy of the atoms $N \sim nkT$. Therefore, the energy emitted by an atom at low frequencies is $u \sim E^2 kT e^{-E/kT} = (hf)^2 kT e^{-hf/kT}$ or $u \sim (hf)^2 kT$, if we take into account the proximity of $e^{-hf/kT}$ to unity. But this is the Rayleigh-Jeans formula or the Planck formula for low frequencies (Fig. 144)!

So, Planck's formula has a classical explanation in both limiting cases. The criterion for the transition between them gives the ratio of the thermal energy of atoms and electrons, - the ratio of the energy kT and $E = hf$. For $kT \gg hf$, we obtain the Jeans formula, and for $kT \ll hf$, the Wien formula. The intermediate case can also be calculated, and it will give a close but inexact match with Planck's formula. But, after all, and it is not entirely accurate, sometimes giving noticeable discrepancies with experience, although this is explained by the fact that there are no absolutely black bodies in nature.

So, the radiation spectrum of a black body can be easily explained within the framework of the classical Ritz theory. This means that the foundation of quantum physics has been undermined. After all, quantum physics was invented precisely because the classical one could not explain the spectrum of black body radiation and led to an ultraviolet catastrophe - radiation at high frequencies of infinite

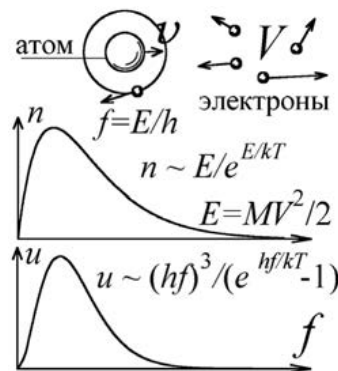


Fig. 144. The Maxwellian distribution of electrons $n(E)$ goes over into the Planckian $u(f)$. The frequency of the capture of electrons by atoms depends on their mutual velocity ($v-V$), which in extreme cases is equal to v or V .

energy. Physics was saved from ultraviolet catastrophe by Planck's law and its quantum interpretation. But later it turned out that quantum physics and electrodynamics give rise to even more divergences and infinities: "what we fought for, we ran into it"! And, the funniest thing is that the radiation energy of a black body at high frequencies was infinite in quantum mechanics. Following it, to the radiation at each of the frequencies it is necessary to add the energy of zero-point vibrations $hf/2$, which tends to infinity, with increasing frequency f . So we returned to the ultraviolet catastrophe of the classic Rayleigh-Jeans law.

All this does not harm Planck's formula, but speaks of the falsity of the current quantum interpretation of this formula. Not in vain, Planck called for careful handling of quanta, which he introduced as a formal device, believing that the law of radiation discovered by him could be explained within the

framework of classical physics. Ritz said the same in his dispute with Einstein (see epigraph). He linked the ultraviolet catastrophe with an incorrect description of the radiation process and the viciousness of Maxwellian electrodynamics. As if anticipating the coming quantum-mechanical shocks, Ritz pointed out that the main problem in the theory of blackbody radiation is in the incorrect description of the motion of electrons in metal and atoms, in its uncertainty. Maxwell's equations and Lorentz's theory are too ambiguous, that is, they admit a large number of physically impossible solutions. If appropriate restrictions are imposed, including the condition of retarded potentials (in fact, the classical principle of causality, determinism) and the relationship between the oscillation frequency and the electron energy proposed by Planck, then the Planck law of radiation will turn out by itself within the framework of the classical approach. A series of four articles is devoted to this issue, including Ritz's suicide article, where he fought with Einstein himself (Fig. 23), who stood up like a mountain behind Maxwell's electrodynamics and thermodynamic irreversibility [6, 146, 161].

And, exactly, as shown above, Planck's law is fully explainable classically and is associated with the deterministic frequency of the revolution of the electron, with discreteness, discontinuity, but not of light, but of matter and radiation itself, consisting of separate acts. Indeed, in thermal radiation, each act of radiation and absorption of light is associated with the movement in the orbit of an individual electron, captured by an atom or emitted from it. It is noteworthy that even at the beginning of the XX century, Ritz noted that it is Maxwell's theory that contradicts classical mechanics and the principle of causality, determinism in physics. And, therefore, not Newton's mechanics, but Maxwell's theory is responsible for the crisis of science at the beginning of the 20th century, in connection with the problem of Michelson's experiment and the law of black body radiation. As Ritz rightly noted, it is Maxwell's theory, which contradicts classical mechanics and deprives the field with matter of a clear corpuscular structure, that is responsible for the emergence of the theory of relativity and quantum physics. These absurd theories are an inevitable consequence of Maxwell's equally absurd theory.

The fact that the energy E of oscillations, the spinning of an electron in an atom, is related to the frequency f of its revolution, is also confirmed by the photoeffect: the outer electron of an atom, falling from its orbit under the action of light of frequency f , when it leaves the metal, has the energy $E = hf$ (§ 4.3). Planck sought to return physics to the classical track, fighting for the correct interpretation of his ideas in the framework of the discrete properties of electricity, atoms, and not light. Ritz's atomic model made it possible to achieve this. The model explains not only how a continuous and linear spectrum of radiation of heated bodies is born, but also why bodies emit more intensely, the higher their temperature.

Heating leads to an accelerated movement of atoms. The strength and frequency of their collisions are growing, the jolts induce the inner and outer electrons of the atom to whirl and radiate more intensely, generating, respectively, discrete and continuous spectra. External electrons are more often

detached from atoms and, having gained additional energy in collisions, radiate it in the form of a continuous spectrum when captured by other atoms (Fig. 145). This phenomenon, referred to as the "inverse photoelectric effect," also gives rise to a continuous X-ray tube spectrum [134]. However, in a gas, atoms are distant from each other, they rarely lose and absorb electrons. Therefore, gases, in contrast to incandescent solids, with their continuous spectrum, have a brighter discrete, line spectrum, the nature of which was analyzed above (§ 3.1). Only in an extended stellar plasma do electrons move freely and in large volumes of gas often collide with atoms, generating a continuous spectrum, no worse than solids. Note that quantum physics is unable to explain the continuous spectrum of radiation from the Sun and stars.

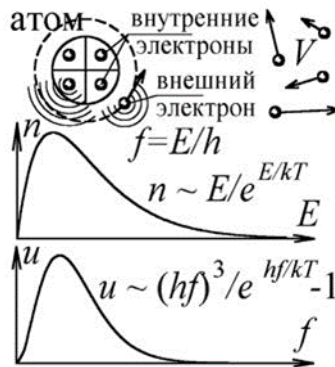


Fig. 145. Generation of continuous and line spectrum, respectively, by external and internal electrons. Maxwellian electron energy distribution E , which transforms at $E = hf$ into the Planck distribution over the spectrum intensity.

It is interesting to note that as early as 1750, M.V. Lomonosov in his work "Reflections on the cause of heat and cold" (§ 4.15) linked the thermal properties of bodies with the rotation of their particles, which becomes more and more intense with increasing temperature, which causes the body to radiate more and more heat. Thus, Lomonosov not only predicted the existence of spinning electrons in atoms, but also guessed that it was their spinning that was responsible for the thermal radiation of bodies. The classical explanation for the blackbody radiation spectrum is just the first brick removed from the foundations of quantum theory and built into the building of classical physics. As we will show below, all the other foundation bricks: the photoelectric effect, the Compton effect, the Franck-Hertz experiment, etc., have nothing to do with the quantum concept, in the building of which they are unreliable, however, they fit neatly into the framework of classical physics.

§ 4.2. Are there photons - quanta of light?

If beer is always sold in bottles containing a pint, it does not follow at all that beer consists of indivisible parts equal to a pint.

A Einstein on the difference between the photon and Planck hypothesis [73, p. 147]

The question of the nature of the wave properties of light was discussed earlier (§1.12). Now the time has come to discuss the nature of corpuscular manifestations of light and show that a light wave cannot be a particle, just as a particle cannot be a wave. But, after all, earlier we argued that, according to the

BTR, light is a stream of rheon particles. And it turns out that light is not a particle? That's right: one particle is not yet light, just as one, two, and even three nuts are not a heap. According to Ritz, light is a wave carried at the speed of light by a stream of many rheons. In other words, there are no quanta of light in the armored personnel carrier - photons, but there are quanta of electric impact - rheons. How, then, can one explain the existence of photons - particles, each of which can generate light by itself? Below we will show that the concept of photons arose as a result of an error.

First of all, there is nothing strange about the emission and absorption of light by standard portions. It is quite natural that atoms similar, like two drops of water, will emit energy in the same portions, like radio transmitters of the same type, sending standard pulses in the form of "dots" and "dashes". It can be seen that atoms are arranged in such a way that, like a radiotelegraph, they emit only a discrete series of energies and, like radio stations, in a discrete frequency range. Many scientists have tried to uncover this internal mechanism of the atom. The greatest success in this was achieved by the unsurpassed master of creating models, Walter Ritz, as shown above (§ 3.1). The atomic mechanism proposed by him made it possible not only to explain the discontinuous nature of the emission spectrum of an atom, but also to find the entire range of frequencies generated by the atom. In these models, there were no photons and quantum transitions, on the contrary, light in the form of ordinary electromagnetic waves was created by classical oscillations of electrons in an atom.

As you know, the history of photons, light quanta, began with the discovery of radiation quanta by Max Planck. He first started talking about quanta when faced with the problem of blackbody radiation. The problem was that the classical theory incorrectly described the radiation spectrum of heated bodies, say, a red-hot filament in a lamp. Max Planck solved this problem by assuming that the energy E of an oscillator, an oscillating electron in an atom, is not arbitrary, but rigidly related to the frequency f of its oscillations, according to the formula $E = hf$, where h is Planck's constant. But Planck's idea was misinterpreted, believing, for some reason, that quantization is associated with the light itself, and not with the atoms emitting it, inside which electrons vibrate. Although the fact that the quantum properties of light are manifested only when it interacts with matter, said that the whole point is in the atomic mechanism, and not in light.

It is interesting that Planck himself, introducing the concept of quanta, relied on the views of Boltzmann, who, as he defended the kinetic theory of gases and the atomistic concept, like Ritz, realized the fallacy of Maxwell's theory, which operates with continuous quantities. Boltzmann pointed out that an element of discontinuity should be introduced into Maxwell's equations, taking into account the discreteness in the interaction of the field with matter and due, according to this physicist-atomist, to discreteness not of energy, but of matter, consisting of standard atoms and other particles. Essentially, Boltzmann predicted the Ritz's rheons, noting that the electromagnetic effect should be quantized. And these were precisely the quanta of electric impact (rheons), and

not quanta of light, energy (photons). The meaning of the term "quantum" was originally closer to the concept of "atom", therefore Boltzmann, Thomson, Planck, Stark and others talked about quanta of matter (atoms), quanta of electricity (electrons), that is, about real particles. And only through the fault of Einstein, Bohr and, in part, Planck himself, the concept of a quantum began to be interpreted from the standpoint of energetism (§ 5.14), in the form of discrete portions of energy, and not matter or electric impact.

However, Planck himself did not at all believe that in the process of radiation and absorption of energy quanta by atoms, some particles-bunches of light, photons appear and disappear. He only said that atoms give out electromagnetic energy in dosed, standard portions. And, more specifically, he argued that the energy E of an electron in an atom is proportional to the frequency of its oscillations f with a coefficient of proportionality h , - Planck's constant: $E = hf$. But it would be foolish to think that the light spreads, being collected in these portions. It's like thinking that when the same radio transmitters emit standard "dots" and "dashes" in pulse energy, these impulses propagate in the form of particles, in the form of separate "dashes" and "dots", each collected at its own point space. It is clear that the pulse of radio emission diverges in all directions at once - in the form of a wide spherical wave.

Deriving his law of radiation, Planck did not at all consider light to be composed of quanta, photons, but admitted that atoms give off energy in portions, and each portion is uniformly scattered in all directions. Planck believed that light is a wave, and discreteness arises only when light is emitted and absorbed [73, 83]. That is, the Planckian law of radiation is caused not by the granular structure of light, but by the discreteness of matter and the process of radiation, which is a set of elementary acts associated with a change in the states of electrons in individual atoms.

This difference between Planck's quanta and Einstein's photon hypothesis was illustrated by the latter in the form of a beer analogy (see the epigraph to §4.2). And, indeed, the dosed nature of light emission and the connection between the frequency of electron vibrations and the energy of these vibrations, discovered by Planck, in no way mean that light propagates and exists in the form of these portions - abstract photons proposed by Einstein.

The same is with the absorption of light. So, S.I. Vavilov studied such weak streams of light that, after adaptation of the eye to darkness, the light was either observed or disappeared [82]. At the same time, according to the experimenter, the eye recorded individual photons - then light was observed. However, this experiment does not yet speak about the discrete structure of light, but demonstrates the peculiarity of our vision. Similarly, if one tries to hear a faint sound source in complete silence, say, the ticking of a wristwatch, its sound will disappear and appear [95]. Fortunately, no one concluded from this that sound is discrete and consists of sound quanta, otherwise, and this could be interpreted as confirmation of the phonons invented by I. Tamm. It's just that when the ear is working at the limit of audibility, the sound is indistinguishable in volume. It is either audible or not - it depends on the threshold of sound perception and the tension of attention. Likewise, the eye is a device with a threshold of sensitivity:

the eye either sees a weak source or it does not. It's all about the discreteness of perception, not the light itself. Trying with the help of our crude instruments to detect the discreteness of light (photons) is as foolish as trying to notice the discreteness of mass (atoms) with digital scales. When weighing a small mass (for example, a gram weight), the balance readings jump down to zero, changing to a discrete mass threshold, which is usually 1 gram. But, after all, this does not mean that the scales register individual "atoms" (weighing 1 gram!) Or in general the action on the weight of individual quanta of gravity (the notorious gravitons). It's just that the values and changes in mass, which are less than a certain threshold, are, in principle, not able to distinguish and show the scales. The whole reason is in the discretization of values by a measuring device (balance, eye, detector), and not in the discreteness of the value itself.

The same situation, if you use not an eye, but a photographic film, a photomultiplier, a photodetector, a Geiger counter (gamma radiation detector) as a recording device. Any of them has a sensitivity threshold. And a small random variation of a weak light flux or sensitivity threshold is enough for this threshold to be exceeded - then the device registers light, otherwise, there is no signal. The threshold of sensitivity is caused by the fact that the reaction of absorption of light occurs at the atomic, molecular level. So, in a photomultiplier and a Geiger counter, the act of registration begins with one electron escaping from an atom that has absorbed light due to the photoelectric effect (§ 4.3). This electron, being accelerated by an electric field, gives rise to an avalanche of electrons, which is registered (Fig. 146). Likewise, in photographic film: a crystal of silver bromide decays starting from one molecule that has received enough energy from the light. This decay entails a chain (avalanche) reaction of the decay of all the molecules in the crystal. That is, the discreteness of the absorption act is associated not with the discontinuous, granular structure of light, but with the sensitivity threshold, the granularity of the receiver, film. And the eye and the device, in principle, is

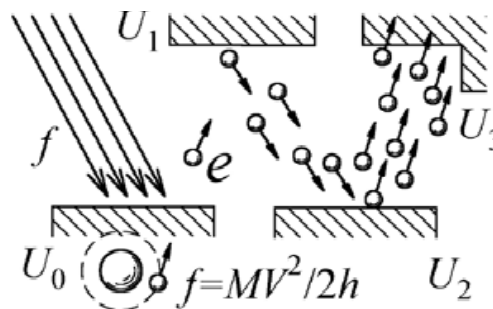


Fig. 146. Cascade, avalanche process - the basis of sensitive light detectors. In a photomultiplier, the fall of light of frequency f leads to the ejection from the atom of an electron spinning with frequency f . He gives rise to an avalanche of electrons.

not able to distinguish between low light intensities: they either register a signal or not. Scientists, however, interpret this as if the photon is either absorbed or not.

The following experience is indicative in this respect. A screen with two thin slits is placed in the path of the laser beam, due to which a usual interference

pattern from two slits appears on the photographic plate (Fig. 147). After that, the laser beam is attenuated with the help of filters so that the photodetector no longer registers a continuous stream of light, but individual pulses, which are believed to be caused by individual photons entering the detector. But, although the photons follow each other extremely rarely, the same interference pattern appears again on the photographic plate. It turns out that each photon that creates a separate illuminated grain on a photographic plate (from such grains an interference pattern is formed over time) passes through both slits at once (otherwise, where does the interference come from?). That is, a photon has contradictory properties - it is smeared over space and, at the same time, is collected at one point (where it is recorded by a photographic film or photodetector). Scientists cannot explain this contradiction and say that man simply cannot understand our world.

But, in fact, everything is simple: you just need to abandon the hypothesis of photons and accept Ritz's idea, according to which light uniformly diverges in all directions, in the form of a continuous stream of particles with a periodic, wave distribution in space. Such a flow, even when weakened, contains myriads of particles and retains wave properties leading to diffraction and interference (§ 1.12). Therefore, an interference pattern is always formed on the screen. However, low light intensity leads to the fact that atoms and molecules in the registering device do not receive sufficient energy for the registration act. And only at rare moments, at rare points, due to random variations, fluctuations of the rheon flux (including due to diffraction by thermal inhomogeneities in the air), - the energy of the wave carried by them turns out to be higher than the threshold one. Then rare pulses appear in the photodetectors, and rare dark dots appear on the photographic plate. Similarly, if you build several identical houses of cards

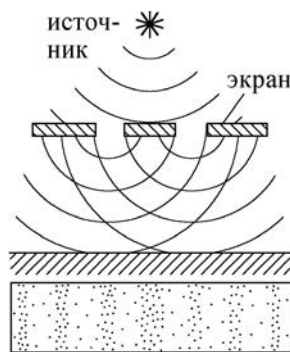


Fig. 147. Although light diffracts at the slits like a wave, the image on the photographic plate consists of grains, as from the fall of individual photons.

on the ground, then a very weak gust of wind can knock down only a few of them, avalanche decaying, starting with a single card. But this does not mean that the wind flow is quantized, but only means its random fluctuations, eddies on obstacles. And discreteness is associated with discrete acts of wind registration: a house of cards cannot fall apart in half: it either stands or falls apart entirely. In the same way, a weak flux of light leading to an avalanche

decay (starting from one molecule) of individual photographic grains is not quantized, but undergoes random variations from diffraction at obstacles, and therefore affects only individual grains: the registration process turns out to be probabilistic, random.

This is especially pronounced when registering gamma radiation, the source of which is rare atomic nuclei and microparticles, which is why the energy of individual radiation events is low. As a result, only occasionally the Geiger counter registers radiation, which is interpreted as falling into the detector of individual gamma quanta. In fact, the source always emits gamma radiation in all directions at once, in the form of a spherical wave, and not gamma rays, as confirmed by the Mössbauer effect (§ 3.7). And the operation of only one or two of the many counters is due to the low power of the radiation and its fluctuations. This can be seen in the annihilation of an electron and a positron, which gives rise, according to quantum theory, to two gamma quanta (§ 1.16, § 3.13). But, in fact, only two detectors do not always register radiation at the same time: occasionally three detectors are triggered at once, even less often - four, which quantum theory cannot explain. The reason is the formation of a spherical wave of gamma radiation (Fig. 42), weakly acting on the detectors, which is why the chance of triggering many counters at once, for which the sensitivity threshold will be accidentally exceeded, albeit small, but not equal to zero.

As you can see, the discontinuity in the registration of light is associated with its small fluctuations, random fluctuations in brightness, which for a weak signal are comparable to the signal itself and the sensitivity threshold. What caused these light fluctuations? The point here is not the fluctuation of the brightness of the source, but in the intermediate medium, air, small thermal fluctuations of the density of which lead to scattering and diffraction of light, due to which the brightness at each point of the screen constantly and randomly changes, which is also caused by the trembling of the laser with the screen. These small fluctuations were indeed discovered, say, in the Brown-Twiss experiment, but, by mistake, were interpreted as fluctuations in the number of photons in a light beam [82]. These random fluctuations in brightness are especially noticeable in a monochromatic laser beam: the laser spot on the screen breaks up into hundreds of flickering dots (speckles), which makes the radiation appear grainy. But, as has been shown, this is not caused by the graininess and discreteness of light, but by its small fluctuations in an inhomogeneous medium. Similarly, thermal fluctuations, turbulence in the Earth's atmosphere lead to flickering of the light of stars, rapid fluctuations in their color and brightness (§ 2.11). Note that the supporters of photonic theories wanted to interpret this phenomenon as a confirmation of the discrete structure of light: as if the light of stars is so weak, and photons follow so rarely that we see separate quanta of different colors only at the moments of their exact hitting the photoreceptors - that's why flickering (here quantorelativists again followed the path of Aristotle, who explained the flickering of stars by the weakness of their light rays, which supposedly tremble from low brightness and often fly past the eye). But, fortunately, the connection between the twinkling of stars and

the excitement of the atmosphere has been proven so reliably that the photonic explanation has no chance.

The first "quantum leap" in the concept of light as photons occurred with the publication in 1905 of Einstein's work on the photoeffect and light quanta. F. Lenard, investigating the photoelectric effect, discovered that in this process of "pulling out" electrons from the metal surface by light, the velocity V of the emission of electrons depends not on the intensity, but on the frequency f of the light that knocked them out. Hence, Einstein concluded that light energy, not only when interacting with atoms, but also in all other processes, is emitted and absorbed only in portions, quanta. So, an electron of mass m , absorbing light, acquires the energy $mV^2/2 = hf$ of one quantum. That is, Einstein, in contrast to Planck, considered quanta to be real particles, photons, in the form of which light propagates, although, according to Planck, the release and absorption of light (or beer) in portions does not yet prove that light consists of quanta (and beer - of indivisible portions).

The next came Bohr, who did not associate the process of radiation and absorption of light by an atom with the oscillations of an electron in it, and, therefore, with electromagnetic waves. Bohr simply accepted that the electron abruptly changes its energy, giving or absorbing its difference in the form of a quantum of light. All this, coupled with the rejection of the ether, gradually led to the idea that light is not just an electromagnetic wave, but a particle, a photon, in the form of which light is not only emitted and absorbed, but also spreads. At the same time, no one thought to deny that light is a wave. Thus, doublethink, ridiculed by J. Orwell in his novel "1984", and hidden in physics under the serious scientific term "particle-wave dualism", entered into science. Following it, any wave must be simultaneously considered a particle and, on the contrary, pretending that, in fact, there is no contradiction here.

Scientists have always been confused by the inability to interpret the wave-particle duality of light, which is simultaneously capable of interfering and causing quantum effects. Realizing the absurdity and ambiguity of this provision, they noted that they have to consider light as a wave on Mondays, Wednesdays and Fridays, and as a particle on Tuesdays, Thursdays and Saturdays. This question is so inconvenient that some scientists, for example Feynman, simply shouted in response: "Don't think, but bump into your head that this is so!" Likewise, Landau, when his students asked him such questions, called them fools and snapped back with the phrase: "Shut up, you fool, do not arise and do as they say!" This despair and impotence of scientists in explaining the contradictory properties of light is the best evidence of the fallacy of quantum physics and Maxwell's electrodynamics. Instead of promoting understanding, reflection, we are called in the "best" traditions of religion to believe, because it is absurd. As a result, everyone who professes a non-classical model of the world develops an inferiority complex: they see that they simply cannot understand the nature of light, they realize their dementia and, therefore, are extremely irritated when they are asked such uncomfortable questions that they would like to forget altogether. [111]. However, Einstein himself, by the

end of his life in 1951, honestly admitted that he could not explain what light and light quanta (photons) are.

In particular, the quantum theory cannot explain the presence of group and phase velocities in light, since photons, according to Einstein's theory, always move with the same velocity c . It is also unclear why the light changes its speed, falling into the refracting medium, although the speed of the photons does not change. All these phenomena, as well as the phenomena of propagation of radio waves, can only be explained by the wave theory of light. Only due to addition, interference of light emitted by different emitters, including scattered by atoms of the medium, leads to a change in the phase speed of light, despite the movement of light-carrying rheons with a constant speed c (§ 1.12).

So, a wave or a particle is still light? As follows from a wonderful book on the nature of light [83], this issue is already hundreds and thousands of years old. Perhaps, Democritus and Lucretius were the first to seriously ask them, and, two millennia later, I. Newton. No wonder our famous physicist S.I. Vavilov considered their ideas so relevant that he translated into Russian certain fragments of Lucretius's poem "On the Nature of Things" [77] and Newton's treatise on optics [89]. Back in the 17th century, Newton tried to combine wave and corpuscular concepts of light, but without deceiving dualism. He assumed that light, propagating in the form of corpuscles, creates them by impacts of vibrations of the atoms of the medium emitting new corpuscles [89, p. 282]. This makes Newton's views related to the electronic theory of Lorentz, in Ritz's view. Indeed, according to Ritz, the vibrations of electrons create a flux of particles that is variable in strength and direction (Fig. 29, Fig. 30), the impacts of which make other electrons vibrate, creating, in turn, secondary waves - streams of rheons. Moreover, according to the correct remark of Vavilov [31], already the ancient atomists - Democritus, Epicurus and Lucretius, represented light in the form of successive wave fronts carried by a stream of the smallest particles, exuded by objects at a tremendous speed (see Part 1, epigraph). And the followers of atomists, Newton and Lomonosov, even foresaw the discovery of electrons when they talked about the atoms of the medium vibrating under the influence of light and transmitting it further, due to the ejection of new luminiferous particles.

Let, however, criticism of the photonic, corpuscular theory of light do not force the reader to go to the other extreme and accept the idea of light as waves in a motionless medium, ether. According to BTR, light is neither a wave in a medium, nor a particle, and not even a wave-particle (as in quantum mechanics). According to Ritz, light is a wave carried at the speed of light along with a stream of particles, as if "frozen in" into it. The same wave occurs if you fire a burst from a machine gun, quickly driving them from side to side: the bullets form a wave-like chain in space, moving at the speed of bullets (Fig. 22). It is precisely this form of propagation of light, carried by particles, and, at the same time, with wave properties, proposed by Ritz, that many scientists from Newton to Vavilov tried to find [83]. It turns out that Democritus and Lucretius were right, who were able to guess not only about the particles of bodies (atoms), but also about the luminiferous particles emitted by them. And these

particles are not photons (quanta of light) at all, but rheons - grains, quanta, atoms of electric impact, having a standard mass.

As seen above, the ether hypothesis is as groundless as the photon hypothesis (§ 3.21). Light is not really a wave, and not really a particle. Likewise, the periodic bunches-rarefaction of electrons in the klystron (§ 2.11) cannot be called simply a "stream of particles" (these are huge accumulations of particles ordered in space), and cannot be called "waves in a medium". Let not all experiments have been explained without attracting photons yet, but the myth about the omnipotence of quantum theory and the complete helplessness of classical physics in the interpretation of "purely quantum" effects has been destroyed. So, now it will not be long to wait for the complete solution of the problems of classical science. It seems that it is precisely the classical view of "quantum" phenomena that will finally make it possible to solve such important problems of physics and technology as the problem of creating solar cells with high efficiency and high-temperature superconductors, where quantum mechanics is powerless to help.

So, particles always remain particles, and waves always remain waves. Therefore, it makes no sense to double-book particle waves (§ 4.11). Our world is simple and clear. And only unwillingness or inability to understand the essence of what is happening, in the nature of phenomena, prompts scientists to invent confusing theoretical schemes. These schemes contradict Occam's principle, because they introduce so many new, absurd, out of nowhere assumptions that their chance of being correct is negligible. Ritz also warned that new complex hypotheses should not be accepted as long as there is no certainty that simpler and more natural ones have been exhausted. Occam's sharply honed razor should be the main tool of the scientist. It is it which allows you to cut off everything superfluous, mystical, absurd and separate particles with waves.

§ 4.3. *Photoeffect*

In such a situation, it is natural to assume that the source of energy of electrons detached from the metal is still not in the rays, but in the metal itself. As for the rays, they only release it, serve as a kind of fuse - after all, one spark is enough to blow up a keg of gunpowder

...

Max Planck on the photoelectric effect, 1919 [83, p. 143]

One of the first evidence of the corpuscular properties of light was provided by the photoelectric effect, that is, the emission of electrons from a metal when it is irradiated with light. Let us recall that in 1888 the Russian experimental physicist A.G. Stoletov (Fig. 148) investigated the phenomenon of the photoelectric effect, established its nature and main laws. The phenomenon not only radically influenced the development of physics, but also entailed a lot of discoveries and inventions. All television and video cameras, digital cameras, photocells, solar panels and other devices that convert light into electrical influences and vice versa are based on the photoeffect. Modern technology is unthinkable without it. It would seem that such an important phenomenon should be studied and explained in detail. But, despite more than a century of

research history, the photoelectric effect has not found an adequate exhaustive explanation and is still fraught with a lot of mysteries.



Fig. 148. Alexander Grigorievich Stoletov (1839 - 1896).

The essence of the photoelectric effect, as Stoletov discovered, consists in the emission by a metal, under the influence of light, of negatively charged particles - electrons. The first law of the photoelectric effect, discovered by Stoletov, states: the intensity of the current of electrons (photocurrent) from the metal is proportional to the intensity of illumination. From this, it was believed, it is natural to conclude that it is light that gives energy to photoelectrons, forcing them to fly out of the metal: the more light, the more electrons leave the metal. But Stoletov discovered an amazing thing: electrons began to leave the metal instantly, as soon as the lighting was turned on [23]. Calculations have shown that the light simply would not have had time to transfer the energy required to exit the electrons [134]. Another mystery was the law discovered by F. Lenard, according to which the speed and energy E of photoelectrons depends not on the intensity of light, but only on its frequency f .

Together, these two facts - the inertialessness of the photocurrent and the independence of the energy of electrons from brightness - meant that it is not light that gives energy to electrons. And, behold, Max Planck suggested that photoelectrons receive energy from the metal itself, and light only triggers the photo-effect trigger, playing the role of a spark that causes an explosion of a keg of gunpowder, a flintlock shot, - a metal atom that shoots bullets-electrons [83]. The more light - ignition sparks, the more often shots are heard: metal more often shoots electrons. But this idea of Planck was forgotten and his other hypothesis was accepted, which he himself did not consider seriously: the hypothesis of quanta, according to which light consists of small portions, bunches of energy hf (quanta, photons), which at once give up their energy to electrons. The quantum hypothesis explains the inertialessness of the photoelectric effect and the dependence $E = hf$, but does not explain other properties of the photoelectric effect and does not fit with the wave, electromagnetic nature of light (§ 4.2).

Theoretically, light, being an electromagnetic wave, could, by making the electron vibrate, give it speed and "knock" it out of the metal. But, in this case, it is not clear why the speed of the electron does not depend on the brightness of

light, but is determined only by its frequency. In addition, experiments revealed that the energy of an emitted electron is often greater than the energy of the light absorbed by it, as if the energy was transferred to the electron by a wave not distributed in space, namely a photon, a light quantum, an energy bunch that accumulates all the wave energy in a small space [134]. So, they decided that only photons are on the shoulder to knock electrons out of metal, that's why the energy of electrons depends only on the frequency of light. And, nevertheless, the photoeffect can be explained without attracting photons and light quanta, if we accept, following Planck, that "the source of electron energy is still not in the rays, but in the metal itself." Indeed, scientists admit that the photoeffect is possible only in a metal: no one has yet observed the effect of light on a single electron in a vacuum, similar to the photoeffect. And, since a metal gives energy to an electron, then even a weak light, pressing the trigger of the photoelectric effect, is able to release electrons with enormous energy, regardless of brightness. Likewise, a weak pull on the trigger of a crossbow, ballista, - releases the huge energy stored in the bowstring, leading to the release of an arrow or a projectile.

But where is the source of this latent energy? Probably in the atom. This idea is suggested by the phenomenon of an internal photoelectric effect, a process in which bound electrons of a semiconductor, having been torn off under the action of light from atoms, no longer leave its surface, but move freely inside, reducing the resistance [74]. All photoelectronics is based on this phenomenon: digital cameras, cameras and scanners. So, it seems that with the external photoelectric effect, in reality, there is not a transfer of energy to the free electrons of the metal, but only the emission of electrons from atoms, about which many textbooks write (Fig. 149). And an electron in an atom, moving in its orbit, already initially has energy and speed. All that remains for the light to do is remove an electron from orbit. Then it, like a stone that has fallen from a sling, will fly out of the atom, maintaining the orbital speed V .

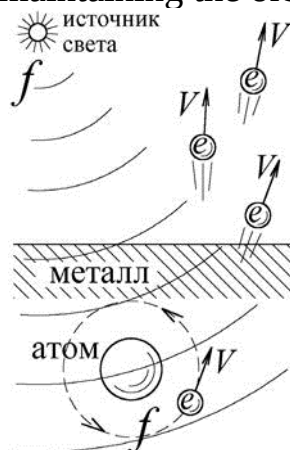


Fig. 149. The nature of the photoelectric effect.

The fact that electrons have energy from the very beginning is irrefutably proven by one little-known, and possibly deliberately hushed up effect, discovered by A.G. Stoletov, the father of the photoelectric effect. Stoletov found that with prolonged irradiation of the metal, it seems to "get tired" - the

yield of electrons gradually decreases and can completely disappear, although the intensity of the light did not change [23, pp. 385, 392]. How is it: there is light, there are electrons, but the photoelectric effect is weakening? Quantum physics cannot explain this. But, if electrons receive energy not from light, but possess it initially, then such a phenomenon is quite natural, because, over time, the energy source is depleted. Fewer and fewer atoms remain capable of "shooting", "charged" with electrons ready to break off, and that is why the photocurrent is weakening. The same phenomenon of "fatigue" was found in the internal photoelectric effect. Everyone who, through negligence, exposed the photo-matrix of a video camera or "digital camera" to the action of too bright light is familiar with this manifestation of it, which is why the operation of the photo-cells of the matrix was briefly disturbed. Like a person who blinks in a bright light, a photographic device also temporarily "blinds": the picture is distorted by "noise", "goosebumps" (this analogy of a photocell and an eye was noted by S.V. Kovalevskaya, our remarkable mathematician and physicist, as follows from the book by P. Kochina). At the moment of a bright flash, the atoms of the substance eject almost all of their stock of photoelectrons, and it must take some time before it is restored.

It is also quite natural that light of a given frequency knocks out electrons from atoms at a strictly defined speed. Light is an alternating electromagnetic field that effectively affects the electron only if the frequency of light f , with which the field changes, coincides with the frequency f of the electron's orbital revolution (and on a swing for swinging - you have to wave your legs, to the beat of the swing). An atom can be likened to a cyclotron, in which an alternating field synchronous with the circular motion of a particle is needed to act on an electron (Fig. 150).

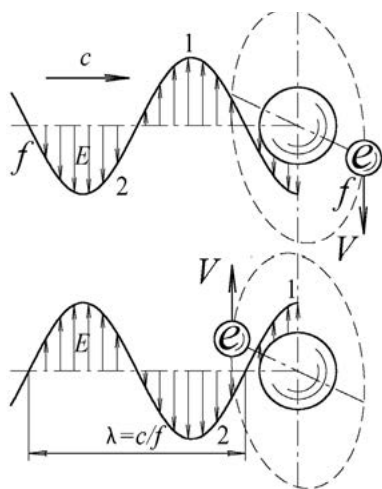


Fig. 150. Action of a wave synchronous with the circulation of an electron inside an atom.

From such an impact, the electron leaves its orbit and flies out of the atom, maintaining its orbital speed. It is clear that this velocity V is the greater, the higher the frequency of revolution was, equal to the frequency f of the light that knocked out the electron: $E = MV^2/2 = hf$. It is this dependence of energy and

velocity on frequency that follows from the Ritz magnetic model of the atom (§ 3.3).

Let us consider in more detail the fatigue of the photoeffect, discovered by Stoletov, - a decrease in the photocurrent over time, at a constant level of illumination [23]. This can be explained only by recognizing that the source of photoelectron energy is hidden in the metal. Over time, this source is depleted, as Stoletov found, the faster the stronger the photocurrent. Quantum theory cannot explain this effect. Another effect, also problematic for the quantum theory, and also discovered by Stoletov, is the temperature dependence of the photocurrent [23]. It turned out that at constant illumination, the photocurrent noticeably increases with an increase in the temperature of the metal, moreover, long before thermionic emission begins to affect. If the source of energy of photoelectrons is not in light, but in a metal, then this dependence is quite understandable: the higher the temperature of the metal, its energy, the more electrons of sufficient energy the metal accumulates.

So, light acts not on free metal electrons, but on those captured by atoms and spinning in their magnetic field, if we follow the magnetic model of the atom (Fig. 151). Such electrons already possess the kinetic energy required for escape. The incident light only changes their trajectories so that they leave the magnetic traps of atoms, retaining their original energy (unlike electrically trapping electrons, magnetic does not change their energy). Soon, other electrons take their place, gaining energy in the course of thermal motion and random collisions. The more the metal is heated, the more such electrons have

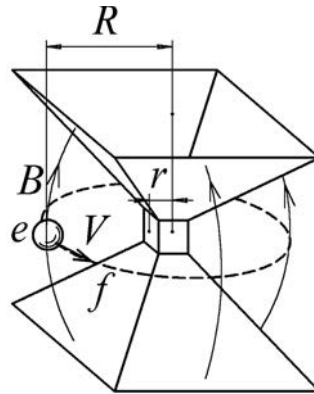


Fig. 151. The motion of the outer electron in the magnetic field B of the atom and the critical radii of the orbits.

the required energy and are captured by atoms. Hence, the temperature dependence of the photocurrent is clear. Thus, there is no fundamental difference between internal and external photoelectric effect: in both cases, light acts on electrons in atoms, as in the case of photoionization (§ 4.6). Simply, in the first case, the electrons remain inside the sample, and, in the second, they leave it.

Thus, photoelectrons, ripped out of an atom by an electromagnetic wave, already initially have energy E and orbital velocity V , associated with the frequency f of light and electron rotation - the relationship $E = MV^2/2 = hf$. If the

electron were kept in orbit by an electric Coulomb force, the frequency of its revolution would be proportional to the cube, and not the square of the velocity V . That is why this force must be magnetic, and not electrical in nature. And, indeed, in the magnetic field B of the atom, the Lorentz force $F = eVB = MV^2/r$ acts on the electron. Earlier it was found (§ 3.1, § 3.3) that in a magnetic atom with an increase in the radius r of the orbit, the field changes as $B = \mu_0\mu/\pi ar^2$, where a is the distance between the particles in the rod, μ is their magnetic moment. Therefore, $MV^2/r = eV\mu_0\mu/\pi ar^2$, whence, multiplying everything by $r/2$, we obtain $MV^2/2 = k(V/2\pi r)$, where $V/2\pi r$ is the electron revolution frequency f , and $k = e\mu_0\mu/a$ is some constant.

If the coefficient k is equal to Planck's constant h , then we arrive at the well-known formula $E = MV^2/2 = hf$, connecting the energy E of the photoelectron - with the frequency of the light f that knocked it out. Let us show that $k = h$. For this, in the formula $k = e\mu_0\mu/a$ we substitute the known values of the electron magnetic moment $\mu = eh/4\pi M$ and the distances a between electrons and positrons, which are of the order of the classical electron radius $a = e^2/4\pi\epsilon_0 Mc^2$ ($3 \cdot 10^{-15}$ m). Hence $k = h/\epsilon_0\mu_0 c^2 = h$. Strictly appropriate magnitude and direction of the magnetic field B and the law $E = hf$ are obtained by direct consideration of oriented magnetic particles in the rods of a bipyramidal atom in the shape of an anti-tank hedgehog (Fig. 108).

The atom plays the role of a magnetic trap of electrons, capturing and keeping them in orbit for a long time. When the incident light, an electromagnetic field that changes with a frequency f , falls into resonance with the frequency of the revolution of the electron, it forces it to leave a stable orbit and leave the atom, and then the metal (Fig. 149). The separation of electrons from an atom by light has long been discovered in the internal photoelectric effect. But, if Planck's sparkling hypothesis is correct, then in the external photoeffect the light will only affect the electrons trapped by the atoms. It is the atoms that will be the gun, the slingshot, the ballista, shooting electrons, while the light is assigned the modest role of the trigger of these projectile weapons. So, the energy of photoelectrons is contained in the atoms, from which they are detached, so no one has yet discovered the transfer of energy by light to a free electron. A free electron, as adherents of the quantum theory admit, in principle, cannot absorb the energy hf from light [134]. That is why the photoelectric effect and the Compton effect (§ 4.7) are observed only in matter - in electrons associated with atoms.

Let's take a closer look at the mechanism of the photoelectric effect - how it goes at the atomic level. It can only be understood on the basis of Ritz's magnetic model of the atom. Ritz showed that electrons in an atom occupy stable positions near the nucleus, from which follows the stability of the atom (impossible in dynamic, planetary models). If electrons move around the nucleus, then only - under the influence of magnetic, and not electrical forces. In this case, a rotating electron, losing energy for radiation, will not fall on the nucleus, but move away from it: in a magnetic field, all the energy of an electron is kinetic, and it decreases with distance. When the outer electrons captured by the atom are torn off, new ones come to replace them. The magnetic

field of an atom is generated by elementary magnetic dipoles - electrons and positrons, arranged in the correct order. As a result, the nucleus, the skeleton of the atom, resembles an hourglass - a four-sided bipyramid (Fig. 151). The electron moves in its middle plane and its kinetic energy E is related to the frequency f of the revolution of the electron and the radiation generated by it by the law $E = hf$, where h is Planck's constant. In a metal, various atoms contain electrons, oscillating, rotating - with very different frequencies (it is these oscillations that form the continuous thermal spectrum of the metal, where all the frequencies of § 4.1 are presented). That is why, the light of frequency f , hitting in the metal in resonance with the revolution of individual electrons spinning with the same frequency f , tears them out of orbit, and they fly out with conservation of their energy $E = hf$ (Fig. 149). In this case, since the electrons are external, excess, and the field is magnetic, they do not have to expend energy to detach from the atom. After all, there is no electrical force from the atom.

Note that Planck, explaining the law of thermal radiation by means of the hypothesis of quanta, initially spoke only about the connection $E = hf$ of the energy of oscillators (electrons in an atom) - with the frequency of their oscillations f (§ 4.1, § 4.2). And, since just such a connection is given by the bipyramidal model of the atom, it immediately follows from Planck's law of radiation. Only later was Planck's classical idea perverted so that energy is quantized: light is emitted by quanta, photons. The fate of Planck's ideas is reminiscent of the story of Ritz's discoveries. Their conclusions were used by adherents of non-classical physics, ignoring the classical ideas, within the framework of which these conclusions were obtained.

The considered mechanism of photoelectron production leads to the conclusion that the photoelectric effect can be observed only in a certain frequency range. Since the energy of an electron is $E = MV^2/2 = hf$, and its velocity is related to the radius of the orbit R by the dependence $V = 2\pi Rf$, then $f = h/2\pi^2 R^2 M$. But the radius R of the orbit of an electron in an atom can be neither too large nor too small, and, therefore, the frequency range of radiation that knocks out electrons is limited from above and below. The electron should not be too close to the nucleus, where the Coulomb attraction of the nucleus prevails over the magnetic force (as Rutherford's experiment shows). The outer electron must be located behind the sphere of the inner, nodal electrons that screen the nuclear charge. This gives the blue border of the photoeffect. On the other hand, the radius of the orbit cannot be larger than the size of the atom: outside the atomic core, the magnetic field rapidly decreases, and the atom in this region cannot keep electrons in orbit. So, for the internal photoelectric effect, where the electron remains in the sample and it does not need to do the work, there must be a red border of the photoelectric effect: light with a frequency lower than $f = h/2\pi^2 R^2 M$ is ineffective (R is the radius of the atom). And such a red border has been found.

It is interesting to calculate these boundaries, knowing the minimum r and maximum R radii of the electron orbit (Fig. 151). The minimum radius should be on the order of a hundred radii of the nucleus, that is, electrons can hardly be

located closer to $r \approx 10^{-13}$ m. Hence, the maximum frequency is $f = h/2\pi^2 r^2 M \approx 10^{21}$ Hz. Therefore, radiation with a frequency much higher than 10^{21} Hz (hard gamma rays) will no longer be able to cause a photoeffect (which is also confirmed by experiments). The maximum orbital radius is on the order of the atomic radius $R \approx 10^{-10}$ m. So, the red border of the photoelectric effect will lie in the frequency range $f_{cr} = h/2\pi^2 R^2 M \approx 10^{15}$ Hz, but this is visible light. And in the external photoelectric effect, the red border does indeed correspond to visible light. It is believed that this is due to the presence of a work function - the minimum energy A , which must be spent by an electron in order to leave the metal (§ 4.12). Then the lowest frequency of light (red border) knocking out an electron is $f_{cr} = A/h$. However, it is possible that the red border and the work function are related to the properties of the atoms themselves, and not of the metal. There is confirmation of this.

Thus, alkali metals have the longest-wavelength red border, which is natural, since they have the largest atomic radii R . In these metals, the red border is located in the range of visible light, and the limiting wavelength $\lambda = c/f_{cr}$ grows with increasing atomic radius. For metals with smaller atomic radii, the red border is located in the ultraviolet region (Table 8). It turns out that both the red border and

Metal	$\lambda_{meas}, \text{ nm}$	$R, \text{ \AA}$	$\lambda_{ras}, \text{ nm}$
Ag	261	1.75	250
Fe	262	1.72	241
Au	265	1.79	261
Hg	274	1.76	252
Ta	305	2.09	355
Li	500	2.05	342
Na	540	2.23	405
K	550	2.77	625
Table 8. Measured red border of metals and calculated $\lambda_{ras} = c/f_{cr}$ according to R.			

the work function itself are set by the properties of atoms, and not of the metal as a whole. And this is natural, because a metal is, in fact, one giant molecule - many atoms fused together: their electrons are generalized. And the work function is the ionization energy of such a molecule, proportional to the ionization energy of its atoms.

And, exactly, for metals with the lowest ionization energy E and - for alkali metals - the work function A is also minimal, and these energies increase with decreasing atomic radius (Table 9). For some reason, this fact, mysterious from the point of view of quantum theory, is ignored, although it is noted that the red border is shifted further towards longer waves, the more electrically positive the metal atoms, that is, the easier they give up their electrons [74]. We will return to the question of the nature of the work function and discuss it in more detail (§ 4.12).

Metal	A , eV	E_i , eV	R , Å
Cs	1.89	3.88	3.34
Ba	2.29	5.19	2.78
Al	3.74	5.96	1.82
Fe	4.36	7.83	1.72
Mo	4.37	7.65	2.01
Cu	4.47	7.72	1.57
W	4.50	7.98	2.02
Cr	4.51	6.74	1.85
Ni	4.84	7.61	1.62
Pt	5.29	8.96	1.83
Table 9. Work functions A and ionization potentials E_i for metals.			

So, the wave approach is not inferior to the quantum one, allowing it to visually explain much more effects that previously seemed completely mysterious. The wave theory is also more convenient for explaining the Compton effect and the production of electron-positron pairs under the action of gamma radiation. Why not abandon the quantum explanation with all its absurdity? The first reason is to ignore alternative approaches (the path discovered by Planck has long been forgotten). The second reason is the stubborn reluctance of academia to question the foundations of quantum mechanics, because the photoelectric effect is its foundation. Therefore, representatives of official science by hook or by crook hide alternative ways and problems of the quantum theory of the photoelectric effect. This silence, the latent opposition of classical and non-classical physics, goes back to the beginning of the 20th century, to the same Stoletov, whose sudden death is associated with a dark history, of which there are many in science.

Stoletov was a supporter of the classical approach in physics and was the guardian of common sense in science, for which he suffered [15]. The fact is that another physicist, B. Golitsyn, long before Einstein and Louis de Broglie put forward the idea of wave-particle duality, including in relation to light, attributing to it a certain temperature as a measure of the energy of light atoms (like photons having their energies). Stoletov harshly criticized this idea and got it recognized as erroneous. After that, they accused Stoletov: had he not exerted such an influence with his authority, the idea of wave-particle dualism would have taken root much earlier and would have belonged to Russia. Stoletov allegedly ruined the idea that explained the photoeffect he had studied. But, in fact, Stoletov, being a subtle theoretician and experimenter, deeply felt the true nature of phenomena, intuitively understood that the idea of wave-particle dualism, coming from the mystical energetism of Mach and Ostwald, which he hated, was absurd, alien to materialism and a clear atomistic view of the world (§ 5.14). It is no coincidence that Stoletov was a friend and scientific associate of such materialist scientists as Mendeleev, Timiryazev, Tsiolkovsky, who were opponents of energetism and mysticism [23].

The end of this story is tragic. Supporters of Golitsyn's energetism, using their high position, in response to criticism from Stoletov, achieved that he began to have official troubles [15, 23]. And Stoletov, being a man of principle, could not give up his scientific convictions. The real persecution of the scientist began. It all ended with a severe heart attack and the early death of Stoletov. This story received little coverage. And, until now, such dark deeds continue to be hushed up, helping some hidden force to create lawlessness in science and implement absurd non-classical ideas, sweeping out of the way all those who resist them. It was these forces that did not allow such giants of thought like Stoletov and Mendeleev to enter the Russian Academy of Sciences, where, since the time of its founder, Peter I, the dominance of foreigners was established, who did not allow domestic, original and boldly thinking scientists into the academic environment. And, to this day, the RAS is dominated by figures of non-indigenous origin, blocking progressive directions of research - under the pretext of fighting pseudoscience, which they themselves actually represent. Only a few heroic scientists, like Stoletov, dare, in spite of their higher ranks and academics, to publicly oppose the absurd, exposing its stupidity, as in the fairy tale about the naked king. For this alone, such scientists are worthy of respect. Through their efforts, light will one day disperse the darkness that reigns in the teaching of light and the photoelectric effect.

So, we see that **the photoeffect fits harmoniously into the classical picture of the world, which, in addition, explains much more of the features of the photoeffect.** It is enough just to admit that light is still a wave, not photons, and to accept Ritz's magnetic model of the atom. Within the framework of this model, Planck's hypothesis is rigorously substantiated that the source of photoelectron energy is hidden not in light, but in the metal, while light serves as a kind of ignition spark leading to the explosion of the metal with electrons, like a keg of gunpowder or a charge of shrapnel.

§ 4.4. Selective photoeffect

The selectivity of photoelectric phenomena is very similar to resonance effects. It happens as if the electrons in the metal have their own period of oscillation, and as the frequency of the exciting light approaches the natural frequency of the electrons, the amplitude of their oscillations increases and they overcome the work function. Confirmation of this view could be seen in the fact that the phenomenon of the selective photoelectric effect strongly depends on the direction of polarization of light and the angle of incidence.

G.S. Landsberg, "Optics" [74]

Another mysterious and, until now, unexplained feature of the photoelectric effect is the selective (selective) photoelectric effect. Its essence is that near certain frequencies the photocurrent increases strongly, as at resonance (Fig. 152). Moreover, the selective photoelectric effect strongly depends on the polarization of the incident light (therefore it is also called 'vectorial' [36, Part I]).

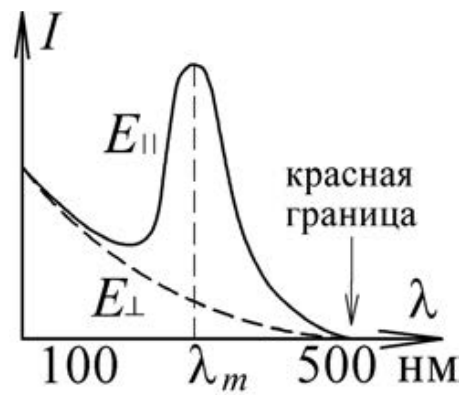


Fig. 152. Dependence of the photocurrent I on the wavelength of the incident light in the selective photoelectric effect for two directions of polarization [74].

The effect is exerted only by the field component normal to the metal surface, which can be detected, for example, using Stoletov's foot (a stack of glass plates) [74]. The dependence of the photocurrent on the polarization of light, in relation to the metal surface, proves that here, too, the cause of the effect lies in the metal, and not in photons. It is easy to understand the nature of the effect if you notice that it is found in the ultraviolet region. But, just in ultraviolet, metals acquire transparency, as was discovered by R. Wood [56, 136]. That is, ultraviolet rays of a certain range are able to pull out electrons not only from the surface of the metal, but also from the depths, penetrating into its thickness. That is why, at these frequencies, the photocurrent increases noticeably.

Then the intensification of the effect of light in the selective photoelectric effect is caused, firstly, by the fact that a smaller part of the light is reflected, penetrating deep into the interior. Second, light affects a larger number of atoms that are ready to eject an electron, which is why the effectiveness of the effect of light on matter is increased. So, the peak of the photocurrent is observed in the metal transparency window for light. As Table 10 shows, the frequency $f = c/\lambda_m$ corresponding to this peak increases with a decrease in the size of the atom R . Therefore, the peak may be due to the fact that atoms have orbits, where there are especially many electrons, and, due to the similarity of atoms, the radius of these orbits increases with the size of the atom.

Metal	λ_m , nm	R , Å	E_u , eV
Al	215	1.11	5.98
Mg	250	1.72	7.64
Li	280	2.05	5.39
Na	340	2.23	5.14
Ba	400	2.78	5.81
K	435	2.77	4.33
Rb	480	2.98	4.18
Cs	510	3.34	3.89

Table 10. Wavelength of the maximum photocurrent in the selective photoelectric effect.

So, the selective effect arises, since at some frequencies metals poorly reflect and transmit light well, which passes into the thickness of the metal and thereby

increases the photocurrent. Since the absorption is precisely resonant in nature and is associated with the presence of natural frequencies of electron vibrations, the photocurrent also exhibits a pronounced peak in the absorption band. Absorption near resonance frequencies f_m strongly changes the dielectric constant of the metal $\varepsilon = n^2 = 1 - f_p^2 / (f^2 - f_m^2)$, where f_p is the plasma frequency of the electron gas in the given metal [74]. As a result, the imaginary part of the refractive index n decreases, which leads to a decrease in the conductivity of the metal, up to the point that near the frequencies $f = f_m$ it can be conventionally considered a dielectric. Accordingly, the reflection coefficient R of the metal also decreases, due to the reduced conductivity, it ceases to reflect light well and approaches in its reflective properties with dielectrics. Therefore, light at these frequencies is especially effective on electrons, due to penetration into the metal. And, precisely, in the ultraviolet region, where the selective photoelectric effect was mainly observed, many metals absorb light well and reflect poorly. So, silver, which has a high reflectivity $R = 95\%$ in visible light and therefore is used as a reflective coating for mirrors, already for light with a wavelength of $\lambda = 316$ nm reduces the reflectivity to 4.2%, becoming similar in properties to glass [136, p. 431]. Thus, the dependence of the photocurrent on frequency is a reflection of the spectral sensitivity curve of the metal, that is, the dependence of its absorption coefficient (due to electrons) on the frequency of light. In this case, absorption peaks are superimposed on the continuous absorption spectrum, which are associated with the presence of eigenfrequencies of electron vibrations in atoms. It remains to explain the dependence of the selective photoelectric effect on the polarization of the radiation. So, when the beam is incident perpendicular to the metal boundary, the selective photoelectric effect is absent. But, with an oblique, sliding incidence of the beam, the effect is maximum. If the selective effect is caused by the radiation component penetrating deep into the metal, then the explanation is obvious. It is known from optics [74] that radiation of different polarization penetrates the refractive medium in different ways (Fig. 153). Radiation with a polarization vector lying in the plane of incidence (parallel polarization $E_{\parallel}$) passes best, that is, just - radiation with an electric component field normal to the boundary of the medium. And radiation with a polarization vector, perpendicular to the plane of incidence (perpendicular polarization $E_{\perp}$), - has no field component normal to the boundary and penetrates into the medium much weaker, effectively reflecting.

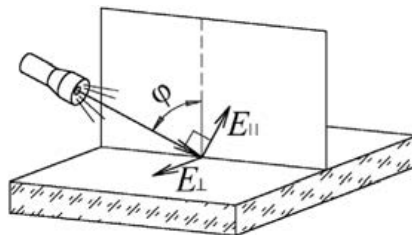


Fig. 153. Incidence on the boundary of two media of light with longitudinal and transverse polarization relative to the plane of incidence.

At an angle of incidence equal to the Brewster angle, longitudinal polarized radiation completely passes into the medium (Fig. 154). The difference in the permeability of the medium to light is expressed the brighter, the higher the refractive index n of the medium. For ultraviolet rays, the metal can be conventionally considered transparent medium, but with a large and, moreover, complex n (this is strictly done in metal optics [136]). Hence - the high reflectivity of metals (the reflection coefficient R increases with increasing n) and from this it is also clear why light with the polarization vector $E_{\perp}$ almost does not penetrate into the thickness of the metal and does not give a selective photoelectric effect, being almost completely reflected due to $R_{\perp}$, close to one. But, as can be seen from the graph (Fig. 154), the light from the longitudinal polarization $E_{\parallel}$, having



Fig. 154. Dependence of the reflection coefficient R on the angle of incidence φ for two types of polarization [74].

a low reflection coefficient $R_{\parallel}$, penetrates well into metal and creates a photocurrent the more efficiently, the greater the angle of incidence φ and the component of the field $\mathbf{E}$ in the incident electromagnetic wave normal to the metal surface. If n is large, then the Brewster angle at which all radiation $E_{\parallel}$ passes into metal, close to 90° . Therefore, the photocurrent should increase with increasing the angle of incidence up to the Brewster angle. It is this dependence of the photocurrent on the angle of incidence that was observed in experiments: the photocurrent monotonically increases as the angle φ increases from 0 to 90° [134].

Note that the key to understanding the selective and simple photoelectric effect is based on the wave theory, was proposed by P. Drude, who developed the classical theory of metal conductivity, based on the electron gas model (§ 4.17). It was Drude who discovered that the light reflected by the metal polarized as if reflected by a dielectric, which proves the predominant transmission and absorption of light of the same polarization by the metal [136]. However, Drude, shortly after the development of these theories, died tragically in 1906 at the age of 42, it is believed, as a result of suicide [161]. It not only allowed him to calmly deal with his classical theories metal optics and conductivity, but also opened the way for the theory of relativity and quantum theory to the pages of the journal "Annals of Physics", - one of the leading at that time.

§ 4.5. Nonlinear photoeffect

For more than fifteen years now, a new scientific and technical direction associated with the multiplication of optical frequencies (applied also the term "generation of optical harmonics": second harmonic, third, fourth, etc. - depending on how many times the frequency of the initial laser radiation is multiplied).

L.V. Tarasov, "What is nonlinear optics" [143]

Another important type of photoelectric effect is the nonlinear photoelectric effect, more often called by mistake - "multiphoton". Its essence is that powerful laser radiation of frequency f knocks out electrons with energy no longer hf , but - double and multiple energy $E = nhf$, where n is an integer [74]. It is accepted as an explanation by the fact that in laser radiation the light flux density is so high that the electron, at times, absorbs not one, but immediately n photons, each taking energy $E = hf$, therefore the effect is also called "multiphoton". And yet, this effect is easily explained in terms of wave optics. Metal under the action of laser radiation generates, due to nonlinear effects, radiation of doubled and other multiple frequencies. Secondary radiation and knocks electrons out of the metal. Unlike the accepted multiphoton explanation, this allows us to understand why the nonlinear photoelectric effect causes, again, only the component of the wave field normal to the metal. Then that is, the nonlinear photoelectric effect, like the selective one, is sensitive to the polarization of light (§ 4.4). This means that here, too, the light pulls out electrons. not from the surface, but from the thickness of the metal, penetrating deeply.

Just the fact that polarization of radiation, the direction of field fluctuations, plays a role, proves that the nonlinear, and therefore simple (linear) photo-effect is connected with wave properties of light [74]. This is also evidenced by the fact that the effect is only manifested by the influence of powerful laser radiation, when nonlinear effects and fluctuations occur in the environment. And, since it's the waves, the fluctuations, the photons are out of phase.

Indeed, media have been known for a long time that generate in the light of a laser beam radiation with doubled, tripled and, in general, multiple frequencies. This nonlinear effect, following purely classically from the nonlinear oscillation theory [103], is called the multiplication of optical frequencies or the generation of optical harmonics [143, p. 110]. So, an infrared ray falling on the crystal of lithium niobate, comes out of it already green. Obviously the same also occurs in the nonlinear photoeffect: a ray falling on the boundary of a semiconductor or metal gives rise to radiation of a doubled and multiple frequency nf . It is secondary radiation and it knocks out electrons of multiple energies hnf (Fig. 155). Nonlinear and selective photoeffects therefore depend on the direction light vibrations relative to the medium, which knocks out the electrons secondary medium-converted radiation. So, in the selective photoelectric effect the resonance of radiation in a substance selectively enhances the transmission of light in a certain range, increasing the photocurrent at a given frequency (§ 4.4).

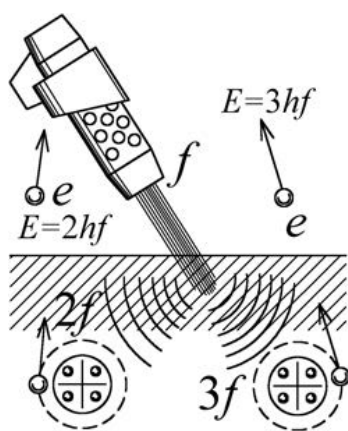


Fig. 155. Nonlinear photoelectric effect.

And in the nonlinear photoelectric effect, the medium generates radiation of multiple frequencies. So, the photoelectric effect can be easily explained within the framework of the wave theory of light, and photons with quanta are superfluous here.

So, there are media with cubic nonlinearity that easily generate the third harmonic and much worse - the second, although, according to quantum theory, everything would be on the contrary, since it is easier for two photons to add up than three at once. Also concerns two- and multiphoton absorption, nonlinear photoelectric effect, where it is not the capture of many photons that actually occurs, but the absorption of radiation multiple of the frequency generated by the medium, under the pressure of laser light. Thus, following Occam's principle, you should not multiply entities in excess of necessary. Since the classical wave theory is quite enough to explain the photoeffect, including selective and nonlinear, then there is no need invent quanta of light and photons that contradict a number of features photoeffect. Why fence and quantize the garden, since everything is complete without it understandably? If the reason was the absorption of several photons by an electron, then the nonlinear photoelectric effect would be most intense on the surface metal, where the light intensity and the proportional probability of multiphoton processes are higher. Since the classical wave theory is quite enough to explain the photoeffect, including selective and nonlinear, then there is no need invent quanta of light and photons that contradict a number of photoeffect features. Why fence and quantize the garden, since everything is completely understandable without it? If the reason was the absorption of several photons by an electron, then the nonlinear photoelectric effect would be most intense on the surface metal, where the light intensity and the proportional probability of multiphoton processes are higher. And, in fact, as the sensitivity of the photoelectric effect to the polarization of radiation shows, light pulls out electrons from the metal thickness, confirming the wave nature of the photoelectric effect.

Interestingly, the nonlinear effect of the generation of difference or total (including multiples) frequencies from the addition of two oscillations, much earlier, than in optics, was discovered and investigated in acoustics (Helmholtz tones [72]). It would never occur to anyone to explain this effect by adding

quanta of sound. (hypothetical phonons), since the effect can be easily explained by the classical nonlinear theory of oscillations. However, when it was finally revealed in optics generation of difference and total frequencies of light (say, in Raman Raman scattering), then scientists for some reason resorted to quantum interpretation of the effect, according to the principle of addition and division of light quanta, although there was a ready-made theory of the interaction of light oscillations in nonlinear media and the Manley-Row relation. So, quantum theory, the Raman effect and optical frequency multiplication are not only unnecessary, but even harmful because it introduces redundant and erroneous statements that interfere with correct understanding of the processes and their accurate description.

So, only a wave, oscillatory interpretation explains the fact that for nonlinear photoelectric effect, there is a dependence of the photocurrent on the direction of polarization of the incident light, just like in the selective photoelectric effect (§ 4.4). Since the conversion of radiation to the second harmonic is the usual nonlinear wave effect occurring in matter (any matter in strong laser fields becomes a nonlinear medium), then the radiation must first penetrate into the medium. And this, as we have seen, is possible only for light with longitudinal polarization, penetrating into the thickness of the metal and knocking out electrons not only from the surface. Indeed, the light's high intensity, even with strong attenuation, is capable of penetrating relatively deeply into the metal. The intense light that penetrates deep into the metal creates non-linear effects. Frequency doubling can occur both in the volume of the metal and in its individual crystals oriented randomly, including - one that ensures the execution synchronism conditions and effective conversion of the first harmonic in the second. So, the transparency of the metal is a relative thing. In addition, in strong laser fields, due to the bleaching effect of the medium, even an opaque medium can become partially transparent. This is what was allowed at one time, to create semiconductor lasers, although semiconductors are opaque to light and are in many ways similar in properties to metals, which, was believed by quantorelativists, makes a semiconductor unusable as active medium of the laser (§ 4.9). Thus, the photoelectric effect, often referred to as “multiphoton”, it is much more correct to call it “nonlinear”, as in Landsberg [74]. Nonlinear photoelectric effect is purely wave, vibrational, a classical phenomenon related to nonlinear optics.

§ 4.6. Inverse photoeffect, photoionization and solar cells

The so-called internal photoelectric effect is widely used for practical purposes, in which, unlike external, optically excited electrons remain inside the illuminated body, without violating the neutrality of the latter ... There is a spatial separation inside the volume of the conductor of optically excited electrons and microzones (holes) arising in the immediate vicinity of atoms from which electrons have torn away ... direct conversion of light energy into electrical energy.

G.S. Landsberg, "Optics" [74]

The last kind of photoeffect is the inverse photoeffect: generation of radiation from metal when its surface is bombarded with electrons of energy E (§ 4.1). An

electron, when captured by an atom, begins to emit at the frequency of its rotation $f = E/h$ (Fig. 156). A similar effect works in some LEDs, where in the transition layer of a semiconductor crystal, the edges which are under voltage V , electrons gain energy $E = eV$ and, when captured by atoms, swirling in their magnetic field, radiate on rotation speed $f = eV/h$. Note again that the capture and ejection of an electron by the atom occurs without changing energy (without costs and energy release ionization), since capture produces a magnetic field of a neutral atom, which does not change the energy of the captured electron. With regard to potential electric field of an atomic nucleus, then it, in principle, is not able to capture electrons. Therefore, in the photoelectric effect, electrons only have a small fraction of the energy receive from light, but the bulk of the energy they have initially. And, it is possible that one day experiments will show: the energy of electrons leaving metal sometimes surpasses the energy of the light that knocked them out. Light energy goes only to change the orbit of the electron and its detachment from the atom when leaving a stable orbit. In photovoltaic cells (solar panels), this energy the release of electrons and converted into electrical. If would the energy of light also go to give speed to electrons, in fact, to heating the semiconductor, the efficiency of solar cells would be significant less known. In reality, the energy of light is directly, with minimal losses, converted into electrical.

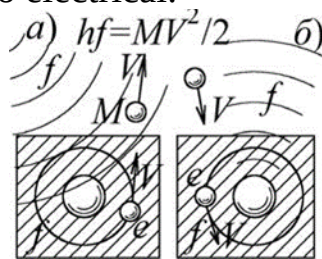


Fig. 156. Direct (a) and reverse (b) photoeffects: ejection of an electron by an atom under the influence of light (a) and generation of an X-ray radiation by an atom upon capture of an electron.

It is quite possible that a correct understanding of the mechanism of the photoelectric effect will allow for further increases in the efficiency of solar cells, find cheaper and more efficient semiconductor materials that convert light into electricity. In the meantime, the search for such materials was carried out blindly. And only based on the classical approach, this search will finally become purposeful, meaningful and effective. It should be noted that in dielectrics and semiconductors, unlike metals, light may still have to do some work of ionizing atoms, since the separation is no longer only external, but, at times, and internal electrons in the atom. Most likely, in such cases, the light itself does not knock out these internal electrons, but does it through external ones. Light acts first on the outer electrons of energy $E = hf$ spinning near the atom, forcing them go out of orbit (§ 4.3). These outer electrons hit other atoms and with sufficient energy E (if it reaches the ionization energy E_i), knock out internal electrons from atoms, producing ionization. In that, it is seen, and is the reason that an atom can be ionized only by light frequency $f = E_i/h$ or more. Therefore, for photovoltaic cells and solar panels it is necessary to design on the

basis of materials with the lowest possible energy of separation of electrons from atoms.

Photoionization in gases proceeds similarly: the outer electrons of atoms, having escaped from orbit, under the action of light of frequency $f = E_i/h$, without losses their energy $E = E_i$ hit other neutral atoms and knock out of them internal electrons, which already have to overcome nuclei attraction, spending the reported energy E_i for this. Also known is the multiphoton ionization, when ionization is produced by light of a lower frequency $f = E_i/nh$, where n is an integer [74]. However, this phenomenon is explained as non-photoelectric effect, not by the absorption of n photons at once, but by the generation by the medium multiple frequencies $2f, 3f, \dots, nf$, due to nonlinear effects (§ 4.5). Intensive radiation of frequency f , passing through the medium, enriches its spectrum, due to generation of new harmonics by gas atoms. This is the secondary radiation of multiples frequencies $f' = nf = E_i/h$ and knocks out electrons from atoms. However, it is possible and the tearing of an electron from an atom under the influence of impacts of several photoelectrons (not photons!), with an energy lower than the ionization energy.

The process of formation of electron-positron pairs under the action of gamma radiation, which also has a critical frequency $f = E_p/h$, is in many ways similar to the photoelectric effect, after which electrons are ejected from the nuclei. with positrons [139]. Only here the energy E_p is no longer the binding energy electrons with a metal or with an atom (ionization energy), and the electrostatic binding energy of electrons and positrons in the nucleus, which is of the order of $E_p = 2mc^2$ (§ 1.16, § 3.12, § 3.13). In general, the process of "birth" electron-positron pairs proceed similarly to photoionization: radiation with a frequency above $f > E_p/h$ acts on an electron spinning in a magnetic nuclear field with the same frequency f and energy $E = hf > E_p$. This electron, on impact the nucleus, due to its high energy, is capable of knocking out either an electron from the nucleus, or a positron, of which there are almost equal numbers in the nuclei. Therefore, gamma radiation and creates a flow, where electrons and positrons are equally divided, which is interpreted as their birth in pairs. However, quite often they do fly out in pairs, if the electron that knocked out the positron will not be absorbed by the nucleus, but will bounce off it. Then, in the Wilson chamber, one can see how from one point (from one nucleus) emanate immediately two traces: an electron and a positron. If we recall the analogy of electrons and positrons - with black and white checkers sitting in their cages on chessboard (atomic nucleus, § 3.2, § 3.12), then the mechanism of departure from the nucleus electron-positron pairs resembles the game "Chapaev", where black strikes checkers (electrons) are knocked out of the chessboard by white checkers (positrons), often flying out in pairs, together with the black ones that hit them.

The fact that the nuclei contain positrons, and the impacts of electrons knock them out of there, confirmed by the phenomenon of β^+ -decay and the experiments of D. Skobeltsyn, in which electron-positron pairs escaped from nuclei under irradiation with high-energy natural electrons [19, p. 326]. If the energy of the incident electron or another particle (say, from cosmic rays) - high

enough, then, when hitting a nucleus, it can release up to several tens of electrons and positrons. In this case, in the Wilson chamber or on the emulsion, one can see "stars": hundreds of tracks emanate from one point (nucleus) at once, - the nucleus is like explodes into hundreds of elementary charges that make it up (§ 3.9). Same, and when irradiated with gamma rays with a frequency $f \gg E_p/h$, high-energy electrons are formed, knocking out several electron-positron pairs from the nucleus at once steam. It is also understandable why the number of pairs formed is proportional to the square nucleus charge Z^2 . Indeed, in nuclei with high Z - proportionally Z^2 is increased the number of electrons spinning in the magnetic field of the nucleus - in the corresponding orbits, with an energy of the order of 1 MeV. This means that gamma radiation is Z^2 times acts more effectively on the substance, pulling out these electrons and, upon impact them about the nucleus, generating more electron-positron pairs.

So, experience convinces us that all the so-called "quantum laws" discovered in the phenomena of the photoelectric effect, photoionization and birth electron-positron pairs are by no means due to the properties of light, but properties of atoms, matter. Thus, selective and nonlinear photoeffects clearly indicate that the processes of radiation and absorption by matter light have a resonant, vibrational, wave character, and in no way quantum. Only the classical model of the photoelectric effect, which was defended and the father of the photoelectric effect A. Stoletov, is able to help an adequate and simple understanding of all the laws of the photoelectric effect.

§ 4.7. Compton effect

The phenomenon of a change in wavelength during light scattering could be, would be explained from a wave point of view using the Doppler phenomenon: electrons scattering X-rays, under the influence of their ejection from atoms in different directions with different speeds. Thus, the scattered radiation should have modified wavelength depending on speed and direction the movement of scattering electrons. Calculating how you should scattering electrons move, it is easy to obtain the classical a picture of the Compton phenomenon.

G.S. Landsberg, "Optics" [74]

It will not be difficult to explain from the classical point of view, and more. "quantum" phenomenon - the Compton effect, which together with the photoelectric effect considered irrefutable proof of the photon theory. Its essence is the fact that X-rays undergo on electrons the so-called "Compton scattering" (Fig. 157). Moreover, unlike ordinary scattering, the wavelengths of the incident λ_0 and scattered λ' radiation do not coincide, and their difference is rigidly related to the scattering angle θ by the relation $\lambda' - \lambda_0 = 2\lambda_K \sin^2(\theta/2)$, where λ_K is the Compton length, the component for an electron mass m the value $\lambda_K = h/mc = 2.4 \cdot 10^{-12}$ m [134]. Also, as shown experiments, the electron in the process of scattering experiences recoil, acquiring velocity directed at such an angle φ to the incident beam that $\tan \varphi = \cotan(\theta/2)/(1 + \lambda_K/\lambda_0)$. It looks like it's not a wave that is scattered by an electron, and a particle collides elastically with it, a photon, which transfers a part to the electron its momentum and energy. In addition, as many textbooks claim, the classical interaction of a wave

with electrons of matter could not generate scattered radiation at an offset frequency. After all, free the electron, according to the theory of J. Thomson, should oscillate under the action of an electromagnetic wave - with the frequency of the field of this wave, and, therefore, emit radiation - at the same frequency and with the same wavelength λ_0 [82]. And, meanwhile, the scattered radiation in the Compton effect, except for the unbiased component spectrum λ_0 , contains shifted, - with wavelength λ' .

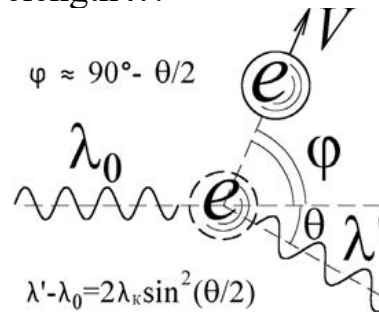


Fig. 157. The Compton Effect.

In addition, just like in the photoelectric effect, in the Compton one - the speed and energy of an electron often exceed those that a wave could impart to it in the moment of irradiation [134]. This, again, is interpreted as a collision with electrons. light wave collected in portions, quanta. But, in reality, it seems and here the beam does not give energy to electrons, but only releases electrons, originally possessed speed in atoms. Therefore, no one has yet been able to observe Compton scattering on free electrons. Scientists admit that it is given only by the electrons of the atoms, but it is believed that the atom that emitted an electron is just an annoying hindrance and electrons in it can be considered as free. In fact, without the participation of atoms, the Compton effect would be completely impossible, no one will ever be able to observe it at the free electrons. Thus, in the case of the inverse Compton effect, when a freely flying electron does not absorb, but, on the contrary, gives up energy to light, only classical scattering takes place [151, p. 312]. Next, we will show that Forward Compton scattering has purely classical reasons.

As a matter of fact, some scientists even let slip what is the explanation existed but was largely forgotten. So, G.S. Landsberg writes, contrary to the statement often made in textbooks, according to which the classical theory is unable to explain the scattering at the new frequency, which is real and the classics predicts the displaced components of the radiation. Indeed, if we take into account that the electrons escaping from atoms under the action internal photoelectric effect, have high velocities, then the scattered According to the Doppler effect, their radiation must have a different wavelength [74]. This wavelength λ' , in full agreement with the Compton effect, will depend on the wavelength λ_0 of the incident radiation, on the electron emission angle and the direction of the scattered radiation. This is how the classic picture of the Compton effect arises. Landsberg does not disclose the details of this description and who its author is. Therefore, we will try to reconstruct, restore this forgotten interpretation, restoring the classic picture of the phenomenon.

Let an electromagnetic wave of frequency f_0 , falling on an atom, "pull out" from it an electron, which has, as shown by the photoelectric effect (§ 4.3), the energy $mV^2/2 = hf_0$. The angle φ of electron emission can be any. The incident wave will cause this electron flying freely at a speed of V to oscillate, but, in the strength of the Doppler effect, - with a frequency $f = f_0(1+V\cos\varphi/c)$ different from f_0 (Fig. 158).

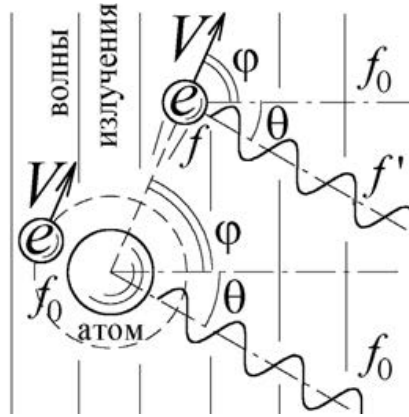


Fig. 158. Mechanism of the Compton effect: radiation f_0 , "pulling out" an electron from an atom, is scattered by it with a frequency f' .

Let an electromagnetic wave of frequency f_0 , falling on an atom, "pull out" from it an electron, which has, as shown by the photoelectric effect (§ 4.3), the energy $mV^2/2 = hf_0$. The angle φ of electron emission can be any. The incident wave will cause this electron flying freely at a speed of V to oscillate, but, in the strength of the Doppler effect, - with a frequency $f = f_0(1+V\cos\varphi/c)$ different from f_0 (Fig. 158). The vibrating electron emits secondary waves, the arrival frequency f' of which, in a certain direction θ , is different from the frequency of their emission f . From the Doppler effect $f' = f(1+V\cos(\varphi+\theta)/c) = f_0(1+V\cos\varphi/c)(1+V\cos(\varphi+\theta)/c)$. In addition, the falling wave will cause the electrons remaining in the atom to wobble and radiate at the frequency f_0 . These two waves from the atom and the free electron interfere, but can't develop correctly, because their frequencies f_0 and f' do not match. In all directions, these two waves will develop indefinitely randomly, creating beats, or at all will not form from an unsynchronous arrival. And, only in the direction θ , for which $f_0 = f' = f_0(1+V\cos\varphi/c)(1+V\cos(\varphi+\theta)/c)$, Waves interfere due to equal frequencies and simultaneous arrival, from where $\cos\varphi = -\cos(\varphi+\theta)$, i.e., $\varphi = 90^\circ - \theta/2$.

Substituting the value of φ , we find that the rays going in the direction θ have frequency $f' = f_0(1-V\sin(\theta/2)/c)(1+V\sin(\theta/2)/c) = f_0(1-\sin^2(\theta/2)V^2/c^2)$ and wavelength $\lambda' = c/f' = \lambda_0 + \lambda_0\sin^2(\theta/2)V^2/c^2$. Taking into account that for the radiation that knocked out the electron, $\lambda_0 = c/f_0 = 2hc/mV^2$, we find $\lambda' = \lambda_0 + \sin^2(\theta/2) 2h/mc$. That is, we came to a proven experience the formula $\lambda' - \lambda_0 = 2\lambda_K\sin^2(\theta/2)$, where $\lambda_K = h/mc$. We also arrive at the correct ratio of the scattering and recoil angles, because if $\varphi = 90^\circ - \theta/2$, then $\tan\varphi = \cotan(\theta/2)$. This is pretty much the same as an experienced dependency. $\tan\varphi = \cotan(\theta/2)/(1+\lambda_K/\lambda_0)$, since $\lambda_K = 2.4 \cdot 10^{-12}$ m is usually much less than the

wavelength λ_0 of X-ray radiation, the range of which extends from 10^{-7} to 10^{-12} meters. Only for the hardest X-rays is $(1 + \lambda_K / \lambda_0)$ will differ markedly from unity. But then it is necessary, respectively, to refine our approximate calculation, because when $\lambda_K = h/mc$ and $\lambda_0 = 2ch/mV^2$ the speed V of the electron becomes comparable to the speed of light c , and in the expression for f' we must take into account the quadratic Doppler effect (§ 1.20). When the calculation was made and a number of other simplifications, of course, do not change the essence of the matter, since a more rigorous classical analysis that takes into account the recoil of the atom when emitting an electron, interaction with a backscattering wave and the wave-matching condition gives the same picture of the Compton effect.

Let us note one more difference between the quantum and classical theory of the Compton effect. In quantum theory, light (photon) is emitted only in the plane formed by a light beam with the line of motion of an electron. And in the classic picture the scattered light is emitted in all directions along the generatrix of the cone, oriented at an angle $\varphi + \theta$ to the line of motion of the electron (axis of the cone), since for all these directions the condition of ray interference is satisfied. However, the most intense radiation is still emitted at an angle θ to the original beam. The fact is that electrons emitted at an angle φ to the axis of the beam and generating radiation of the corresponding wavelength $\lambda' = \lambda_0 + \sin^2(\theta/2) 2h/mc$, can fly not only up, but also sideways and down, along the generatrix of a cone with an angle φ and the axis of the beam. All these electrons form their radiation cones, which, adding up, give an average picture. Tangent surface to these cones are given a caustic surface along which the radiation is most intense. This surface is in the form of a cone, with an apex angle θ and the axis coinciding with the original ray. Thus, although the scattering occurs in all directions, the most intense light emission wavelength $\lambda' = \lambda_0 + \sin^2(\theta/2) 2h/mc$ goes at an angle θ , where $\theta = 180^\circ - 2\varphi$. Exactly this revealed in experience. Moreover, the Compton radiation λ' is really emanates not only in the direction of θ , but also at other angles, just with less intensity. Therefore, on the spectrograms, for a given angle θ , one can see radiation not only at the wavelength $\lambda' = \lambda_0 + \sin^2(\theta/2) 2h/mc$, but also at neighboring wavelengths [134], which the quantum theory cannot explain.

To check which of the theories of the Compton effect (quantum or classical) is valid, it suffices to study the Compton effect on free electrons, say, flying in vacuum tubes or in electron-beam tubes. If the Compton effect is observed in this case, then quantum theory of the phenomenon. If he does not show up or is too weak, then the quantum theory is erroneous, and the classical theory is valid, according to which only electrons emitted from atoms are able to create Compton effect. Distinguish whether light is scattered by free electrons or residual atoms in the flask, it is possible by the known electron velocity in ray tubes. This velocity will introduce the known Doppler shift in positions of spectral lines of Compton radiation.

There have been many experiments to measure the energies of electrons in the Compton effect, emission angles, synchronicity check emission of radiation and electrons [82, 134]. All of them confirmed the validity of the quantum

picture of the Compton effect. However, the same picture as shown above, should also occur in the classical case, only an explanation will be quite different. That is, experiments in no way confirm the quantum interpretation of the Compton effect, but, often, contradict it, rather confirming the classical picture of the phenomenon, if we take into account a number of experimental revealed features of the Compton effect.

It turns out that the photoelectric effect and the Compton effect are the two main evidence in favor of the photon theory and particle-wave dualism, turned out to be negligible: there is no need to consider a light wave as a photon, a particle. There does not exist experiments, for the interpretation of which quanta of light are needed. Introduction of photons into while all the properties of light can be easily explained by classical waves, this is the same multiplication of entities against which Occam warned. Two fundamental effects, the photoeffect and the Compton effect, on which the whole building of quantum physics was held, as it turned out, is quite possible interpreted within the framework of classical physics, and so successfully that managed to explain a number of features that are problematic for quantum physics. As a result, photons and light quanta are not only redundant, unnecessary, but also harmful for an adequate understanding of the essence of phenomena. After all non-classical, dualistic explanations are not materialistic (§ 4.13, § 5.12). It is not by chance that in his views A. Compton was just a supporter of physical idealism, since he tried to develop non-materialistic ideas of relativism within the framework of physics [29, p. 20], speaking about the absence objective reality and relativity of the concept of "particle" and "wave".

We know a lot about Compton, but unfortunately, we can't say anything about that Unknown Scientist who, as follows from Landsberg's Optics, offered a classical interpretation of the Compton effect. In this regard, the textbook of Landsberg, in general, is very remarkable and deserves a close attention. Consciously or accidentally, many faithful ideas, or mentioning them, albeit in a critical way. This and the presentation essence of the BTR, and the mention of the classical model of the Ritz atom, as well as the openwork model of the Lenard atom (the prototype of Rutherford's nuclear model), and interesting remarks about the nonlinear, selective photoeffect, finally - the classic interpretation of the Compton effect. Closely related to optical problems, G.S. Landsberg apparently had access to closed sources of information, possessed and was interested in many hidden data about ideas and personalities forgotten in the quantorelativistic fever. But a whole book is not enough to list them all, talk about their lives and merits. How many were such obscure scientists-heroes who dared, contrary to common opinion and a chorus of fools, singing along with non-classical physics, to doubt the quantorelativistic picture of the world and put forward their alternative ideas? How many such great, sometimes priceless ideas died due to the fault of someone's ambitions, an evil will, envy and self-interest? How many such unknown scientists were tortured in torture chambers of institutes - persecution by a pack of academicians, terror of the scientific mafia, bans on publishing in journals? How many of them are seeking and unselfish serving the truth, died unknown, not having time to convey to us

their bright thoughts? But not their names are pronounced with respect, but the names of their tormentors and trampling on the truth. And isn't it worth it, since the Tomb of the Unknown Soldier exists to honor the memory of the Unknown Scientist, Fighter for the classic science and freedom of thought like a monument? Also, every effort should be applied to restore, reconstruct the names and ideas of these scientists who selflessly gave their lives to the struggle for truth, against obscurantism in science. They are worthy of memory and respect no less than the heroes of the war.

§ 4.8. *Franck-Hertz experience*

When the potential difference reaches 4.9 V, the electrons at inelastic collisions with mercury atoms near the grid will give them all its energy ... Similar experiments were subsequently carried out with other atoms. For all of them, the characteristic differences were obtained potentials, called *resonance potentials*.

A.N. Matveev, "Atomic Physics" [82]

So, energy is not emitted or absorbed by an atom in the form of photons, quanta of light. There are no "quantum phenomena" that cannot be interpreted within the framework of classical physics. But even inside atoms, the energy of an electron is not quantized, does not change discretely, contrary to quantum mechanics. Discrete energy change in an atom is usually proved by a discrete spectrum of atoms (the spectrum of frequencies emitted by an atom is created, supposedly, by transitions between constant energy levels) and the Franck-Hertz experience. As we remember, the discrete spectrum radiation is connected, in reality, not with energy levels, but with the presence electrons have natural frequencies of vibrations in the magnetic field of an atom (§ 3.1). Therefore, the Franck-Hertz experiment is apparently associated with these resonant atom frequencies. In this experiment, it turned out that atoms absorb energy in portions [82, 134]. This followed from the fact that electrons accelerated by an electric field, in a collision with atoms, - gave them their energy E , as soon as it reached the value of E_1 , equal to the first resonance potential of the atom (the minimum electron energy required to excite the atom). Already by itself the mention of resonance indicates that the loss of energy by the electron is caused by coincidence of frequencies. Indeed, an electron with energy E , colliding with atom, either bounces off, or temporarily connects with it, falling into a magnetic the trap of the atom and starting to rotate with the frequency $f = E/h$. Having turned in the society of the atom, it can leave it, preserving his reserve of energy.

But everything will be different if the frequency of revolution f of this external electron coincides, enters into resonance with the natural frequency of one of the internal electrons sitting in the nodes of the atom (Fig. 159). Then, the external electron, whirling, will become its periodic effect, with a regular approach, strongly shake the nodal, and, having transferred its energy to it, the atom will leave - with a noticeably smaller reserve of it. And the hesitant, the inner electron will begin to gradually lose energy in the form of radiation with a frequency f circling in the node until it freezes there. That's why, electrons

barely gain critical energy E_1 in the accelerating field, they immediately lose it, causing the gas to glow at the frequency $f = E_1/h$ of the first resonance line [134].

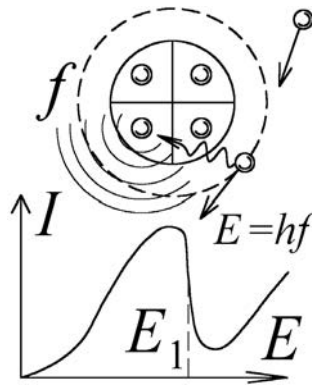


Fig. 159. The Franck-Hertz experiment: the departure of the electron energy into radiation at resonance.

Note that if the energy of a captured electron is greater than the resonance potential, it will no longer be able to excite oscillations of the internal electron, since it will rotate at a higher frequency. The improved Franck-Hertz experiment actually showed that if an electron enters into a gas already with an energy greater than the resonance potential, it does not lose this energy, and the electron current does not decrease [134]. This once again proves the resonant nature of the phenomenon: an atom cannot take energy from electrons not only with an energy less than the critical one, equal to the resonance potential, but with more. In contrast, ionization of an atom, detachment from it electron, as experiments have shown, are capable of producing electrons with energy, higher ionization potential E_i . This is consistent with the classical theory, since, in contrast to the excitation of radiation, the ionization of an atom is caused by a purely mechanical impact of an electron on an atom. But this phenomenon is shock ionization - fundamentally contradicts the quantum theory of the Bohr atom, according to which an atom, with its discrete level system, is capable of absorbing only strictly certain portions of energy, both during excitation and during ionization.

However, quantorelativists have invented the following trick. If the electron has an energy E that is greater than the ionization potential E_i , then its energy can be absorbed by an atom, regardless of the value of E , since above E and the spectrum energy of the atom becomes from discrete - continuous, since the energy of the electron outside the atom can be arbitrary [134]. This allegedly confirms the fact that the line spectrum of the radiation of the atom becomes continuous - after reaching the boundary of the series f_∞ (for example, for hydrogen, this is the frequency $f_\infty = Rc (1/n^2 - 1/m^2) = Rc/n^2$, for which $m = \infty$ [74]). But this, precisely, is a trick, for it contradicts the postulate Bohr on the portioned capture of energy by an atom. After all, the electrons outside the atom are no longer related to its energy spectrum, and it is necessary to separately consider discrete jumps of the electron energy inside the atom and its

continuous variations after ionization and absorption of energy E_i . That is, the quantum interpretation does not work, but the classical one easily explains it as ionization, and a continuous spectrum adjacent to the boundary of the series. Continuous spectrum generates electrons trapped in the magnetic field of an atom as they spin in it with a frequency $f = E/h$ and radiate at this frequency (§ 3.1). From their radiation the energy E decreases, and the frequency f of the electron radiation decreases smoothly, according to as the loops of its orbit expand. This is how the atom generates a continuous spectrum. But, as soon as the rotational speed f drops to f_∞ (to the limiting frequency radiation in the spectral series), as an external electron, due to resonance, will quickly give up its energy to internal, nodal electrons (with natural frequencies $\sim f_\infty$), as in the Franck-Hertz experiment. Therefore, external the electron, having given them energy and losing speed, is no longer held by Lorentz force. It breaks away from the atom, ceasing to rotate and emit, and the continuous spectrum it generates breaks off at the boundary of the f_∞ series.

Thus, one more fundamental experiment, proving, as it were, that the energy of radiation and an electron in an atom is quantized, taking only a discrete series of values, as it turned out, can be easily interpreted from the classical positions if we accept the Ritz magnetic model of the atom. The energy of an electron in atom changes continuously, and the imaginary discreteness is caused by the frequency relationship oscillations of an electron and its energy, as well as a discrete range of frequencies that an atom can emit due to the discrete distribution of nodal electrons. Perhaps this is why many tutorials avoid mentioning resonance potentials, suggesting a resonance of frequencies, and they say about them as critical potentials or potentials of excitation.

§ 4.9. Lasers and Quantum Electronics

No one disputes the fact that I made the first laser ... If they did it, then where the hell is their laser?

Theodore Meiman on quantorelativist scientists

Lasers have become the most important component of modern science, technology and everyday life. Therefore, it is especially offensive that these light generators, contrary to the ideas their creators are called quantum generators, and laser physics itself is called quantum electronics. In fact, laser radiation, as seen (§ 4.5), should not be associated with quanta and photons, because a laser is just high-quality optical resonator and amplifier, which selectively amplifies some waves and dampens others, like an acoustic one, highlighting given frequencies and phases of oscillations. What happens is essentially the same as in the Franck-Hertz experiment, the transfer of energy stored in external electrons atom, the vibration frequency of which is not fixed and exceeds the fundamental frequency f , - to the nodal, internal electrons, oscillating and radiating at a given standard frequency f . This is what allows you to transform different types of pumping energies - into coherent light, with its rigidly set phase and frequency. And the standard of this frequency is set not by quanta and discrete values of the energy of the atom, but by a crystal clear

spatial atomic structure, with a solid scale of distances and radius constants r_0 , the magnetic moment μ and the charge e of the electron (§ 3.1).

A laser is a purely classical device in which a nonlinear interaction of electromagnetic waves and vibrations of atomic electrons. Due to this, the energy of electrons vibrating at different frequencies and phases, is converted into the energy of oscillations of electrons at the standard frequency f laser radiation. This process has long been described in the classical, although and nonlinear theory of oscillations [103], while photons and quanta here, as it says, "and did not smell." First, the optical pump radiation (say, from a flash lamp) excites oscillations of the outer and inner electrons of the atom at a set of natural frequencies, and at a certain frequency f vibrations are excited especially efficiently. Electrons vibrating with frequency f , lose energy more slowly than they receive it from interaction with other electrons and waves emitted by them. Therefore, for some radiation intensity exceeding the threshold, electron oscillations at the frequency f will be amplified due to the energy of all other vibrations, which transforms into the energy of vibrations and radiation at the fundamental frequency f . As follows from the Manley-Rowe relations [103], such energy transfer effective only if high-frequency radiation is converted into the low frequency. That is why the pump radiation must necessarily have the frequency f_p is greater than the frequency f of the laser radiation, although here it plays a role and the gradual expansion of the orbital loops of the outer electrons transmitting their energy to the nodal electron, with a decrease in the frequency of their oscillations from f_p to f . That is, it has nothing to do with the usual explanation according to which the energy laser radiation quantum $E = hf$ cannot be higher than the pump quantum energy $E_p = hf_p$. The idea of the population inversion of the atomic levels is also completely superfluous here, because the generation threshold is set by the velocity balance inflow and outflow of energy of the main oscillations of electrons at frequency f . So, "quantum" generators and amplifiers work exclusively on classical principles of the theory of oscillations and waves, without requiring quantum. In some types of lasers, for example, semiconductor, gas and some others, the mechanism of energy transfer can be more complex, but all the same, - a classic character. In these cases, the generation of the laser radiation can go something like this: When pumped (say electric discharge) atoms, or rather, their outer electrons, gain energy. At the same time, internal electrons are excited at the sites, which generate a still incoherent, but already having a standard frequency f radiation (there may be other frequencies in the spectrum, which are amplified and emitted much worse).

This radiation, passing through the atoms, makes them, by the trigger mechanism of the photoelectric effect, eject those external electrons that are spinning with the same frequency f (unlike internal electrons, they emit a very weak, since they have much lower values of speeds and accelerations, § 3.2). Then, the atom experiences a recoil, which is why it is shaken nodal electrons, especially electrons with natural frequencies f , as in the Franck-Hertz experiment. Therefore, they themselves begin to generate radiation f , moreover, in the same phase as the incident light, since there the oscillations are launched by an

external electron synchronous with the incident wave (Fig. 160). Its jerk-recoil not only triggers the vibrations of the inner electron, but also synchronizes them with the incident light.

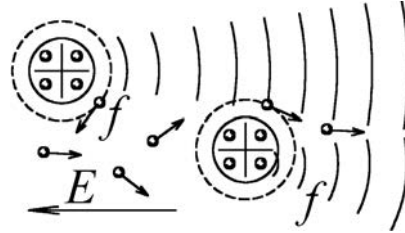


Fig. 160. Generation of laser light: the collection of energy by the electron in the field of the E discharge, its capture and emission by the atom from the photoelectric effect.

Thus, the ignition radiation will grow avalanche due to energy of external electrons. After a while, they will replenish the energy lost during the flight, due to the pumping device, then they will be absorbed by atoms and again will be emitted when the wave falls. So, each act of strengthening the initial radiation is associated with the ejection and capture of an electron. No wonder, the greatest efficiency and distribution are developed by Russian physicists G. Alferov and N.G. Bass semiconductor lasers (those that work in CD and DVD devices), where injection light generation directly related to the internal photoelectric effect. This proves the close relationship of laser radiation with direct and inverse photoelectric effect - with elementary acts emission-absorption of electrons and light by atoms of the medium. Not in vain, and like myself, Planck likened the photoeffect to an explosive, avalanche process, where light only releases stored energy, serving as an avalanche trigger (§ 4.3). In general, the laser began to be used as a weapon in part because that his work has long been illustrated with a ballistic analogy. In a laser, atoms first store energy, as the bowstring of a bow, crossbow, ballista, or a charge of gunpowder in a gun stores it, and then the energy is explosive is released by the trigger, which is the light itself in the laser.

In quantum physics, the explanation for the generation of laser light sounds extremely unlikely. Suffice it to say that the main property of laser radiation is its coherence, equality of frequencies and phases for all waves light, - they explain there, not considering the waves themselves and their generation, but reasoning exclusively about photons and quanta of light, - about the non-wave side phenomena. And, in general, it is a mistake to believe that the creation of lasers owes something to quantum theory. Lasers were originally developed exclusively for based on the optical properties of media known from experiments, - the ability excited atoms of the medium emit light of a given frequency under the action of incident light (a purely classical photoluminescence effect, § 3.1). Therefore, the first lasers were invented and built by technicians, engineers, experimenters, people far from quantum and theoretical physics in general (similarly, the first maser was built by Basov and Prokhorov, based on classical molecular radiospectroscopy and nonlinear oscillation theory). The first progress in this direction and, even, actually working lasers were made back in the 19th century by the engineer N. Tesla,

who later had an extremely negative attitude to the theory of relativity, and to quantum physics. Created by him in 1890, the electronic lamp gave light by a mechanism close to the generation of a monochromatic light in the Franck-Hertz experiment (§ 4.8) and already had a mirror resonator with a semitransparent section, as in current lasers [110, p. 537].

The very idea of the laser was put forward in 1939, and more developed in 1951, by Soviet power engineer V.A. Fabrikant, and not in the form of a scientific articles, but in the form of an application for an invention. The discovery of V. Fabrikant, however, was rejected as unrealizable and contrary to theory. And built the first working laser in 1960, again an engineer, American T. Meiman, guided no longer by calculations, but by experience and common sense (see <http://www.ritz-btr.narod.ru/mejman.html>). Meiman assembled the laser, in fact, at home: from a simple flash lamp and a ruby rod. This laser fit in a pocket like modern laser pointers [143], and was a real effectively working laser that did not go into any comparison with the cumbersome installations created even after some time by representatives of official quantum science. Meiman, however, had to publish a report on this invention in a regular newspaper, then how scientific journals refused to accept the article, because, firstly, it was not an article by a theoretical specialist, but secondly, a Meiman laser worked contrary to quantum theory. Meiman himself is the foundation of his success. considered, just, a departure from quantum dogma, from traditional ideas, based on the "unshakable" postulates of the scientific elite. It is blind faith into authority ("the guru effect", as T. Meiman called it) did not allow, by according to the inventor, to achieve success for other scientists. And it is not known if there would be. We generally have working lasers now, do not dare someone to go against official quantum dogmas.

The same is with a maser - a device that emits radio waves strictly fixed frequency and, therefore, served as the basis for creating lasers and highly stable clocks. Maser also works on the purely classical principle of excitation and amplification of electromagnetic oscillations in resonator - from a beam of excited ammonia molecules, giving off energy natural oscillations, in the form of radiation energy at a standard frequency these fluctuations. In order to ensure the predominance of gain over absorption, a beam of molecules entering the resonator is passed through an inhomogeneous electric field. It removes absorbing ammonia molecules from the beam, which do not fluctuate, but, therefore, have a constant dipole moment, on which the field acts. At the same time, hesitant, excited ammonia molecules are similar to a pulsating dipole (Fig. 29): their dipole moment periodically changes the magnitude and sign, which is why the average the dipole moment and the action of the electric field in time spans are zero. Therefore, excited emitting molecules are not are removed from the beam by an electric field, and, once in the resonator, they excite it at the frequency of its vibrations. Vibrations of ammonia NH_3 molecules having view of a pyramid, with a nitrogen atom N at the top and three hydrogen atoms H in basis, are of a classical continuous nature: the nitrogen atom vibrates mechanically, flying between the hydrogen atoms and leaving now one by one, then on the other side of them (if the nitrogen atom has low energy, it will not

pass between hydrogen atoms, and the molecule will not vibrate). So, that, discrete state changes and energy levels from quantum physics has absolutely nothing to do with it (§ 3.4). Moreover, quantum theory contradicts the work of the maser.

According to N.G. Basov, physicist-engineer, together with A.M. Prokhorov who built the first maser, he approached the idea of such a generator to many prominent quantum theorists. And all quantorelativists unanimously argued that it was impossible to create a maser, that the frequency radiation cannot be rigidly fixed, because this contradicts the uncertainty principle of Heisenberg (Kryukov P.G., Femtosecond pulses, M. Fizmatlit, 2008, p. 53). And yet, contrary to the tenets of quantum physics the maser was built by Basov in 1954. the invention, realized by physicists-engineers, fitted the theoretical basis by quantorelativists, as if the maser owed its appearance to the quantum theory. In fact, we see that the maser and laser were not created thanks to, but rather - contrary to quantum theory and should be considered not a triumph, but a grandiose failure of non-classical physics. The same can say about the basis of modern laser systems – semiconductor lasers, the idea of which was put forward by the same Basov, although all theorists rebelled against this, who insisted that such a laser could not work - because of strong absorption of light by the semiconductor. And, after all, back in the 1920s Nizhny Novgorod radio engineer O.V. Losev watched the glow emanating from semiconductors, and the amplification effect, opening the way to create not only all current electronics and transistors, but also LEDs with lasers. As a result, contrary to all the predictions of quantorelativists, the semiconductor the laser is working, and how!

So, the first masers and lasers could not work according to quantum theory! It is no coincidence that the same Meiman, who spoke out against quantum dogma, had to work in conditions of constant lack of money, disbelief and ridicule. When the solid-state laser was built, and July 7, 1960. at a press conference organized by Meiman, everyone saw that the laser works, it was immediately used for their own purposes by quantorelativists, having forgotten about the inventor and starting to claim that the laser was built and predicted on quantum theory. So, in hindsight, C. Townes and other scientists adjusted the theoretical basis for a ready-made invention, although the original theory Townes laser, as shown by Meiman, is inoperable, and the proposed Towns failed to build a sodium vapor laser. However, in the end The Nobel Prize for the creation of lasers was won not by V. Fabrikant, and not by T. Meiman, who discovered lasers and indicated all currently known the scope of their application, and C. Townes, who combined lasers with non-classical physics and applied them to assert the dictatorship of quantum theory and the theory of relativity. The situation was repeated, which already took place at the discovery of superconductivity, superfluidity (which quantum theory could not predict and, even after the discovery for a long time could not explain § 4.20, § 4.21), with the discovery of nuclear energy (no obligatory theory of relativity, § 3.13). Likewise, a laser is a purely classical device, to understand the principles of operation of which quantum representations are not needed, but it is enough to

know the classical model of the atom or the experimentally discovered the ability of a medium of excited atoms to resonantly amplify incident radiation. The quantorelativist sect took over the discovery of the laser as well as the discovery of superconductivity, nuclear energy, spectral Ritz's formulas, his formulas for the displacement of the perihelion of Mercury, quanta electric field (rheons), - all that to which quantorelativists had nothing to do, but they still cite their absurd theories. "Punish the innocent and reward the innocent" - this is the motto of quantorelativists. The invention of the laser, built by the hands of engineers and classical physicists, was stolen from them by businessmen from science, completely as in the story of A. Tolstoy "The Hyperboloid of Engineer Garin", and used to assert the worldwide domination of the quantorelativistic sect.

§ 4.10. *Is an electron a wave or a particle?*

- Who is commanded to tweet - do not purr!
 - Who is commanded to purr - do not tweet!
 Do not be a cow a raven,
 Do not fly frogs under the cloud!

K. Chukovsky, "Confusion"

The arrival of quantum physics turned science upside down: not only light began to be endowed with corpuscular properties, but also particles of matter began to count as waves, confusing everything, as in Chukovsky's poem. Indeed, there is no more bizarre statement of quantum physics than the hypothesis de Broglie, according to which every particle must be simultaneously considered as a wave, and a wave is like a particle. However, scientists have accepted this paradoxical a thesis that violates the Occam's principle, so revered by them, according to which there is no need to consider light as a particle if its properties can be explained, considering light as a wave, one should not consider electrons and atoms as waves, since it is easy to understand their properties as particles. However, it seemed that electrons in experiments showed also a wave nature, and light - a corpuscular one. Therefore, now few people doubt that electrons have, in addition to corpuscular ones, and wave properties. Besides the laws of conduction (§ 4.17) and the tunneling effect (§ 4.12), indirectly confirming the dual nature of the electron, there seems to be direct evidence of its wave properties. These are experiments that discovered interference and diffraction of electron beams or even individual electrons. However, as we have seen, many nonclassical effects can be fully explained classically. This is exactly how it was shown above that quantum effects can be explained by considering light to be a simple wave. Likewise, the "wave" properties of the electron can be interpreted classically, considering it a particle. These explanations were not found only because physicists, blinded by the successes of quantum mechanics, did not try to find them. So, is there any real evidence wave-particle dualism?

The first experiment that "confirmed" the wave nature of the electron was the experiment Davison and Jermer, who irradiated the nickel crystal with high-energy electrons [134]. Those were scattered by the crystal surface unevenly: in some directions more electrons were emitted, in others - less. The scattering

maxima and minima alternated, as in the diffraction of light on a diffraction grating or X-rays on a crystal (Fig. 161). Therefore, it was considered that electrons are similar to a wave scattered by a surface crystal, whose atoms play the same role as the strokes of the reflective diffraction grating. It seemed to be confirmed and consistent with experience numerical estimates of the wavelengths of electrons - according to the de Broglie formula, based on their known speeds

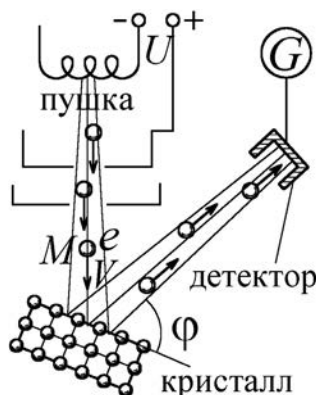


Fig. 161. Electron diffraction: an electron beam scattered by a crystal, depending on the angle φ , gives the maxima and minima of the current of electrons entering the detector.

and energies. Physicists, however, did not take into account that electrons, when they hit a metal, always generate electromagnetic waves. And, conversely, electromagnetic waves, light, hitting a metal, pull out electrons from it. Therefore, it is possible that in fact, it was not the electrons themselves that were diffracted on the nickel crystal, but the created they still have electromagnetic X-rays in the electron gun. Not in vain, compare the diffraction of the crystal of electrons and X-rays. And the detector, designed to register electrons, detects precisely X-rays. After all, photographic film, often used for registration diffraction pattern, are equally capable of illuminating as electronic beams and X-rays.

If, however, a galvanometer is used as a detector, which measures the magnitude of the current, the charge brought by electrons, then it can also register, really, just the intensity of the X-rays. These rays they can induce current and photo-emf in the galvanometer, and they can knock electrons out of the detector, generating a current opposite to that given by electrons. Therefore, in addition to the magnitude of the galvanometer current, it is necessary to measure its sign – corresponds does it bring in electrons or leave them? The magnitude of the photocurrent, as it says Stoletov's law is proportional to the radiation intensity.

Therefore, there, where X-ray diffraction gives maximum, will be maximum and photocurrent, which is interpreted as an increase in the number of incident electrons. And where the minima are located, and the photocurrent is small there, - therefore, it is believed that in these electrons almost do not hit the area (Fig. 162).

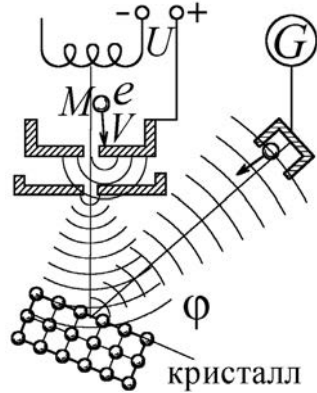


Fig. 162. Classical interpretation of Jermer's experiments. Electrons hitting the metal generate X-rays that are diffracted on the crystal and affect the detector.

In addition to the qualitative agreement, there is also a quantitative agreement. Wavelength de Broglie $\lambda = h/MV$, where M is the mass of a particle, V is its velocity, h is a constant Plank. The higher the speed and energy of the electron, the shorter the corresponding wavelength. Judging by the position of the diffraction maxima in the experiment Davison, as the electron energy increases, the wavelength decreases in this way. The same is given by the classical picture of the phenomenon. It is not electrons that are diffracted on the crystal, but X-rays created by their impacts, the wavelength λ of which is according to the laws of the inverse photoelectric effect, it is related to the electron energy $E = hf = hc/\lambda$, or $\lambda = hc/E$. That is, in the classics, the wavelength of diffracted radiation is decreased with increasing energy, electron velocity. Since the experiments investigate fast electrons with speeds of the order of the speed of light c , their momentum $p = MV$ expressed in terms of energy by the relativistic formula $E = pc = MVc$. From here we find $\lambda = hc/E = h/MV$, which coincides with de Broglie's formula.

If scientists used the classical expression $E = MV^2/2$, they would notice the discrepancy, because the wavelength would be expressed differently: $\lambda = 2hc/MV^2$. They don't notice it just from acceptance SRT formula $E = pc$. One erroneous theory hides the errors of another. How in the saying "a hand washes a hand, a thief hides a thief," and the theory of relativity with quantum mechanics: do not be one, the falsity of the other would become obvious.

Yet Jermer's experiment reveals a divergence from quantum theory. According to STR, the formula $E = pc$ is valid only for very fast electrons, giving birth to the harshest radiation. Therefore, the slower the electrons, the stronger the deviation towards the classical formula $E = MV^2/2$. So that, for slow electrons, according to the classical theory, noticeable inconsistencies with de Broglie's formula should be observed. And they really arise, perplexing physicists [56, 134]. They really try save the theory, assuming that in the metal, due to the work function, the wavelength electron changes [82, 134]. But all these desperate attempts do not hold water. So, found from the experiments of Jermer, taking into account this hypothesis, the values of the work function are

completely inconsistent with its real values. This means that the problem is precisely in the quantum theory of the phenomenon, and not in unaccounted for interference.

As you can see, the classical interpretation of Jermer's experiments is not only possible, but also gives better agreement with the experiment than the quantum one. Likewise, all other experiments on the diffraction of "electrons" by crystals are interpreted and polycrystals: everywhere it is not the electrons themselves that diffract, but the X-ray radiation, which is recorded by the detectors. True, in one of the experiments J. Thomson and P. Tartakovsky, realizing that the diffraction X-rays can also create a picture, they tried to exclude this effect by imposing a magnetic field in the space behind the screen [82]. If the case is X-rays, the picture was not expected to change (magnetic field does not affect them), and if the reason is in electrons, the magnetic field will distort picture, which was observed in the experiments. But also, in the classical picture of the phenomenon electrons passing behind the screen and knocked out of the detector can distort a picture created by x-rays. Much easier to split phenomena, completely eliminating the entry of electrons into the detectors by a partition that traps electrons but transmits X-rays rays, or by imposing such a powerful magnetic field that will deflect electron beam, so that electrons cannot reach the film at all. If, in this case, a diffraction pattern does arise, then the cause of the effect will unambiguously be in X-rays.

Experiments on "diffraction" or "interference" can be explained in the same way. electrons at the edge of the screen, on one or two slits in the screen. Consider, that an electron wave, diffracting from the partition, like light, creates interference pattern on a luminescent coating. But, and in this case, obviously, it is not the electrons themselves that diffract and interfere, but the electromagnetic waves generated by them in the metal, which act on the phosphor of the screen is the same as the electrons, causing it to glow. Specialize the experiment on the interference of electrons in a setup similar to interferometer from the Sagnac experiment (§1.13). The electron beam was divided into two, which again converged on the detector, where they "interfered". When this, depending on the rotation of the installation, the interference pattern changed, as if in the Sagnac experience, where light waves interfered. However, here the scientists overdid it and "substituted" themselves, because experience led to the conclusion that the waves in the experiment move with the speed of light, and not with the speed of electrons. That is, it was not electrons that interfered, but electromagnetic waves excited by electrons and reflected by flat electrodes of electron mirrors. That is, no interference electrons or other particles were not observed in such experiments: there was classical light interference.

It is the classical interpretation that allows you to solve one of the main mysteries of interference and electron diffraction. If electrons are rarely allowed, so that they followed one at a time, then interference on two slits and other diffraction patterns nevertheless arise, as the experiments of V. Fabrikant have shown (the inventor of the laser, § 4.9). But this means that each electron passes immediately through both slits, interfering with itself, otherwise the

interference would be impossible. On the other hand, you can fix exactly which slit each electron passed through, as well as notice the place of the luminescent screen where the electron hit. All this does not fit with the wave representation of the electron and the fact that it passes both slits at once [15]. Scientists are oppressed by this contradiction, and, therefore, they either avoid this topic or invent absolutely mystical theories.

But in reality, everything is simple. Since the cause of diffraction is not in the electron, but in the X-rays caused by it, then there is no need for it to go through both slits. Electrons flying one by one through the slits have no effect at all on the diffraction pattern. You can generally plug the slits with a material impenetrable for electrons, but transparent for the radiation generated by them - the diffraction pattern will remain, although not by one electron. And the points where the detectors record electrons are not places hit by electrons that have passed through the slits, and the areas where the radiation energy is sufficient to excite the detector atoms, to illuminate the crystals phosphor or silver bromide. Everything is exactly the same as considered above in the case for conventional optical radiation (Fig. 147).

Also known is the experiment on the diffraction of electrons by atoms of inert gases. Such an experiment was carried out by Ramsauer and Townsend [82]. Briefly the essence of it is in the following. Between the source of and electrons and installed opposite a scattering medium is placed on it by the receiver P (Fig. 163) - an inert gas. A narrow beam of electrons of known energy fired by the source to the receiver is scattered by the gas atoms. Part of the electrons from those that are not scattered or scattered at small angles, reaches the receiver, creating electrical current measured to give the percentage of particles flown in (this percentage and the current is the greater, the smaller the scattering).

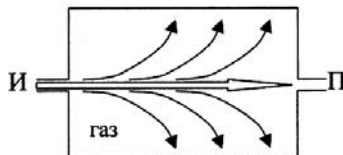


Fig. 163. The electron beam from the source comes to the receiver weakened due to the scattering of electrons by gas atoms.

Theoretically, with a decrease in the speed and energy of particles, the degree of their scattering by atoms, determined in terms of the effective scattering cross section σ , should grow monotonously. Likewise, a fast-moving car or a projectile entering an obstacle course deviates from a straight path, "Dissipates" the earlier and stronger, the lower its initial velocity.

But in experiment, such a picture, - an increase in scattering with a decrease in velocity, - is given only up to a certain value E_1 of the electron energy (Fig. 164). From reaching it, a further decrease in speed does not lead to growth, but to the decay of the scattering. Only after the energy of the electrons decreases until the next characteristic value E_0 , the degree of scattering starts to increase again.

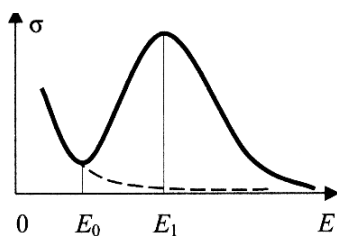


Fig. 164. Dependence of the cross section of scattering of electrons on their energy in the experiment of Ramsauer.

If Rutherford, in his famous experiment, compared alpha particles, thrown back with thin gold foil, with rifle bullets, bouncing off a sheet of paper, then slow electrons piercing it. On the other hand, the gas layer in Ramsauer's experiment should be likened to light straws piercing through a thick sheet of armor. Indeed, the classic theory for a long time could not explain the abnormally high permeability gases - for relatively slow electrons.

But it was enough to assume that the electron has wave properties, as everything fell into place. According to quantum mechanical concepts, the scattering of an electron as a particle can be considered only as long as while its momentum is higher than a certain value, while the de Broglie length the electron wave is small, much smaller than the size of the scattering atom. (Likewise, geometric optics, essentially treating light as the flux of rectilinearly flying particles, - photons, is applicable only for optical systems that are much larger than the length of light waves.) But, at some, rather small, speed, the de Broglie length electron wave ($\lambda = h/p$, where h is Planck's constant and p is the electron momentum) is compared with the size of the atoms scattering electrons.

In this case, according to quantum theory, electrons are scattered by atoms not as particles, but as waves: diffraction of electron waves on atoms. In diffraction, as follows from optical experiments, the waves go around the screen, creating, during addition, interference maxima behind it, in the region of the geometric shadow. So, for example, when lighting a round screen in the center of its shadow, under certain conditions, appears light spot (Poisson spot). Roughly the same thing happens with electrons. At a sufficiently low speed, they begin, as it were, to pass through atoms, bend around them, which is manifested in a decrease in scattering and the creation of the receiver of a kind of electronic Poisson spot. (Likewise, a car slowly entering an obstacle course will no longer be in them crash, but will go around them, and, therefore, despite the low speed, will be able to move in the right direction for a long time).

And so it happened that the scattering of electrons, with a decrease in their speed, grows only up to a certain value of their impulse, energy. Barely speed electrons will decrease so much that their wavelength becomes comparable to the size of the atoms, the scattering will decrease sharply. This explains the unusual the nature of the graph (Fig. 164), which has an anomalous dip - at least in the region of low values of the electron energy.

It is remarkable that the heavier the inert gas used, the more lower electron velocities, it is possible to observe the effect of anomalous reducing scattering. Thus, in the "General Course of Physics" [134] for a comparatively light argon,

the critical energy value $E_1 = 13$ eV is given, for more heavy krypton $E_1 = 11$ eV, and for heavy xenon $E_1 = 6$ eV. Decrease E_1 is explained by the fact that the size of atoms of inert gases gradually increases with increasing their atomic number, when going from He to Xe (Table 11: radii under the article "Inert gases" from TSB). Therefore, the heavier the gas, the the larger its atoms, and the larger should be the de Broglie wavelength λ electron, for diffraction on them. The more you need to slow down electrons for the appearance of abnormally low scattering. It turns out that from the dependence of the scattering of electrons by atoms, one can even estimate the values atomic radii.

Ele- ment	Atomic radii, Å		Energy, eV		
	by A. Bondi	by V.I. Lebedev	maximum scattering	excitement	ionization
He	1.40	0.291	-	20.60	24.58
Ne	1.4	0.350	-	16.77	21.56
Ar	1.88	0.690	13	11.77	15.76
Kr	2.02	0.95	11	10.59	13.94
Xe	2.16	0.986	9	9.52	12.08
Table 11.					

Such is the quantum-mechanical interpretation of the Ramsauer-Townsend experiment, it would seem that it is extremely clear and convincing. But, in fact, not everything is so smooth.

The fact is that the considered law of scattering amplification with a decrease in velocity is justified only for the case of elastic scattering, that is, for scattering, in which the sum of the kinetic energies of the electron and the scattering atom before and after the collision is the same: the impact energy does not pass into the internal energy of the atom ... Therefore, in the textbooks it is specially stipulated that only the case of elastic collision is considered [82]. But the fact of the matter is that at energies of the order of 10 eV the collision is already close to inelastic (§ 4.8). Indeed, for each of the gases, the energy E_1 , starting from which there is a discrepancy with the classical scattering law, is only slightly less than the corresponding ionization energies (Table 11). And, according to other sources, for argon, these energies do coincide. So, for example, according to the textbook by A.N. Matveev [82] for argon the energy of the greatest scattering is 16 eV, which almost coincides with the ionization energy of its atoms (15.7 eV). But then the collision becomes already inelastic: at such an energy, individual electrons, having collided with an atom, will no longer bounce off it elastically, but will lose speed, having given part of the energy to ionize the atom, to detach an electron from it.

However, the collision becomes inelastic long before the impact energy exceeds the ionization energy. Much less than the latter - the excitation energy of the atom (Table 11), - the minimum portion of the energy that the atom can

absorb. Only this, but - in no way less, portion of energy is capable of transferring the atom into an excited state. Only electrons of energy E_1 , vibrating during capture by an atom with a frequency $f = E_1/h$, are able to enter into resonance with the natural vibration frequency of the internal electrons of the atom and, therefore, easily give this energy E_1 to the atom, which is emitted in the form of the so-called "first resonance spectral line atom". The existence of such a threshold energy value was discovered in the Franck-Hertz experiment (§ 4.8), no less simple and convincing than the Ramsauer-Townsend experiment. And in many other ways, these experiments are similar.

Both there and there there was a source and a receiver of electrons with a scattering medium (metal vapor or inert gas) between them. In both experiments, the percentage of electrons reaching the receiver was measured by the current created in it. And, also, as the speed and energy of the electrons increased, more and more of them, due to the decrease in scattering, had to reach the receiver: the current I of the receiver had to increase monotonically as the energy of the electrons grew (Fig. 165, dashed curve).

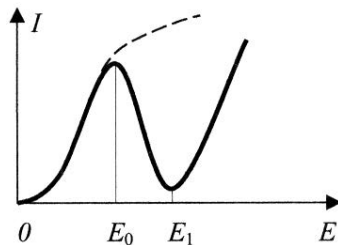


Fig. 165. Dependence of the current I of electrons on their energy E in the Franck-Hertz experiment.

However, just as in Ramsauer's experiment, on the experimental curve (Fig. 165, solid line), minima and maxima appeared: when the electrons reached a certain velocity corresponding to a certain energy E_0 , the number of particles that reached the receiver, with a further increase in velocity, ceased increase and begin to decrease. Only after the electrons reached the next characteristic value of velocity (and energy E_1), the fraction of particles absorbed by the receiver began to grow again. The experiment is explained simply: while the velocities of the electrons are small, the atoms scatter them elastically, almost without decreasing their velocity in collisions, since the atom is much more massive than the electrons bouncing off it.

But, as soon as the growing energy of the electron exceeds the excitation potential of the atom E_1 (and its first resonance line), the latter will take energy away from the particle: the energy of the electrons burns out, as when going over the point in the card game (this is how the electron gains energy greater than 21 eV, leads to its "combustion"). Electrons with such an energy lose speed and can no longer overcome the blocking field. If the electron has a noticeably high energy, then, depending on the conditions of the experiment, it either loses only a part of it (equal to the resonance potential), or does not lose it at all (the improved experiment of Hertz). That is why, as the electron energy

continues to grow, the percentage of particles reaching the receiver will begin to increase again (Fig. 165).

The similarity of the experiments is so obvious that it immediately attracts attention. In both experiments, contrary to the predicted dependence (in Fig. 164 and Fig. 165 shown by a dotted line), a sharp drop in the number of electrons reaching the receiver is observed, which is minimized when they reach the energy E_1 . No wonder, the dependencies in Fig. 164 and Fig. 165 are qualitatively mirror images of each other, since $\sigma \sim 1/I$. That is, in the Ramsauer experiment, the dependence of the electron current on energy also arises, as in Fig. 165. Therefore, the Ramsauer-Townsend experience is explained in the same way as the Franck-Hertz experience. Having gained a certain energy, the electrons cease to dissipate elastically in collisions, and at once give up the accumulated energy to the atoms (equal to the excitation energy - the resonance potential). At the same time, their speed decreases, which leads to increased scattering, which reduces the percentage of particles that have reached the receiver. Then, a kind of resonance maximum, a burst, appears on the monotonically decreasing scattering curve. That is why the graph (Fig. 164) is so reminiscent of the resonance curve familiar to everyone from school.

Thus, the resonance maximum and the accompanying scattering minimum should be observed in any case, regardless of the nature of the electron. The resonance peak of the scattering cross section per excitation energy is also mentioned in the literature on the theory of collisions and scattering of electrons by atoms. And, since on the graph (Fig. 164), besides the extrema associated with the excitation of the atom, there are no others, then, it turns out, there is no use here to attract diffraction and wave properties of the electron. So, the result of the Ramsauer-Townsend experiment cannot serve as proof of the wave nature of the electron: this experience is nothing more than a modified Franck-Hertz experiment.

This is confirmed by the values of the energy of the scattering maxima in the Ramsauer experiment, which are close to the excitation energies of the indicated gases (Table 11: the excitation energies of atoms according to the book [91, p. 44]). Due to the fact that the resonance peak of the scattering curve is very blurred for various reasons, the scattering minimum can be noticeably separated from the maximum, and the maximum energy may not exactly coincide with the excitation energy.

And not at all an increase in the size of atoms is explained in Ramsauer's experiment by the decrease in the energy E_1 of the scattering maximum, but by the fact that the excitation (and ionization) energy gradually decreases in going from helium to xenon. If the sizes of atoms, in fact, are sometimes estimated by the scattering and diffraction of electrons on them, then, perhaps, the error of this measurement technique is caused by the large discrepancies (sometimes by a factor of 5) in the values of atomic radii found by different methods.

So, the Ramsauer-Townsend experiment does not confirm the wave properties of the electron and should be excluded from the corresponding sections of the textbooks. It would seem that nothing terrible: just in this experiment, as in many others, not the wave, but only the corpuscular side of the

two-faced electron is manifested, but in other diffraction experiments the wave properties of these and other particles are evident. But not everything is so simple ...

In the Ramsauer experiment, as in the Franck-Hertz experiment, the wave properties of the electron, leading to a decrease in scattering, should nevertheless manifest themselves, if not at the indicated, then at slightly lower energies. But the fact of the matter is that on the dependences (Fig. 164 and Fig. 165), apart from the obligatory scattering oscillations associated with the excitation of spectral lines and ionization of atoms, there are no others. It turns out that Ramsauer's experiment not only does not confirm the wave nature of the electron, but even refutes it.

In addition, the erroneous wave interpretation of the Ramsauer experiment, included in the textbooks, undermines the credibility of the wave explanation and all other experiments on the interference or diffraction of electrons and other particles. As we will see, all these experiments can be explained rationally, without involving the wave properties of particles. It turns out that there really is no wave-particle dualism, and scientists take what is expected for reality. It's just that the results of experiments on the interference of electrons, like the results of the Ramsauer experiment, were so unusual, seemed so contrary to classical concepts that the wave nature of the electron was unconditionally recognized in them, and there were no attempts to give the experiments an alternative explanation. And, meanwhile, we see that such an explanation can be found, it should be looked for. No wonder, even Einstein and Planck, whom no one will accuse of blind adherence to classical views, whose works laid the foundation for quantum physics, until the end of their days denied quantum mechanics and the indeterminism of the phenomena of the microcosm, arguing that it is impossible for a particle to be simultaneously a wave, and for a wave - a particle. And many other physicists believed that over time, in each case, only one model will survive, which will explain both the wave and corpuscular properties of particles or waves. This point of view was selflessly defended by A.G. Stoletov (§ 4.3).

§ 4.11. *Wave properties of particles*

His rich imagination, his optimistic readiness to master the problem, not hindered by an overly critical approach, would be quite appropriate here.

A. Sommerfeld on the early death of W. Ritz [50]

Walter Ritz, like Sherlock Holmes, was an unsurpassed master in a simple rational explanation of seemingly supernatural phenomena and mysterious facts that were too tough for representatives of official structures. So, Ritz classically explained the result of the Michelson experiment, the spectra of atoms, the radiation of a black body. And, in explaining the wave properties of particles, perhaps it was Ritz, who could do a lot, thanks to his optimism and bold imagination, who would offer a clue. He had already done this once, explaining, on the basis of the corpuscular theory of light outflow and the ballistic principle, the wave properties of light carried by rheon particles. Undoubtedly, Ritz would

offer a reasonable visual classical explanation for the wave properties of all other particles.

So, wave properties were found not only in electrons, but also in other particles - neutrons, atoms and molecules. But, in exactly the same way as in the case of rheons and electrons, these experiments can be explained classically, without resorting to the hypothesis of wave-particle duality, but continuing to consider particles as simple bodies, corpuscles. Consider, for example, the diffraction of molecular beams on the surface of a crystal. First, a device called a "velocity selector" and representing two rotating discs with slots [134] selects from the beam particles with a given velocity and corresponding de Broglie wavelength (Fig. 166). This beam falls on the crystal and is reflected like an electron beam

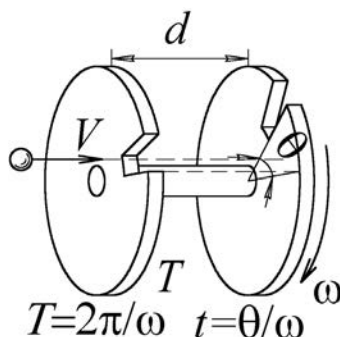


Fig. 166. Scheme of operation of the speed selector, which passes molecules with speeds $V = d/t$.

(Fig. 161). In this case, in addition to the beam reflected at an angle of incidence φ , two side beams appear - two secondary maxima, both from diffraction (Fig. 167). These maxima are the farther from the main one, the lower the molecular velocity and the longer the wavelength. It seems that this experiment confidently proves the wave properties of particles. But this only seems to be because it also has a simple classical interpretation. First of all, the selector passes, in addition to molecules with a velocity $V = d/t$, particles flying with velocities $d/(t + nT)$, where n is an integer and T is the period of revolution of the disks. That is, relatively slow particles also enter the crystal, during the time of flight of which the selector makes one or n revolutions.

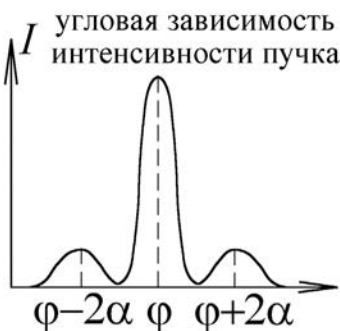


Fig. 167. The picture of the scattering of a beam of atoms by a crystal resembles a diffraction one, but it is explained classically.

Let us now consider a particle incident on a crystal surface. The atom bounces off not from individual atoms of the crystal, but from interaction with their common electric field. The field of the atomic plane has wavy equipotential surfaces, the humps of which are located opposite the atoms, and the depressions are between them. In this case, the farther from the crystal boundary, the more flat and smooth the planes of equal potential become. From these equipotential surfaces and bounce, atoms or molecules of the gas are reflected. The higher the energy of the gas particles, the more they will be reflected from the deeper surface, as if from a rigid one, that is, at an angle equal to the angle of incidence. If the cross-section of the surface is depicted as a sinusoid with the limiting steepness α , then it can be seen that the atoms will be reflected at any angles between $\varphi - 2\alpha$ and $\varphi + 2\alpha$. Moreover, the most intense reflection occurs precisely at these extreme angles: each beam creates two maxima (Fig. 168). For slow particles, they are not far apart, since the particles are reflected by external equipotential layers, almost flat, with small α . These slow molecules with $V = d/(t + nT)$, which are the most in the gas, create a high main peak near the angle φ - the maxima are merged into one (Fig. 167). But fast molecules with $V = d/t$ reach deeper layers with greater waviness and steepness α . It is they who create two side maxima near the main one, mistakenly taken for diffraction ones.

The higher the velocities of the fastest molecules missed by the selector, the deeper the equipotential surfaces reflecting them, having a greater steepness α , lie. And the further are the side highs from the main one. However, the angle α may decrease with deepening. That is why the results of such experiments are ambiguous, and their quantitative analysis is not given. Indeed, if the effect is classical and is not associated with diffraction, then experience cannot agree with the formulas of quantum mechanics, proving the falsity of de Broglie waves. That is why the results of such experiments are ambiguous, and their quantitative analysis is not given. Indeed, if the effect is classical and is not associated with diffraction, then experience cannot agree with the formulas of quantum mechanics, proving the falsity of de Broglie waves.

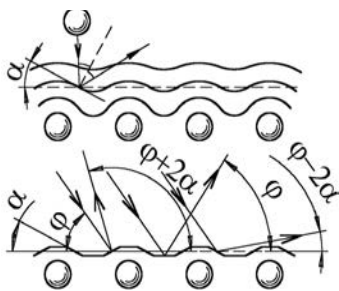


Fig. 168. The scattering of atoms by the surface of the crystal at selected angles is the result of the reflection of atoms by equipotential surfaces.

The uselessness of the wave properties of particles and "diffraction" for explaining the effect also follows from the fact that the effect was observed only in light helium atoms and hydrogen molecules. If heavier inert gases and metal vapors were used, then the "diffraction" pattern did not arise. As shown by the

experiments in 1971, instead of three maxima, either one peak or two symmetrical humps were obtained (["Tekhnika - Molodyozhi" No. 4, 2001](#)). Apparently, this is due to the low speed of heavy atoms, which is why only the fastest of them passed through the selector, and all the others were scattered. As shown above, it is these atoms flying with a velocity $V=d/t$ that form two symmetrically scattered humps. If the angle φ is close to the angle of the limiting steepness α , then of these two humps only one hump remains, corresponding to the reflection of the beam of atoms at the angle $\varphi+2\alpha$. And the second hump, corresponding to the angle of reflection $\varphi-2\alpha$, cannot appear or has negligible intensity, like the peak corresponding to specular reflection at an angle of φ . Thus, it was proved that the reflection of atomic and molecular beams is not of a diffractive nature, "predicted" by quantum mechanics, but is quite classical.

The last convincing, according to physicists, argument in favor of the wave properties of particles is neutron diffraction. The flux of neutrons, just like the flux of electrons, when falling on a crystal, gives rise to diffraction patterns. However, they are unlikely to be due to neutron diffraction. Rather, the fact is that neutrons, as you know, also generate X-ray and gamma electromagnetic waves when they hit matter. Neutrons, colliding with a nucleus, transfer it to an excited state, like electrons exciting an atom (this is the principle of pumping with neutrons, for example, a γ -laser works). Recall that nucleons (proton and neutron) play the same role in generating nuclear spectra as an electron with a positron plays in generating atomic spectra (§ 3.7). The nucleus that has absorbed the neutron is excited and begins to emit electromagnetic waves, the frequency f of which is related to the energy E of the incident neutron. It is possible that in the nucleus it decays to a proton and an electron, which, having received all the energy of the neutron, begin to rotate in the magnetic field of the nucleus with a frequency $f = E/h$, emitting at a wavelength close to de Broglie's $\lambda = h/(E/c) \approx h/p$, where p is the momentum of the incident neutron (§ 4.3). And, conversely, radiation of frequency f is capable of resonantly knocking out a neutron of energy $E = hf$ from the nucleus, say, as a result of the impact on the nucleus of a photoelectron of energy E or the escape of a proton spinning with frequency f , which captured an electron when it leaves the nucleus [135, p. 64]. Such a resonant emission of protons and neutrons, under the action of gamma radiation of the corresponding frequency, has long been known [19] and is called the "nuclear photoelectric effect" (photonuclear reactions). That is, the analogy of the manifestation of the "wave" properties of electrons and neutrons when interacting with atoms is another example of the relationship between the properties of an atom and a nucleus, as well as a single mechanism for generating atomic and nuclear spectra (§3.1, §3.7).

Thus, we again have a classical picture: incident neutrons excite radiation of the corresponding wavelength, which is diffracted by the crystal. Then, at those points of the diffraction pattern where the radiation is most intense, neutrons are emitted from the nuclei (in the course of the nuclear photoeffect §4.6), which are recorded by the instruments. X-ray, electron, and neutron diffraction have become the most popular methods for analyzing the structure of matter, because

each of them produces X-ray radiation, which is convenient for studying crystals. Only the methods of generation and registration of this radiation differ. Thus, there is no need to consider particles as waves. All of their so-called "wave" properties are illusion. Occam's Principle has paid off again!

The phenomena and laws of nature are rigidly determined and fully cognizable. Therefore, a scientist who wants to achieve real success in science must be, first of all, an optimist, have unlimited confidence in the ability to understand and explain natural phenomena on a rational basis, from the standpoint of visual classical, and not mystical ideas. If you really want and try, you will be able to find a simple natural explanation for any mysteries of nature. It was precisely this optimism, the boldness of the imagination, as Sommerfeld correctly noted, that was one of the reasons for Ritz's success in understanding natural phenomena. No wonder, it was Ritz, in accordance with the laws of dialectics, consistently combining wave and corpuscular concepts of light, for the first time gave a visual adequate classical description of the flow of matter waves - kinematic waves formed by rheons, analogous to classical electronic "waves" in klystrons (§ 1.11).

§ 4.12. Work function and tunnel effect

Lightning is fast running, and it strikes with a heavy blow And with an extraordinary speed it always glides during flight. Due to the fact that it itself is gaining strength in the clouds, Before it flies out, gaining tremendous speed. And when the cloud cannot withstand its greater pressure, Bursting out here, it flies out with amazing force, Like a projectile rushing from mighty guns. In addition, its elements are small and smooth, And therefore it is not easy for lightning to put up barriers. It penetrates inside and passes through porous passages.
Titus Lucretius Carus, "On the nature of things", 1st century. BC. [77]

In order to finally prove the adequacy and sufficiency of the classical description of particle motion, let us finally consider the tunneling effect. The tunneling effect is the last important "manifestation of wave properties" of electrons and other particles, which is also easy to interpret classically. Electrons form an electron gas in the metal, which, like any gas, has no sharp boundaries and, therefore, partially goes beyond the metal. This is how electrons "tunnel" through the boundary without the aid of wave properties.

Let us consider in more detail the effect of tunneling and the nature of the work function of electrons. It is known that an electron can leave a metal only by spending energy equal to the work function A [36, Part I]. That is why, for the intense electron emission from the metal, it needs to be heated. This is the only way electrons arise with velocities and energies sufficient to escape from the surface (thermionic emission). But, as it turned out, electrons can escape even from the surface of a cold metal if a sufficiently strong electric field is applied from the outside (cold emission). It was believed that in the classical theory this is impossible. Indeed, in order for an electron to gain output energy in an electric field, it must travel a certain path in this field, moving away from the surface. And to get out of the metal, energy is needed equal to the work function A . A vicious circle arises: the electron could gain the required energy if it jumped over the energy barrier, but for this it needs energy [134]. And,

nevertheless, electrons somehow get out of the metal, as if borrowing energy and following not over the barrier, but through it, like through a tunnel, bending around the barrier like waves, being blurred in space and time, due to quantum uncertainty. That is why, this tunneling effect is considered possible only within the framework of quantum mechanics.

And yet, the tunneling effect does not prove quantum fantasies about an electron blurred in the form of a wave, but admits a purely classical interpretation, if the work function is correctly interpreted. First of all, mobile electrons, even in a cold metal, now and then leave its surface, giving it a positive charge, which pulls the electrons back (Fig. 169).

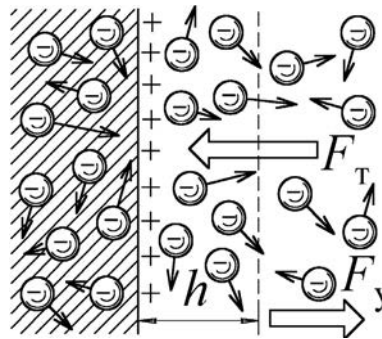


Fig. 169. The electrons that have escaped beyond the metal boundary are pulled back. Only the fastest and those accelerated by the E field leave the metal for good.

As a result, over the surface of any metal a cloud of electrons soaring and falling floats - a kind of electronic atmosphere that surrounds the metal with a thin layer. This layer sets the work function. Each electron, escaping from the surface of the metal, flies into a cloud, the electrical repulsion of which creates a braking force F_T , pulling the electron back. The electron between the negatively charged top of the cloud and the positively charged surface appears as between the plates of a capacitor with a blocking field.

In fact, a thin layer of electron gas enveloping the surface of a metal is analogous to the Earth's atmosphere, whose atoms also cannot escape into outer space, since for this it is necessary to overcome the earth's gravity by performing a kind of work of exit. The speed of atoms is less than the first cosmic one, and, having taken off to a certain height, they return to the surface. Only in planets with a hot atmosphere or small size, atoms incessantly flow into space. Like the concentration of atoms in the atmosphere, the concentration of electrons decreases exponentially with distance from the surface. And only rare high-speed electrons reach the outer layers of the electron cloud.

Heating the metal speeds up the movement of electrons, and more and more of them manage to leave the metal. This is how thermionic emission occurs, similar to the leakage of gas atoms from a heated atmosphere. In the case of cold emission, a different type of leakage occurs: not from the increase in the velocity of the particles of the electron gas, but from the drop in the locking force and the work function (this corresponds to the leakage of gases from small planets that are not able to hold atoms with their field). Indeed, during cold

emission, the electron is not only in the blocking field of the electron atmosphere, but also in the external accelerating field E , which reduces the return force F_T and allows the electrons, overcoming the attraction of the metal, to leave it for good.

Previously, it was believed that an external field is not capable of imparting sufficient energy to an electron, since there is no electric field inside the metal, and the electron, according to previous ideas, could not leave the metal. In reality, the electrons fly out of the metal and on the way L gain energy EL in the field E . That is, the external field has time to impart energy A to the electron, sufficient for a complete exit from the metal. Here, indeed, a kind of tunneling effect is observed: the electron gas comes out to a certain height from the metal, without being constrained by its boundaries, as if it were blurred. But this blur has nothing to do with the quantum-mechanical uncertainty of the position and energy of the electron, with its representation in the form of a wave. The phenomenon is of a purely classical nature, for gases and atmospheres, including electronic ones, cannot have clear boundaries. Their border is always conditional, blurred.

Finally, and quantitatively, the electron current during cold emission is in full agreement with the classical theory. As it was said, the concentration of the electron atmosphere in the near-surface layer of the metal decreases with distance h from the boundary - according to the exponential Boltzmann law $n \sim e^{-h/H}$, similar to the decrease in the concentration of molecules in the Earth's atmosphere with height h , where $H \sim kT$ is the characteristic height increasing with an increase in temperature T and is approximately equal to the thickness of the atmospheric layer. Only those electrons that pass the path $L = A/E$ in the accelerating field E are capable of gaining energy A sufficient for complete flight from the metal. In other words, electrons flying to a height $h > L$ will be able to leave the metal. Their number is easy to find by integrating their concentration $n \sim e^{-h/H}$, within the range of h from the height L to infinity. Hence, we find that the percentage of outgoing electrons capable of leaving the metal is proportional to $e^{-L/H} = e^{-A/E}$. It is this dependence of the cold emission current $I \sim e^{-E'/E}$ that was found in experiments where the constant $E' = A/H$ [36, 134].

The tunneling effect for two metal plates separated by a thin dielectric layer is explained in a similar way. The electrons of one plate fly into the dielectric and, with its small thickness, can pass into another plate. In the absence of voltage, this flow is counterbalanced. But, when a voltage is applied, this balance is violated, and a small current will flow through such a contact, the value of which exponentially grows with the temperature T and with a decrease in the thickness L of the dielectric. The same thin electron cloud is created in the transition layer at the interface of two metals with different electron concentrations, which explains the contact potential difference.

In addition, as shown earlier, the existence of the work function is directly related to the properties of atoms and molecules, with the presence of ionization energy in them, since the metal can be considered as one giant molecule with a certain ionization energy, which is the work function of the metal (§4.3). It is

interesting that clear mechanical ideas about the movement of electrons in a metal were formed back in the ancient world by Democritus and Lucretius, who represented a lightning discharge in the form of a current of tiny particles (electrons) that overcome the blocking field of the cloud and rapidly fly out of the cloud. No wonder, and in this ancient theory of electricity, a ballistic analogy was applied, which made it possible to anticipate the discovery of the electron work function, the critical breakdown field and impact ionization.

Another manifestation of the "tunneling" effect, already for alpha particles, was considered above (§3.14). The phenomenon also found a simple classical interpretation, so that there is no need to consider the α -particle as a wave, introducing the uncertainty of its position and energy in the nucleus. The activation energy required to detach from the nucleus is imparted to the α -particle by random impacts of rheons, which make the components of the nucleus twitch like Brownian particles. When the total energy of impacts exceeds the activation energy E_a , the α -particle breaks off and its further acceleration is carried out by Coulomb forces, which give up the potential energy E_k (Fig. 132). At the same time, the probability of obtaining the activation energy, according to the laws of mathematical statistics, decreases exponentially with the growth of this energy. And, therefore, if this energy is high, then decays occur extremely rarely: nuclei have a long half-life $T_{1/2}$. Since the average stored internal energy of the E_r reaction in different nuclei is approximately the same, the total energy $E_k = E_r + E_a$, acquired by the α -particle due to the internal energy of the nucleus and random collisions, differs little for different nuclei, amounting to 2–9 MeV. Moreover, the increase in the energy of α -particles, which occurs due to the communication of the additional activation energy E_a , is, as mentioned, accompanied by a very strong increase in the half-life of the nucleus $T_{1/2}$. Thus, a simple explanation is obtained for the Geiger-Nettall law, which now does not require the use of the quantum theory of Gamow's α -decays [135].

Similarly, it was shown that an electron constantly emitting rheons or experiencing their impacts must also constantly twitch, tremble, which is somewhat reminiscent of the quantum uncertainty of its position, however, with a purely classical nature. Finally, a certain "blur" is inherent in electrons and for the reason that they do not generate a stream of rheons themselves, but emit first blastons, exploding in cascades of rheons at different distances from the electron - within the sphere of decay, which has a certain thickness and length (§ 3.18). This leads to the fact that the Coulomb forces and Coulomb's law, just like the pressure force generated by the impacts of air atoms, have only an average statistical meaning: on small scales, the Coulomb force, like the pressure force, turns out to be randomly changing, at some moment it turns out to be more, then less, depending on the distance at which the blastons explode. This, too, can, in some cases, explain the effects of tunneling that occurs at those moments when the forces of attraction or repulsion of charges are weakened or increased due to fluctuations. Thus, the effects of tunneling, although they are associated with probabilistic processes, "blurring" of particles, but this probability and blurring is purely classical, deterministic, having a simple visual mechanical explanation.

§ 4.13. *Determinism in physics and objective reality*

Democritus was so carried away by the possibility of a "through" causal explanation of the world that he declared all kinds of random events only a subjective illusion generated by ignorance of the true reasons for what was happening. Knowing them, according to Democritus, turns any chance into a necessity.

B. B. Witz, "Democritus" [31, p. 62]

The main problem of non-classical physics is, perhaps, that it deprives the world of the property of being an objective reality, makes it substantially dependent on the observer, that is, in fact, it denies the materiality of the world and the materialistic approach in science. All concepts and properties of bodies become conditional, relative, indefinite. Not only time, space, length, mass becomes relative, but even the concept of a wave and a particle. Therefore, all quantorelativistic theories are quite suitable for the definition of "relativism" - an idealistic doctrine that denies the possibility of objective knowledge of reality, due to the alleged complete relativity of our knowledge (§ 5.12). Indeed, Einstein, in his theory of relativity, puts the whole world under the control of the observer: everything is tied to him. The concepts of the rhythm of processes, length, mass and other individual characteristics of bodies, according to Einstein, no longer make sense regardless of the observer. This is the purest water subjectivism, which denies the objective reality of the world. This absolutization of the observer is, in fact, a return to the geocentric theory of Aristotle-Ptolemy, who placed an earthly observer in the center of the world, relative to whom everything turned. Just as Aristotle could not imagine that the Sun was "at rest", so Einstein could not imagine a "resting" sun ray of light, which supposedly should always move relative to the observer with the same speed c , just as it moves with constant speed along the circle of the Sun in the Aristotle system. The fact that Einstein nullified the achievement of Copernicus was said a century ago by A.K. Timiryazev [25]. It is the absolutized observer (or observation device) that appears in all non-classical theories as the "Navel of the Earth" and sets physical reality with its subjective sensations.

Moreover, Einstein argues that the dependence of phenomena on the observer is not just an illusion, but reality. So, previously the Doppler and Ritz effect was considered, which speaks of a change in frequency from a moving source (§ 1.10). However, this change is only visible, imaginary. We know that the real frequency of processes in the source, of course, does not change when the observer moves relative to the source. The source has its own strictly specified frequency. And, following Einstein, one could also say in this case that depending on the motion of the source and the observer, there is a real change in the frequency of the source processes. Moreover, different observers moving at different speeds will register different frequencies of the source and, from the relativistic point of view of Einstein, they will all be right. After all, even here there is no way to know whether the course of time is real or imaginary. That is, there is uncertainty, ambiguity, indeterminism, "physical lawlessness": the source does not have one, strictly specified frequency - frequency, time does not

exist in objective reality, they are relative, in accordance with the definition of relativism and in contradiction with the materialistic classical picture of the world ... The same is with mass, length: these physical properties lose their definiteness, blur and become dependent on the observer. This is the essence of SRT. Thus, Einstein himself goes against determinism (the unambiguity of physical values connected by a rigid causal relationship), which he defended when he criticized quantum mechanics, which denies the classical principle of causality: the principle of causal, historical conditionality, the laws of all phenomena.

It may be objected that there is nothing strange in such relativity, the dependence of phenomena on the observer. For example, Martin Gardner's book "Relativity for Millions" [37] gives the following example: two people of equal height look at each other through the same diffusing lens, which makes it seem to each that the other is smaller, and there is no contradiction in this. Therefore, in the same way, each of the two moving observers may well seem that the other is shorter and that the ticking frequency of the other is less. But it is essential that the theory of relativity indicates the reality of such changes, whereas we know that this is just a trick, an illusion. Through the lens we see not the object itself, but only - its enlarged, distorted image (§ 1.12), while the true dimensions of the object remain unchanged, existing in objective reality. In the same way, when moving, the rhythm of time of the observed object does not change, retaining its standard value. For Einstein, objective physical reality does not exist, and the whole world is only subjective perception, different for each observer and device. And this is subjectivism, idealism, simply - physical, veiled, since not only a person, but also a physical measuring device acts as a cognizing subject.

We encounter even greater violations of determinism and violation of objective reality in quantum mechanics. Each particle turns out to be blurred in the form of a fog of uncertainty, and, moreover, it is not just diffused in some volume, but, according to the Heisenberg uncertainty principle, can be at every point with a certain probability. It is fundamentally impossible to determine at what point, for example, an electron will be detected, in contrast to the well-known examples of random probabilistic processes (throwing coins, dice, movement of Brownian particles). And, again, this property turns out to be directly related to the observer. Depending on the speed of the particle relative to the observer, its position turns out to be more or less blurred. In addition, the very concept of "particle" also becomes relative. Depending on the frame of reference and the observer, the object turns out to be either a wave or a particle. Not only can we not say for sure where the particle is at a given moment, but we cannot even clearly indicate whether it is a particle or a wave. This is a complete indeterminism, uncertainty that deprives the world of all physical properties and, above all, the property of being an objective reality, independent of the observer.

It was with the advent of the Heisenberg uncertainty principle that indeterminism, contrary to the spirit of materialistic science, reached its apogee in physics. It is no accident that Heisenberg himself was a supporter of idealism,

which he introduced into physics [156]. Ritz convincingly showed, in defiance of Einstein and Heisenberg, that energy is localized, that the behavior of an atom and the movement of electrons in it obeys the laws of classical mechanics: it is rigidly determined. At the same time, it was Ritz's theory that made it possible to give a classical interpretation of the Heisenberg uncertainty principle. So, the Ritz model shows that the electron charge can indeed be "smeared" within a certain sphere of decay, which classically explains the effects of tunneling (§ 3.18). But this "blur" is of a classical nature: an electron has a structure, consists of small particles flying and fissioning within its sphere. Moreover, the position and movement of each particle at any moment is strictly defined. Likewise, a cloud of atoms, electrons can be considered blurred, having no clear boundaries, but this "blur" is classical, associated with averaging over the time of the random motion of particles.

In addition, R. Fritzius showed that, according to Ritz, an electron in an atom, under the influence of the impacts of rheons emitted by the nucleus, should twitch, tremble: its movement becomes complex, random. An electron, like a Brownian particle in a vessel, begins to rush randomly within a certain region of the atom, having an indefinite position and energy. But, at the same time, at each moment of time it is possible to precisely fix its instantaneous coordinate, speed and energy: there are no fundamental limitations. Random thermal walks of an electron and the action of rheon impacts lead to the fact that at some moments the energy of the electron and particles formed from electrons can exceed the height of the potential barrier, which is why the particles overcome it (§ 3.14, § 4.12). The tremor of electrons in an atom from impacts of rheons can also explain the natural width of spectral lines, which is also associated with the uncertainty principle (§ 3.4). It turns out that these and other "quantum" phenomena can be explained without ridiculous indeterminism, but - quite rationally and classically, if only the principles of statistical molecular physics, including the principle of probabilistic irreversibility, are extended to the phenomena of electrodynamics, as Ritz suggested in a dispute with Einstein [161].

All progressive scientists rebelled against indeterminism, uncertainty, let us recall the same Stoletov, who, on the eve of the advent of quantum mechanics, began to fight against non-materialistic, energetic trends in science (§ 4.3, § 5.14). But long before that, the first materialist scientist Democritus defended determinism. This ancient Greek atomist did not reject indeterminism out of a stupid fear of randomness. On the contrary, it was Democritus, and after him Epicurus and Lucretius, who introduced into physics the random, probabilistic motion of Brownian particles under the influence of random impacts of atoms - the spontaneous mechanical development of processes, independent of the will of the gods. It was these ancient atomists, as noted by S. Vavilov, who foresaw the principle of uncertainty, explaining it by classical reasons. However, they all understood that behind this accident there was a rigid order, a causal relationship of phenomena. Democritus argued that there is no real uncertainty, and all accidents only seem to be such, since we do not know the initial conditions, the connection of phenomena [31]. So, flipping a coin, a dice, we do

not know which side it will fall, but not because this is a completely random, undefined event, but because we do not know the initial conditions for its launch (which we set haphazardly, arbitrarily). Knowing the direction, the speed of the throw and the speed of rotation of the lot at launch, you can accurately calculate what exactly will fall out on the basis of the laws of mechanics and aerodynamics. Laplace also noted that, having knowledge of the velocities and coordinates of all the particles of the world, it is possible, on the basis of the laws of mechanics, to calculate their subsequent positions as accurately as you like, that is, to predict the future, no matter how distant. So, according to Democritus, there are no accidents: all accidents are an inevitable consequence of previous events. Therefore, a particle, say, an electron, having a certain initial velocity and position, will always fall into a strictly defined slit or a predetermined place on the screen, even if we do not know its initial characteristics (§ 4.10).

It is sometimes argued that all this relativism and indeterminism is just a continuation of the program of Democritus, Copernicus, Galileo and Newton. It was Democritus, and then Copernicus and Galileo, who introduced the kinematic principle of relativity into mechanics, showing the relativity of the concept of velocity. That is, if an object moves in one system at a given speed, then in another system moving relative to the first, the object's speed will be different. The illusory nature of the absolute movement of surrounding objects for the observer on the ship was noted by Democritus and Lucretius (see epigraph § 2.19). Likewise, Copernicus showed that the apparent movement of the Sun across the sky does not necessarily indicate its movement, and, in fact, the Earth is moving, rotating. This is the essence of the kinematic principle of relativity and the ballistic principle in the armored personnel carrier. But this in no way deprives the world of objective reality, but just asserts it. There is nothing strange in the fact that from different points of view, different observers see everything in different ways: if to the first one objects seem closer, faster, then to the second - others.

At the same time, Democritus, Copernicus and Galileo unanimously assert that all such, perceived by the observer, movements of stars and planets along the celestial sphere are just an appearance, an illusion created by the rotation of the Earth. There is a clear version of the mutual position and movement of bodies - there is an objective reality, perceived differently by different people. And the non-classical theories of relativity and quantum mechanics, on the contrary, returned to the views of Ptolemy-Aristotle, attributing visibility - the status of reality, absolutizing the observer. No wonder, it turns out, A.K. Timiryazev accused Einstein, who devalued with his theory - the creation of Copernicus, the sacrifice of Bruno, the feat of Galileo. As for the velocity, the relativity of this concept follows, in contrast to the relativity of mass, length and time, already from the definition: velocity is introduced as the ratio of the displacement in space to the time of this displacement. Naturally, moving observers in different ways, relative to whom this displacement is different, and the speed of the bodies appears to be different. It is important that there is one single speed of movement of the body relative to the frame of reference chosen

in a certain way. In the entire universe, a clear single plan, a general structure, strict order, regularity and sequence of phenomena are observed, what is called "determinism".

So, non-classical theories impose on us non-materialistic, irrational, mystical views, indeterminism and relativism, rejecting objective reality. The whole world of non-classical physics of the 20th century is a room of laughter, a kingdom of crooked mirrors. And we are urged to consider real not the true views of the object, but its curves, curved images, seen by different observers in different mirrors. In such mirrors, slow-moving processes seem to be fast-flowing and vice versa; big seems small and vice versa; a curve looks straight, and a straight line looks skewed; a short stick, a particle, appears to be elongated and wavy, and the wave looks straight, like an arrow, or a point. And, worst of all, it is these false distorted images and opinions of observers that urge us to be considered a model of beauty and truth, as in V. Gubarev's story "The Kingdom of Crooked Mirrors". Of course, such an approach to the phenomena of the world cannot be considered scientific.

In fact, determinism reigns in the world: all bodies and particles at each moment of time have strictly defined coordinates and physical properties. Thanks to this, as the "laughing philosopher" Democritus, as well as the hero of the comedy-philosophical film "Route 60", correctly noted: **"any random event is in reality natural and predetermined, otherwise it would not have happened."** Next, we will show how, on the basis of this strictly deterministic scientific approach and the position of particles in atoms and crystals clearly specified in the framework of the BTR, various phenomena and properties of physical substances and solids are explained.

§ 4.14. The structure of matter and chemical bond

What, finally, seems to us hardened and dense, That should consist of hooked beginnings, undoubtedly, Linked to each other like twisted branches. In this category of things, taking the first place in it, Diamonds will stand, that they are not afraid of blows at all ... Things in which their fabric coincides with each other, So, where there is a bulge, the other would have a Hollow in the same place, - their connection will be the closest.

There are also those that seem to hold on tightly with hooks and loops and so cling to each other.

Titus Lucretius Carus, "On the nature of things", 1st century. BC. [77]

Not only the physics of the atom, the nucleus, but also the physics of solids, thermodynamics and chemistry now rely on quantum mechanics. Is it possible that even in these primordially classical sciences it is impossible to explain phenomena visually, but a complex apparatus of quantum mechanics is needed? In the physics of the nucleus, atom and elementary particles, as it turned out, quantum representations are not only optional, but, often, are simply erroneous and inferior to the classical description. And in other branches of physics, the classical approach gives a natural adequate description of all "quantum" effects, it is only necessary to interpret them correctly, to find a successful mechanical model of phenomena, the structure of atoms and particles. The bipyramidal magnetic model of the atom turned out to be such a model. Its foundations were

laid by Ritz, Thomson, Lenard, Langmuir and Lewis at the beginning of the 20th century. [19, 46]. According to the model, the atom has the shape of two pyramids connected by vertices and filled with electrons layer by layer, which explains the spectra of atoms, Mendeleev's law and the laws of the photoelectric effect (§ 3.3, § 4.3).

The sizes of atoms and the interelectronic gaps in the layers also determine the interatomic distances in molecules and crystals. Atoms cannot come closer together. However, why can't they go their separate ways? What holds atoms together in molecules and crystals? The first scientific explanation for this was proposed by the same Langmuir and Lewis on the basis of the cubic model of the atom developed by them, according to which the nucleus of the atom is surrounded by layers of electrons that occupy stable positions in the vertices of the cubes [19, 46]. This model largely corresponds to the bipyramidal one, since the bipyramid fits into the cube (Fig. 170). The Langmuir model was rejected without any reason, accepting the quantum theory of chemical bonding with abstract electron clouds, orbitals and their overlap. But in the classic model, everything looked extremely simple. Electrons filled the spatial levels layer by layer, the shells of atoms - in the form of a cube. If the level in the atom was not completely filled, it could be occupied by electrons of other atoms entering the vacant place, like a key in a lock. This made it possible to form chemical

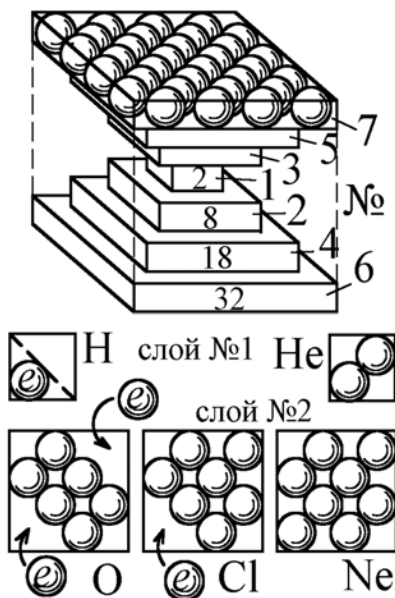


Fig. 170. Electronic layers of atoms with vacancy-loops for the formation of chemical bonds or ions O^{2-} , Cl^- in the capture of electrons. e .

compounds - only certain atoms matching each other in shape and in a strictly specified ratio. For example, an oxygen atom has two free places on the electronic level (Fig. 170). Therefore, two hydrogen atoms containing one electron each can dock to it. This is how a water molecule is formed (Fig. 171). Then the angle between the segments connecting the centers of the atoms will be about 109° (the angle between the diagonals of the cube). This corresponds to a real angle of $105-109^\circ$ measured for water molecules in experiments [138].

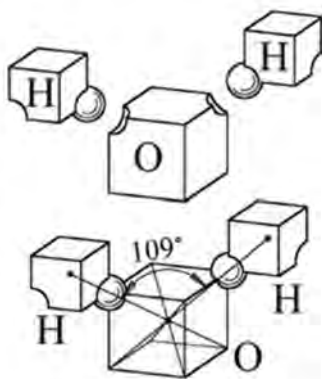


Fig. 171. Formation of a water molecule with an angle of 109° between hydrogen atoms.

All this is very reminiscent of the Democritic model of atomic cohesion according to the "key-lock" principle. Democritus and Lucretius believed that atoms have bulges and depressions, hooks and loops (see epigraph § 4.14). When the bulge (hook) of one atom hits the cavity (loop) of another, they connect like parts of a toy constructor [105]. Hook bulges are electrons of one atom, and concavities-loops, dips, are places not occupied by electrons in the layer of another. In what follows, such a depression will be called a "vacancy", "groove" or "nest", by analogy with a landing nest in the constructor. This term was proposed by V. Manturov in his crystal model of the nucleus [79]. Moreover, the forces holding the atoms together are electrical in nature. The same forces keep electrons in the layer - these are the forces of attraction to the electron-positron lattice, similar to nuclear forces, only with a different scale (§ 3.12).

Thus, an extremely visual mechanical picture of the connection of atoms, interconnected according to the principle of a spike connection of wooden furniture parts, is obtained, where bulges, teeth, spikes of one board fall into the grooves and slots of the other, engaging with them. These periodic rows of staggered spikes are quite analogous to the electronic staggered structure of atoms (Fig. 170). Only in atoms, the role of glue and friction forces holding the spikes in the depressions is played by the electromagnetic forces that hold the electrons in the layer, in its unoccupied areas. By the way, the molecular constructor, widely used in chemistry, of multi-colored balls-atoms with different numbers of holes, in which the frictional forces hold the rods that connect them, representing electrons, is also arranged according to the principle of "thorn-hollow". It turns out that structural chemistry has partly returned to the geometromechanical model of the connection of atoms (due to their shapes, "spikes", "hooks" and "weaves"), discovered in antiquity, then forgotten for a long time, but revived by Boyle and Dalton [106]. It is interesting that even Democritus and Lucretius, who discovered this model of the connection of atoms, due to the similarity of their forms, predicted that the connecting element (bulges and hooks) should be the same tiny particles that create a lightning discharge (electrons, see § 4.17).

The model explains the existence of negative ions just as easily. In Bohr's model, the atom is not able to bind the excess electron, and even more so - a few. And, meanwhile, there are many negative ions, say Cl^- , O^{2-} . According to Bohr, a neutral atom would not have retained the extra electrons, but if we take into account the presence of vacancies in the layer in the classical bipyramidal model, then the electron-positron lattice in them may well bind several extra electrons. There is only one free place in the chlorine atom (Fig. 170). Therefore, the atom captures one electron and holds it firmly, forming the Cl^- ion. In the oxygen atom, the layer has two unoccupied places. Accordingly, upon the attachment of electrons to them, the O^{2-} ion is formed. The binding energy of an electron with an atom, in this case, is called "electron affinity". It is of the same order and nature as the ionization energy. However, if there are too many excess electrons, repulsion prevents them from being retained by the atom.

It is easier to donate electrons to an atom in which there are more free places than occupied ones. Thus, the valence of an atom - its ability to form a chemical bond - is determined by the number of electrons that it can hold or donate. Moreover, the valence is also determined by the way electrons are placed at the level: electrons can move inside the layer, like chips in "tags". In exactly the same way as for nucleons in a nucleus (§ 3.6), an atom can form several stable configurations of electrons capable of capturing or donating more or less electrons (as suggested by A. Mayer § 3.1). That is why the same atoms can exhibit different valencies, forming a different number of bonds. This first and most illustrative model of chemical bonding explains how atoms have a given number of bonds, why the bond energy is of the same order as the ionization energy (electron detachment). Quantum physics gives unintelligible vague explanations, reminiscent of the mystical speculations of Aristotle, the eternal opponent of Democritus [105]. The strangest thing is that this quantum theory of chemical bonding came from Göttingen, as if after Ritz's death power there also passed to his opponents, supporters of non-classical views: M. Born, W. Heitler, F. London, W. Pauli, W. Heisenberg [46]. It was they who developed the abstract theory of the connection of structureless atoms, through the overlap of foggy electron orbitals and quantum exchange interaction, which has nothing to do with the exchange of particles, but is associated with the overlap of the wave functions of electrons.

The classical mechanism of atomic bonding considered above works not only in molecules, but also in amorphous solids, liquids, where bonds are of a disorderly nature, sometimes arising, then breaking, which causes the atoms to connect without any system. Crystals are another matter. In them, the bonds are ordered and this order, perhaps, is given in many respects by the correct structure of atoms and electronic layers. That is why the connection of atoms occurs in a geometrically precise style. Likewise, bricks, blocks, with their correct shape, are stacked in buildings and pyramids in the correct way. Even better, these clear interatomic bonds of a crystal are seen on the example of a puzzle, the square parts of which, due to the geometric-mechanical engagement of their bulges and depressions, form an integral picture, resembling a crystal

lattice of atoms that form a single body, a crystal. It has long been discovered that the shape of molecular crystals is directly related to the shape of the molecules. Likewise, the cubic, octahedral (bipyramidal) shape of diamonds, simple crystals, may be due to the same shape of atoms. The quantum theory of chemical bonding is not only unnatural, but simply unnecessary, since all the features of the atomic bond (ionic, covalent and metallic) were perfectly explained by the classical Thomson-Lewis-Langmuir theory, created much earlier. Quantorelativists shamelessly appropriated the successes of this classical theory, taking away its terminology, designations and principles, only altering them in a quantum way.

Atoms, with their rigid framework, shackled by bonds, have, nevertheless, some freedom of movement. They can move away from each other. At the same time, the forces of attraction of electrons of one atom to the electron-positron lattice of another act on the atoms. Atoms can also approach each other - then they are repelled by the elastic forces of the atomic framework. Therefore, there is a certain equilibrium interatomic distance, there is the resistance of bodies to compression and tension, and there are chaotic thermal vibrations of atoms near equilibrium positions. It was believed that classically it is impossible to obtain stable systems from positive and negative charges. There is a specially proven Earnshaw theorem on this score. Therefore, it is argued that only quantum, non-classical laws ensure the stability of atoms and matter. And, nevertheless, the stability of these systems can be explained classically, it is enough to take into account the non-electric, magnetic forces and the change in the nature of the Coulomb interaction at small distances (§ 3.18). It is the presence of a characteristic particle size, given by the effective radius of their repulsion, that allows charged particles to form stable configurations in the form of atoms, ionic crystals, such as a salt crystal. And physicists themselves recognize the reality of such a spin, electromagnetic interaction of electrons, which ensures the stability of the system of charges, but do not want to recognize its classical nature.

The experiments of A. Mayer, where magnets floating in water spontaneously formed standard stable regular structures (§ 3.1), help to make sure of the stability of some types of electromagnetic systems. It is noteworthy that Alfred Mayer himself considered his experiments precisely as an illustration, as a model of the structure of atoms, the structure of molecules and crystals. He even explained on the basis of this model - many properties of substances, such as the growth of the volume of some bodies (for example, ice) during solidification, allotropy, isomerism, associating them with the presence of several possible stable forms, configurations in one atom, a molecule [78, p. 372]. Indeed, as we have seen, atoms and particles can exist in the form of different stable configurations of electrons and positrons (§ 3.9). In the same way, floating magnets in Mayer's experiment could form several stable regular configurations, with varying degrees of stability. Perhaps Mayer was right in that the change from one stable configuration of an atom to another leads to a change in the type of the crystal lattice of the material, with a change in its volume (change in allotropic modifications). The presence of atoms and molecules of a certain

geometric shape, far from spherical, explains, as Meyer noted, the expansion of some bodies during crystallization. After all, an ordered construction of cubes in contact only by their vertices (Fig. 171) has a larger volume than the same cubes, but piled up in one heap. Likewise, cubic, bipyramidal atoms during crystallization of a substance can increase the specific volume of a body in comparison with its liquid state, which is observed in substances such as water, germanium, gallium, antimony, bismuth (§ 4.17). This expansion presents a big problem for quantum theory, with its structureless, fuzzy spherical atoms.

It is remarkable that even Democritus and Lucretius expressed this idea about the influence on the properties of the body not only of its constituent particles, but also of the shape, the order of their arrangement, the configurations they form, as if the order of the letters in a word - on its meaning (§ 5.16). This key idea of structural chemistry, first clearly formulated by Butlerov, was prophetically expressed by Lomonosov, who, like the ancient atomists, believed that the atoms of elements differ in weight, shape and combine into molecules or solids - according to the principle of similarity, correspondence of geometric shapes, on which he built chemistry science. Moreover, the strength of the chemical bond was set, according to Lomonosov, only by the geometric properties of the atoms in the compound, - by their mutual position and the area of the contacting faces, which is not far from the truth, since the chemical bond energy is determined by the number of bonding electrons that form flat electronic layers of contacting atoms, and the distance between them.

Let's return to the analysis of the stability of the system of charges. If we conventionally consider electrons and positrons not as point charges, but as rigid charged balls - with a radius equal to the classical radius of an electron r_0 , then they may well form stable complexes: elementary particles, nuclei and atoms. The attracted charges approach each other and form a crystal lattice, as in a salt crystal. But further rapprochement either gives rise to repulsive forces or weakens the Coulomb attraction. This sets the equilibrium distance between the particles, equal to the classical radius $r_0 = 2.8 \cdot 10^{-15}$ m, which is why they can be considered rigid balls. Violation of the Coulomb law, when approaching r_0 , is associated with the mechanism of electrical interaction (§ 3.18) and is recognized by physicists [60]. Electronic complexes, as it turned out, can have another characteristic scale, different from r_0 and - much larger, comparable to the radius of the atom $a_0 = 5.3 \cdot 10^{-11}$ m, on which deviations from Coulomb's law should also occur (§ 3.7, § 3.18). In addition, besides electrical, there are also magnetic forces of interaction of electrons. All this, as we have seen, allows them to form stable electron layers of scale a_0 , setting the characteristic size of the atom. The electrons approach each other until their spheres of decay interpenetrate, after which the approach of the electrons or the atoms formed by them stops.

The resistance of atoms or electrons to approach corresponds to the Pauli exclusion principle known in quantum mechanics, according to which two electrons cannot occupy one state. In the classics, this law does not arise as a formal rule, but as a natural consequence of the presence of particles (electrons and positrons) of an effective repulsive radius, which is why they behave like

rigid balls, unable to occupy one position in the atom. If one electron has taken its position on the electronic level, the other will no longer be able to find itself there. There simply will be no room for it, just as there is no room in a fully occupied egg cell. So, the electron-positron lattice, the grid has, like graph paper, two characteristic scales with a difference of 10^4 - 10^5 times (§ 3.7). One scale, with a lattice step of 10^{-15} m (1 fermi), determines the characteristic sizes of nuclei and elementary particles. The other, with a step of 10^{-10} m (1 angstrom), sets the typical sizes of atoms, bond lengths in molecules. The transition from large to small scale occurs when particles reach energies sufficient to overcome repulsion.

The presence of two scales of distance between electrons and positrons has many important consequences. The similarity of these two grids explains the analogy between chemical and nuclear processes. It is not for nothing that the mechanisms of decay or synthesis of molecules and nuclei, the release and absorption of energy in chemical and nuclear reactions are largely similar. Indeed, in both cases, there is a connection and disintegration of crystalline complexes linked by the electrostatic forces of attraction of the electron-positron lattice. Only the scale is different. And, since the scales of distances r between charges are 10^5 times different, respectively, the magnitudes of the forces, released energies and binding energies also differ. After all, the energy of the Coulomb interaction of charges is proportional to $1/r$. And, exactly, the characteristic binding energies of electrons in an atom and the atoms themselves, the energies of single acts of chemical reactions are units of electron volts, and the binding energies of nuclei, nucleons, decay energies are measured by megaelectronvolts, that is, 10^6 times more (§ 3.12, § 3.13). The energy of a chemical bond, ionization of an atom in several electron volts is, in fact, the energy of electrical interaction $E = e^2/4\pi\epsilon_0 r$ of an electron with a positron, with an electron-positron layer in an atom at an interelectron distance $r = a_0 = 5.3 \cdot 10^{-11}$ m. And the characteristic energy of a single act of a nuclear reaction is the essence of the interaction energy $E = e^2/4\pi\epsilon_0 r$ of an electron with a positron or an electron-positron lattice at a distance $r = r_0 = 2.8 \cdot 10^{-15}$ m.

Usually, atoms, nuclei and elementary particles are depicted as balls (which was sometimes done for convenience in this book), and therefore the idea of their clear periodic structure, of the cubic, pyramidal shape of particles, with their edges and edges, seems wild. But, on the other hand, atoms and particles have long been called the elementary bricks from which matter is built. So, what is surprising if these bricks are shaped like polyhedrons, like ordinary building bricks, toy bricks, or construction set parts? And what is strange if these bricks themselves are built of even smaller bricks arranged in regular, periodic rows? It is not for nothing that Kepler and Lomonosov, who were the first to scientifically substantiate the atomic and crystalline structure of matter, considered atoms to be polyhedra, pyramids [63]. And today's scientists, even using an electron microscope, have not yet received clear images of atoms and are only guessing about their shape.

So, the classical model of the atom, not only helps to clearly and naturally explain the mechanism of chemical bonding, but also allows you to establish a

deep analogy of chemical and nuclear processes, energies and bonds. It is interesting that this geometric-mechanical model of communication, first proposed by Democritus, revived by Lomonosov, developed by Lewis and Langmuir, but then forgotten for a long time, has now regained recognition, say, in organic chemistry, in immunology, molecular genetics and in the theory of olfactory receptors. where the attachment of atoms and molecules often occurs according to the principle of the correspondence of their geometric shape, - according to the key-lock mechanism. It is possible that such an idea of the structure of matter, the particles of which are connected due to mechanical interweaving with the formation of layered periodic, chess structures (§ 3.12), which then form voluminous bodies and hollow polyhedrons, are reflected in the material culture of our ancestors, for whom weaving, especially wreaths and braids, had a deep symbolic meaning. It is no coincidence that the life of the Slavs was based on the interweaving of fibers of flax, wool, hair, straw, bast, birch bark, willow twigs and even logs, as can be seen from the example of woven clothes, bast shoes, baskets, wicker boxes, knapsacks, as well as huts, towers and others. masterpieces of folk architecture, erected without a single nail. If our ancestors-craftsmen used metal, then they also intertwined it like fibers, when they connected together links of chains or rings of chain mail (most common in Russia), forming the same patterns as chains and networks of bound electrons and positrons (Fig. 95, Fig. 102). Such a mechanism for the formation of the world, by weaving or tying threads of matter and field (emanating from particles, like yarn), is reflected in the "Book of Veles", compiled by the ancient Slavic scientists-magi. Similar views that our world is woven from periodically located charges of the opposite sign are found in the ancient Indian ["Stanzas of Dzyan"](#): "And this fabric is the Universe, woven of Two Essences fused together."

§ 4.15. Freezing degrees of freedom

Obviously, heat consists in the internal movement of matter ... Internal movement can be imagined as happening in three ways: 1) imperceptible particles constantly change place, or 2) rotate, remaining in place, or, finally, 3) continuously oscillate back and forth ... First, we will call *translational*, the second *rotational*, the third *vibrational* internal movement ... With a faster rotation of particles of bound matter, heat should increase, and with a slower rotation, it should decrease. Particles of hot bodies must rotate faster, colder ones - slower ... There must be the greatest and last degree of cold, which must consist in a complete cessation of the rotational motion of particles.

M.V. Lomonosov, "Reflections on the cause of warmth and cold", 1750.

Another 'confirmation' of the quantum theory in molecular physics is the phenomenon of freezing of the degrees of freedom [19]. It is known that a diatomic molecule, say the hydrogen molecule H_2 , has five degrees of freedom. Three of them are associated with the translational movement of molecules along three axes, and two - with rotation around two axes (Fig. 172). Each degree of freedom of a particle has an energy $kT/2$, and a diatomic molecule has an average energy of $5kT/2$, where k is the Boltzmann constant and T is the temperature in kelvin. A monatomic molecule is endowed only with the energy

of translational motion $3kT/2$. Diatomic molecules actually also have the energy of elastic vibrations of atoms inside the molecule. Therefore, the energy of real diatomic molecules is $7kT/2$.

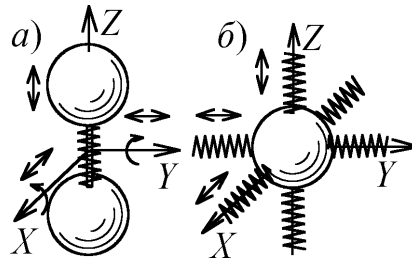


Fig. 172. The energies and degrees of freedom of a diatomic molecule (a) and an atom in a crystal (b) are associated with translational motion, rotation and vibrations.

As a result, the molar heat capacity C (an increase in the internal energy of a body of a fixed volume of $N_a = 6 \cdot 10^{23}$ molecules when heated by 1°C) of a gas from real diatomic molecules is $7R/2$; from rigid diatomic - $5R/2$; of the monatomic - $3R/2$ (here $R = kN_a$ is the gas constant). And, exactly, at high temperatures, the heat capacity of hydrogen $C = 7R/2$, however, upon cooling, C drops to $5R/2$ (Fig. 173.a). And, with approaching absolute zero, C tends to $3R/2$, as if the degrees of freedom of gas molecules "freeze" (freeze) upon cooling. Diatomic molecules first become rigid, and upon further cooling, they stop rotating, as if monoatomic.

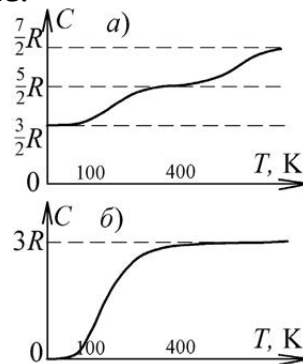


Fig. 173. Change with temperature of heat capacity a) a diatomic gas (hydrogen), b) a solid (copper).

Such a decrease in the heat capacity of diatomic gases, with a decrease in temperature, was considered contrary to the classical molecular kinetic theory and was explained in the quantum theory proposed by W. Nernst, who discovered the phenomenon. For a long time, it seemed that classical physics was incompatible with this phenomenon. And, nevertheless, it can find a simple interpretation in the traditions of the classics, one has only to accept the Ritz model of the atom. Then, at high temperatures, atoms in semi-rigid molecules really vibrate, and $C = 7R/2$. With a decrease in temperature, the energy of atoms is no longer enough to break some of the bonds and vibrations - the molecule becomes "rigid". For example, the hydrogen atom is arranged in such a way that in the first electron layer (Fig. 104, Fig. 105), where there are only

two places, the electron occupies only one (Fig. 170). Therefore, the electron of the second hydrogen atom falls into the vacant place, forming a chemical bond. And the empty space in the layer of the second atom is filled with the electron of the first. This is how the hydrogen molecule $H:H$ arises, where the H atoms are linked by a covalent bond - from a pair of electrons, designated by Langmuir dots (Fig. 174). At high temperatures

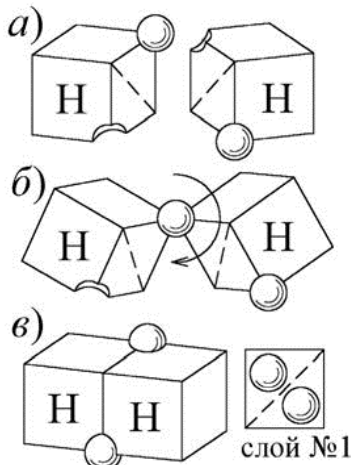


Fig. 174. At high temperatures T , the hydrogen atoms are separated (a). With a decrease in T , one electron is generalized, forming a semi-rigid molecule $H\cdot H$ (b). At low T in a rigid $H:H$ molecule, both electrons are generalized (c).

T , most hydrogen molecules have one bond broken, and the $H\cdot H$ molecule turns out to be semi-rigid: its atoms can rotate, vibrate around a single bond point, in the form of an electron. With a decrease in temperature, there is not enough energy to break bonds, the atoms are completely joined, forming a double bond and a rigid $H:H$ molecule, the atoms of which are no longer able to vibrate. That is why $C = 5R/2$ at such a not too high temperature.

Semi-rigid molecules with one $H\cdot H$ bond and rigid ones, with atoms bound together by a double $H:H$ bond, are simultaneously present in hydrogen. With a decrease in temperature, the heat capacity gradually decreases from $C = 7R/2$ to $C = 5R/2$, since the ratio of the number of $H\cdot H$ and $H:H$ molecules changes smoothly (Fig. 173.a). As it was found out, cooling leads to a decrease in the percentage of semi-rigid $H\cdot H$ molecules, which is why the heat capacity also decreases smoothly. At the same time, theoretically, gases from these two types of molecules can be separated, because, due to their different structure, they should differ in physicochemical properties and spectra (§ 3.4). And such a separation of hydrogen into two components with different properties and spectra was actually carried out in laboratories [19, 134]. We managed to isolate two gases from hydrogen - orthohydrogen and parahydrogen, which have different properties and heat capacities. Since at low temperatures hydrogen is almost entirely composed of more stable parahydrogen, it is obviously formed by particles with a pair of $H:H$ bonds. Accordingly, orthohydrogen, which appears upon strong heating, consists of $H\cdot H$ particles, where one of the bonds is broken.

The fact that orthohydrogen can be converted to parahydrogen and vice versa, by means of chemical methods (heating-cooling, catalysts [134, p. 333]), proves

that the difference between them is caused not by different orientations of nuclear spins, not by nuclear properties [82], and - chemical, - different structure of chemical bonds. It is no coincidence that parahydrogen H:H can be converted into orthohydrogen $\text{H}\cdot\text{H}$ by breaking one of the bonds, using an electric discharge, which is usually used just to ionize molecules and break atomic bonds in them. Note that it is difficult to obtain parahydrogen in a pure state, and even more so, orthohydrogen, and therefore we always deal with their mixtures enriched with one or another component. In this case, over time, the gas gradually comes to a state with an equilibrium concentration of ortho- and parahydrogen [134]. And this is natural, since only at low temperatures the atoms, being in an energetically more favorable state, remain firmly bound in the H:H molecule. And, at high temperatures, due to collisions, bonds are constantly being broken, then restored: there is a dynamic equilibrium between the molecules of ortho- and parahydrogen, alternately turning into each other. So, with a drop in temperature, it is the increase in the concentration of parahydrogen H:H ($C = 5R/2$), with a parallel drop in the percentage of orthohydrogen $\text{H}\cdot\text{H}$ ($C = 7R/2$), that leads to a decrease in the heat capacity of their mixture in hydrogen (Fig. 173.a).

With further cooling, the rotational degree of freedom also freezes out: diatomic molecules stop rotating, which is also quite understandable. Molecules get rotation from oblique, lateral collisions, when part of the kinetic energy during the impact is converted into rotational energy. But, with decreasing temperature, molecules more and more often experience direct, head-on collisions, and no longer twist. Indeed, at low temperatures, the particles move slowly, which is why, in the process of approaching, the electric dipole moments of the molecules (created by mutual polarization) have time to orient them before the impact - along the approaching line. They bounce along it without getting rotation (Fig. 175). This is exactly how a diatomic gas, as the temperature tends to absolute zero, loses its rotational degrees of freedom, behaving like a monoatomic gas, with a heat capacity $C = 3R/2$. At low temperatures, classical ordering takes place, but if in most gases the positions of molecules are ordered from their merging into crystals, then in hydrogen, which remains a gas up to a temperature of 14 K, the very thermal motion of molecules is ordered.

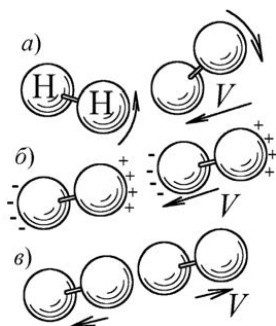


Fig. 175. A fast approach of molecules (a) leads to a lateral impact and their twisting, and at a slow one they are oriented (b) along the axis of the impact, without receiving rotation (c).

From here it is easy to obtain theoretical graphs of the dependence of the heat capacity of the gas on temperature, corresponding to the experimental data (Fig. 173.a). It is obvious that the characteristic temperature at which there is a change in the heat capacity of a diatomic gas - from $5R/2$ to $3R/2$, depends on the moment of inertia of the molecule. The more massive, inert a diatomic molecule, the slower it turns from the dipole electrical interaction of molecules. Therefore, lower convergence rates and more cooling are required to achieve accurate orientation and direct molecular impact, instead of oblique. And, indeed, if in hydrogen a decrease in heat capacity becomes noticeable already at 200 K, then in other gases with higher molecular masses and moments of inertia - at much lower temperatures [19]. Also, the temperature course of the heat capacity is different for the separately separated steam and orthohydrogen. This is connected, apparently, not only with the difference in their molecules, but also with the fact that an increase in temperature leads to the decomposition of parahydrogen molecules to orthohydrogen. And the additional heat (similar to the heat of fusion in § 4.20), which must be supplied for heating parahydrogen, is perceived as its increased heat capacity C , even exceeding the value $C = 5R/2$ typical for average temperatures [19, p. 185]. As you can see, all quantum effects have a classical molecular kinetic interpretation.

It is interesting that M.V. Lomonosov, who built the first version of the molecular-kinetic theory of heat, gases, liquids, solutions and solids, clearly distinguished all three types of possible thermal motion of body particles. Lomonosov assigned a huge role to the rotational motion of molecules, which slows down with decreasing temperature and is accompanied by a corresponding decrease in the calorific properties of the substance. Thus, Lomonosov, even without the help of a mathematical apparatus, discovered, a century before Helmholtz, Joule, Kelvin, Maxwell and others, the molecular-kinetic theory of heat and the existence of absolute zero temperature ("the last degree of cold, consisting in the complete cessation of particle motion"). In addition, Lomonosov came closer to understanding the role of the rotational motion of particles in the formation of the heat capacity of bodies, with its stopping, when the temperature tends to absolute zero. Thus, Lomonosov proved to be a staunch supporter of the atomism of Democritus, in contrast to V. Nernst, who, having discovered the phenomenon of a decrease in the heat capacity of a gas, when its temperature tends to absolute zero, hastened to explain this phenomenon using the hypothesis of quantizing the rotational motion of molecules [156]. And this is not surprising, because Nernst, being a student of Ostwald, this ardent supporter of energetism, took his views close to quantorelativistic (§ 5.14).

In reality, as we can see, the phenomenon does not contain anything supernatural and acquires a clear classical interpretation. Therefore, having found deviations from classical laws, one should clarify the classical model, taking into account the imperfection of the model and bringing it closer to reality, and not reject outright. This is exactly how Van der Waals, to explain the deviations from the molecular kinetic theory (MKT), manifested, again, in a change in heat capacity, - proposed to take into account the finite size of

molecules and their interaction in the law of an ideal gas, thereby discovering the exact law [19, 45]. And physicists of the new generation, such as W. Nernst, would certainly prefer to reject the classical model and derive the Van der-Waals equation from quantum laws. So, the correct path for the development of physics runs through the refinement of classical models and a departure from idealizations that work within narrow frameworks. Following the path of Van der Waals, taking into account the interaction of atoms, their sizes, limiting vibrations, rotation, we classically explained the behavior of heat capacity. Physicists, beginning with A. Einstein and W. Nernst, ignored the rational path of Van der Waals and in the heat of the moment (out of thoughtlessness or malice) rejected the classical models, piling up quantum ones.

In many ways, such a change in methodological attitudes is due to the fact that one of the main defenders of the ICT, Boltzmann, who proved the effectiveness of the classical-mechanical approach, died tragically in 1906, in the course of persecution by the followers of Aristotle, these modern opponents of the atomistic doctrine and the kinetic theory of Democritus [156]. It is these eternal enemies of atomism, supporters of the so-called "energetism," who constitute the ruling elite of the modern gang of quantorelativists. Realizing that atoms are real, and there is no getting away from this, they decided to deny the atoms materiality, considering them to be abstract blurred lumps of energy, which is why such a concept now dominates science. It is from these eternal opponents of materialism and atomism of Democritus that the idea of mass not as matter, but as a measure of the energy of the body, originated. From them, the ideas about quanta, energy levels in the atom, and the atoms, electrons, particles themselves, they now propose to consider, just like the electromagnetic field, not as material bodies, but as abstract blurred waves, energy excitations of space. Namely, in the period 1906–1909, when the active defenders of classics and atomism (Curie, Drude, Boltzmann, Mendeleev, Thomson, Ritz) died, non-classical physics developed rapidly in the direction of energetism. As K.A. Timiryazev about the equally tragic fate of Lavoisier and Y. Mayer, who, following Lomonosov, discovered the mechanical equivalent of heat with the law of conservation of energy and mass: "It was as if some evil fate slowed down the development of the issue we were concerned with, removing from the scientific scene those who could contribute to the movement of science in this direction. "

§ 4.16. *Non-quantum theory of heat capacity*

The origins of things first move by themselves, Following them are bodies from the slightest combination of them, Close, as it were, in strength to the primary principles, Hidden from them receiving shocks, begin to strive Themselves to move, then forcing larger bodies ... Those who have closer their mutual cohesion are few And at only negligible distances spinning separately, By the complexity of their very figures, being tenaciously entangled, The powerful roots of stones and bodies form the iron of the Steadfast, just like everything of this kind. Others, in small numbers in the immense void, twisted, Spin away far away and run back far back.

Titus Lucretius Carus, "On the nature of things", 1st century. BC. [77]

The phenomenon, very similar to the freezing of the degrees of freedom in a gas, was found in solids, crystals. According to the MKT and the Dulong-Petit law, the heat capacity of solids should be equal to $3R$, since each atom in a solid should have an energy of $3kT$. Half of it falls on the energy of the atom's motion - along three axes, and half - on the vibrational energy of the atom - along the same three axes (Fig. 172). Experience has shown the validity of the Dulong-Petit law in a wide temperature range. However, as the temperature approaches absolute zero, the heat capacity of solids decreases down to zero, as from the freezing of the degrees of freedom (Fig. 173.b). It was not possible to understand this within the framework of classical physics and MKT. Only quantum theory has provided an explanation for the phenomenon. It was proposed by A. Einstein and refined by P. Debye. This theory is complex, formal and far-fetched. So, instead of the classical Maxwellian velocity distribution of molecules and atoms, the Fermi-Dirac and Bose-Einstein distributions are introduced, hypothetical phonons are involved, - excitations of the crystal lattice. However, it was believed that it is generally impossible to interpret this effect classically. And yet, let's offer a simple explanation of the phenomenon.

In reality, the situation with the freezing of the degrees of freedom of gas molecules is repeated, only in a solid, with a decrease in temperature, the binding of atoms occurs on a huge scale. More and more atoms are rigidly connected to each other, gaining new connections and losing freedom of movement. As the body cools, ever larger rigid conglomerates of atoms appear in the body - like giant rigid molecules. With a decrease in T , they become less and less, due to the growth and merging with others. And, since for each particle, a rigid molecule, there is an energy of $3kT$, then, with a decrease in their number, the internal energy U of a solid and the heat capacity $C = dU/dT$ - fall. Finally, at absolute zero, when all motion freezes, one giant rigid molecule remains, including the entire crystal and having an energy of $3kT$. Therefore, the internal energy of the body U is no longer $3kTN_a$, but $3kT$ ($N_a = 6 \cdot 10^{23}$ - the number of atoms of the body of molar volume). Since $k = 1.38 \cdot 10^{-23}$ J/K, this energy $U = 3kT$ is negligible. That's why we get $C = dU/dT = 3k \approx 0$, instead of the usual heat capacity $C = 3kN_a = 3R$, since $k/R = 1/N_a \ll 1$. This classically explains the drop in heat capacity to zero at low temperatures of the substance (Fig. 173.b). Although, it would be more logical to talk about a change in the substance itself, in which, taking into account the enlargement of molecules, recalculation of the molar heat capacity would give the previous value $C = 3R$.

It is worth noting that such a combination of atoms inside a crystal - into giant rigid conglomerates, clusters analogous to rigid molecules, is very important for the Mössbauer effect (§ 3.7), in which the thermal motion of atoms, which have enormous velocities even in a solid, would violate stability frequency of gamma radiation, due to the Doppler effect. However, crystals were discovered in which, upon cooling, the atoms were rigidly connected, sometimes forming a single complex that included the entire crystal [74]. The entire complex has a kinetic energy $MV^2/2$ of the order of $3kT$, and therefore, if

we take into account its gigantic mass M , its velocity V , at the same temperature T , turns out to be much less than the thermal velocity of single atoms vibrating at the lattice sites of ordinary, non-rigid crystals and solids (§ 3.7). This practically excluded the Doppler shift from the motions of atoms and gave the coincidence of the radiation and absorption frequencies in the Mössbauer effect, that is, the spectrum inversion effect. Moreover, as experiments have confirmed [135], this coincidence is the better, the higher the hardness and rigidity of the crystal and its characteristic temperature of transition to the superbound state (called the Debye temperature, see below).

Thus, crystals, it turns out, are also characterized by varying degrees of ordering: there are absolutely rigid crystals in which atoms, like parts of a designer, are firmly bound by their shapes. These include the hardest and densest bodies, such as diamond, sapphire, as Lucretius noted (§ 4.14). And there are semi-rigid ones, in which the atoms, although they are arranged in an orderly manner, turn out to be single, loosely bound, movably, then breaking, then forming bonds, and, therefore, moving much faster, with a greater amplitude of oscillations, as the same Lucretius guessed, who outlined Democritus' ideas about the molecular nature of heat and Brownian motion of dust particles (§ 4.16). Such semi-rigid crystals no longer resemble tightly connected parts of a constructor, but, rather, a Rubik's cube, which is easily deformed from the displacement of the cubes-atoms that form it. Or this crystal is like an assembled puzzle, which, when lifted off the edge of the table, bends easily, because the details in it, not having sufficiently rigid connections, wobble. The existence of crystalline bodies with rigidly and non-rigidly bound particles is confirmed, precisely, by the behavior of their heat capacity when the temperature changes. So, for lead, formed by weakly bound atoms and, therefore, easily cut even with a knife, the heat capacity remains at the $3R$ level - even when the temperature drops to 50 K, thereby confirming that its atoms do not form rigidly bound complexes. On the other hand, diamond and beryllium (materials known for their hardness and strength, due to the rigid bond of atoms forming a monolithic crystal), already at room temperatures, the heat capacity is much lower than $3R$ [45, Vol. 1, p. 596]. And, only when heated to 1000 K, their heat capacity begins to approach the $3R$ level, due to the thermal destruction of rigid bonds in large atomic complexes.

This characteristic temperature, below which solids "cease to obey the classical laws" and deviations from $C = 3R$ from the Dulong-Petit law become noticeable, is called the "Debye temperature" $\Theta_D = E/k$, which is introduced through the minimum allowable temperature and energy according to quantum laws E vibrations of atoms in a crystal. In fact, as we have seen, this temperature can be easily defined in the classical way, as the temperature at which the average kinetic energy of atoms $\sim kT$ becomes comparable to the specific energy E_s of a completely saturated bond of atoms. That is, the characteristic temperature is $T_s = E_s/k$. Hence, in contrast to Debye's formula, it is immediately evident that strong, solid bodies with a very high binding energy E_s (boron, diamond, silicon) have a high characteristic temperature T_s , while soft lead and alkali metals are very low. On the other hand, when the same lead is

cooled below this temperature, its atoms adhere so firmly that in terms of hardness and elasticity it is comparable to the best spring steel [90]. For the same reason, the temperature T_s (the classical analogue of the Debye temperature Θ_D) is related to the speed of sound, elasticity and conductivity coefficients of metals (§ 4.17). All these characteristics directly depend on the rigidity, hardness of the metal, - on the binding energy in it of atoms, electrons, on the degree of saturation of this bond.

What has been said in general terms is also true for the heat capacity of liquids, in which molecular bonds arise and break randomly (§ 4.14). But even here, when combined, the molecules can form relatively rigid clusters, "flickering", "pulsating" microcrystals, detected by X-ray diffraction, for example, in water [138]. As the temperature rises, the percentage of such crystals decreases from the rupture of rigid bonds, which is why, following the example of solids, the heat capacity of almost all liquids increases when heated, due to an increase in the number of independent particles and their degrees of freedom.

So, we see that the classical molecular kinetic theory explains all the features of the behavior of solids, liquids and gases, molecules, atoms and nuclei. And, moreover, the classics reveals much finer gradations between the states of aggregation of matter. Scientists too easily succumbed to the pressure of the fashionable quantum flow, without even trying to interpret the effects in the framework of classical physics. The crisis of physics at the beginning of the XX century. arose not from the classical picture of phenomena, but from unsuccessful, imprecise models, especially - models of atoms and molecules. For the most part, these models suffered from idealization and gross simplification. They described limiting cases and did not take into account a number of atomic properties and interactions that are important at low temperatures. If we take into account all these hidden mechanisms, then any phenomena can be interpreted using classical models. And the most successful of them is the bipyramidal-grid crystal-magnetic model of the Ritz atom.

§ 4.17. Non-quantum theory of conduction

This subtlest fire of the fires existing in the world, Made by nature all of the smallest and most mobile Bodies, for which nothing can put obstacles. Even through the walls of houses mighty lightning penetrates ... It penetrates inside and passes along porous passages, Gliding without delay and encountering obstacles a little ... Without causing harm, it pierces many objects, For it passes through the pores with flowing fire without damage. It destroys a lot, if it collides with its bodies Directly with the bodies of things, where the bodies form these connections. Further, the lightning dissolves copper and gold immediately It melts easily because it itself consists of extremely small Bodies of the basic and, moreover, smooth elements.

Titus Lucretius Carus, "On the nature of things", 1st century. BC. [77]

It seems incredible, but, two thousand years before us, people guessed not only about the atoms of matter and light (rheons), but also about the atoms of electricity (electrons), the rapid movement of which, as the ancient atomist scientists understood, caused a lightning discharge ... Realizing that any bodies are not solid, but are compounds of atoms, between which there is enough

empty space, pores, these scientists also built the first theory of conductivity, indicating that the smallest particles of lightning (electrons) easily pass through these pores of metals, creating an electric current and leading to the heating of the metal - from collisions of electrons with atoms. Lucretius even guessed that the same particles-electrons that create the current also form the bonds of atoms (§ 4.14). This was the first classical mechanical theory of conductivity. And, nevertheless, this, well ahead of time, progressive view of things, developed by Democritus, Epicurus and Lucretius, is now consigned to oblivion along with the classical theory of conduction by Drude, since the quantum theory of conduction is still generally accepted.

Currently, it is believed that only quantum laws can explain the electrical conductivity of metals. And, meanwhile, for the first time it was the classical theory of conductivity by Drude that made it possible to explain the nature of electrical conductivity, electrical resistance and many of their features. It would seem that what is simpler and more classic than electrical resistance? Ohm's law, resistors, electrical losses in wires and the generation of heat from heating devices - we are familiar with all this since childhood. However, theorists have caught up so much fog in this intuitively clear phenomenon of resistance that its nature has become a secret behind seven seals. This happened when resistance was attributed to quantum phenomena that can no longer be visualized, but can only be described by formulas, renouncing common sense and taking on faith the dogmas of quantum mechanics. However, the visual classical approach has by no means exhausted itself, and, often, it even better explains the riddles of resistance than quantum mechanics and Sommerfeld's quantum band theory of metals.

Electric current in metals is the directional movement of electrons - the flow of a kind of electron gas, in which the role of atoms is played by electrons. Just as ordinary gases experience resistance from movement through a pipeline, so electron gas, flowing through a conductor, is inhibited by it. That is, electrical resistance arises, the microscopic picture of which is similar to that which exists in gas. Gas atoms, colliding with each other and with the atoms of the pipeline walls, amplify their vibrations, spending part of their kinetic energy on this. This causes resistance to the gas flow and the corresponding heating of the pipeline, because the growth of atomic vibrations means an increase in temperature. It is quite natural that for a long time the electrical resistance with the heating of wires was also explained.

Electrons, gaining speed in an electric field, now and then lose some of it in collisions with metal ions, increasing their vibrations. This creates electrical resistance and releases Joule heat from the flowing current (§ 4.17). It is not for nothing that the electric current in a conductor has long been compared with the flow of gas flowing through a filter tube, hence the terms themselves: "electric current", "voltage", "current source" (Fig. 176). Franklin also compared metal to

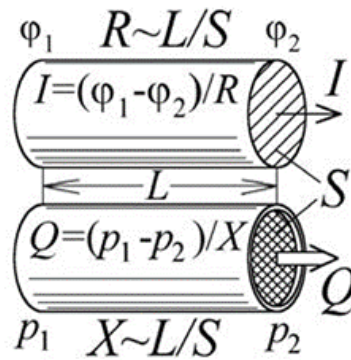


Fig. 176. Similarity of current strength I and gas flow rate Q through the filter, as well as electric R and hydrodynamic X resistances.

a porous sponge through which electrical matter seeps, the particles of which (electrons) the scientist compared with atoms of air. The gas flow through such a pipeline obeys exactly the same laws as the current in the conductor - it is proportional to the pressure, that is, - the pressure difference $p_1 - p_2$ (the potential difference $\phi_1 - \phi_2$ equal to the voltage U), the cross-sectional area S of the filter - wire and is inversely proportional to its length L . The specific resistance of such a pipe, like that of a metal, increases with increasing temperature (Fig. 177). By connecting pipes, it is possible to simulate branched electrical networks (Fig. 178).



Fig. 177. The viscosity of the gas with decreasing temperature T drops to zero, just like the resistance of the metal, proportional to the viscosity of the electron gas.

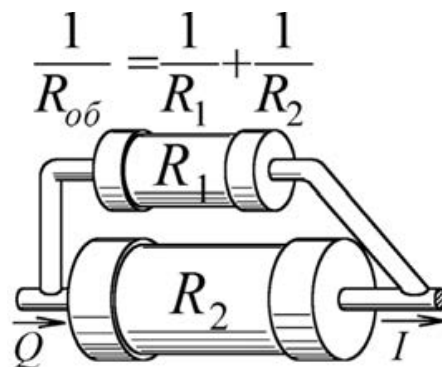


Fig. 178. The total resistance of two resistors can be found in the same way as the resistance of two parallel filters. The streams split and slow down according to the resistances, and then reconnect.

But modern scientists reject this simple and visual explanation of the resistance of conductors. In their opinion, the resistance is associated with the scattering of electrons by phonons - fictional quantum excitations of the crystal lattice of a metal [32]. After absurd photons - quanta of light, such physicists as I.E. Tamm, phonons were invented - quanta of sound, quasiparticles of elastic vibrations. Scientists believed that the ordered crystal lattice of metals, ideally, does not resist the movement of electrons at all. However, atoms of impurities, defects and thermal vibrations of the crystal lattice violate its ideality. And the more the metal lattice is distorted, the worse it conducts current. This is precisely what quantum physics explains the temperature increase in the resistance of metals and its noticeable increase when even an insignificant impurity is introduced. It was believed that such an explanation of resistance was much better than the classical one. In fact, it's just the quantum explanation that doesn't stand up to scrutiny.

Indeed, according to quantum theory, molten metals, in which the crystal lattice is completely destroyed, could not conduct current at all. And, meanwhile, they pass electric current almost as well as solid, crystalline ones. Let's say liquid mercury, which we usually observe at temperatures 60 degrees above its melting point, would be, according to quantum theory, an insulator. However, its specific electrical conductivity is not too inferior to other metals (for example, lead - only 5 times), and, such metals as bismuth, even surpasses. Yes, and the resistance of liquid mercury changes when heated, just like that of solid metals: it increases monotonically.

Even scientists themselves believe that if a liquid metal conducts a current, then, according to quantum theory, the conduction mechanism would be completely different, and the conductivity would be much lower. And, meanwhile, the fact that conductivity in a melt retains the same order of magnitude as in a crystalline state proves that the mechanism of conductivity in a liquid metal is the same as in a solid one. In the same vein, it is interesting to consider the conductivity of solutions and molten electrolytes, say, ordinary table salt. In this case, the charge carriers will no longer be electrons, but the ions of chlorine and sodium. At the same time, to explain the conductivity of electrolytes and the release of heat in them, scientists use the classical law and explanation, although it would seem that everything that has changed is only the type of charge carrier. The conductivity of an electrolyte is determined by its viscosity and ion mobility. Therefore, the same law is fulfilled: the electrical resistance is proportional to the distance between the electrodes and inversely proportional to the cross-sectional area of the tube filled with electrolyte. However, in contrast to the electron gas, the viscosity of electrolytes, like any liquid, decreases with increasing temperature [64]. Accordingly, the resistance of electrolytes when heated does not increase, as in metals, but falls. Using different theories for the essentially identical phenomena of the conductivity of metals and electrolytes, scientists are playing a double game. Already from this it should be clear that the application of the quantum approach is not necessary and even harmful. But back to metal melts.

At the moment of melting, most metals increase the resistance by only one and a half to two times [147], while retaining the purely metallic ability to build up resistance upon further heating. This alone is enough to reject it as an erroneous quantum interpretation of resistance. Indeed, if, according to quantum theory, even insignificant distortions of the crystal lattice, introduced by phonons and impurity atoms, noticeably increase the resistance, then in a melt, where the order of the crystal lattice is extremely disturbed, the resistance would grow immensely. But the funny thing is that some conductors, when melting, not only do not increase resistance, but, on the contrary, reduce it, again, by one and a half to two times. These are the metals bismuth, antimony, gallium, as well as the semiconductors germanium and tellurium [147, p. 126].

Such strange behavior of conductors, from the point of view of quantum theory, is completely mysterious. But we can easily solve this problem if we notice that all these materials - bismuth, antimony, gallium, germanium and tellurium - share another anomalous property. If all other metals and semiconductors expand during melting, then these five contract, reducing their volume by several percent. This convincingly proves that the crystal lattice and its defects by themselves do not affect the resistance: the main role here is played by the density of the arrangement of the atoms of the substance. And the increase in the resistance of metals during melting is associated only with their expansion - the separation of atoms. On the other hand, metals that reduce the volume during melting also reduce resistivity. For the same reason, the speed of sound in a metal and its conductivity are interrelated: both grows together with the hardness of the substance, the saturation of its interatomic bonds, that is, with the Debye temperature, or rather T_s (§ 4.16). Thus, mercury and lead, whose atoms are weakly bound, have the maximum values of resistance and T_s , but the minimum speed of sound among pure metals.

Classically, this is easy to explain. It is known that the conductivity is proportional to the number of charge carriers - free electrons. That is why, when heated, illuminated (internal photoelectric effect), the resistance of dielectrics and semiconductors falls: electrons bound in their atoms acquire speeds sufficient to detach from atoms, and begin to participate in charge transfer. In addition, the density of the metal also increases: its atoms approach each other, their electric fields overlap more and more, and electrons need less and less energy to detach from atoms and participate in charge transfer (Fig. 179). When atoms approach each other, their electrons are socialized, forming new atomic bonds and filling vacancies that could previously hold free electrons (Fig. 170). As a result, more and more excess, free electrons become, which are detached from atoms and begin to transfer charge. In addition, from the "closing of vacancies", free electrons interact less and less with atoms, which, as it were, increases the width of the "pores" of the metal (potential regions available for the movement of electrons) through which the electron gas oozes. That is why the increase in the density of the metal decreases the resistance.

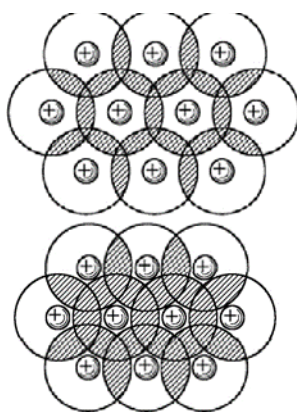


Fig. 179. The closer the atoms are in the crystal lattice, the wider the area of overlapping of their electron shells (shaded), the easier the electrons leave the atoms and flow as a stream through the expanded channels, pores.

And, precisely, it was noticed long ago that metals, increasing their density under pressure, reduce resistance. Thus, the resistance of chromium and other metals under pressure p (measured in atmospheres) decreases by about $10^{-6}p$ from its initial value. Moreover, when compressed under tremendous pressure, even dielectrics, for example, hydrogen, sulfur, become conductors. And some materials, for example, silicon, germanium, are transformed under high pressure into a superconducting state. It is not excluded, therefore, that the temperature rise in resistance is caused partly by the temperature expansion of bodies. And for metals with a negative thermal coefficient of expansion, even a minus thermal coefficient of resistance is possible. Therefore, it would be interesting to find out how the resistance of substances shrinking when heated changes: magnetic alloys, germanium near -243°C , plutonium above 400°C , as well as chromium in the region of 37°C - the temperature near which chromium suddenly stops changing its volume ... However, the resistance must also change depending on the state of the electron gas. After all, the gas flow rate through the filter depends both on the size and shape of the filter pores and on the properties of the gas.

Previously, it was believed that the classical Drude theory of conductivity cannot explain why the introduction of even a small impurity into a pure metal noticeably changes its resistance. Thus, the introduction of only 1% manganese into copper increases its resistance threefold. It is clear that such a strong influence is associated with the violation of the correct crystal lattice of copper by impurity atoms. Therefore, in the quantum theory of conduction, it was considered that it is the strict periodicity of the lattice that ensures the conductivity. But, in fact, lattice defects simply change the density of the metal and bind electrons. Everyone knows that objects laid in regular rows take up less volume than randomly piled ones. Here are the defects - impurity atoms, disturbing the order, expand the metal and increase its resistance. So, here, too, it is not the crystal lattice itself that is important, but only its average interatomic distances.

For the same reason, the specific resistances of different crystalline modifications of the same metal differ markedly. Each packing of atoms has its

own density and its own interatomic distances. Their spatial arrangement also plays an important role. No wonder, the resistance of a metal crystal depends on the direction in which the current flows (Fig. 180). Thus, for the previously mentioned metal gallium, the resistivities along different crystal axes differ by a factor of seven [100]. The connection between such a record difference in resistances with different densities of atoms in the atomic planes of crystalline gallium (similarly to the connection between the hydraulic resistance and the density of fibers at different sections of the filter) is confirmed by the fact that its thermal expansion coefficients also strongly differ along different axes (their relationship with resistance is shown above). Also, the resistance of a metal largely depends on its mechanical and heat treatment, which changes the structure and density of the metal, due to a change in the size of grains, crystalline modification, and the number of defects. In the classical theory of conduction, only the state of the electron gas was taken into account and almost no attention was paid to the material (filter) through which it flows. But, instead of taking into account the influence of the material, physicists completely abandoned the visual picture of conductivity, replacing the classical theory with a quantum one. And, although the classical approach is not yet sufficiently developed quantitatively everywhere, the quantum theory, even qualitatively, is not able to correctly describe many phenomena.

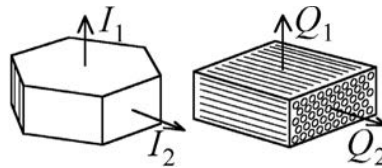


Fig. 180. The difference in resistivity along different axes of the crystal, as if for a gas flow along and across the filter fibers.

So, the motion of electrons in matter obeys the laws of classical mechanics, and the behavior of an electron gas obeys the laws of classical aerohydrodynamics and thermodynamics. The classical theory of metals by P. Drude was inaccurate - not through the fault of the classical approach, but from the unaccounted for the role of the conducting medium and the electron-electron interaction. The prospects for the application of classical mechanics in materials science and solid-state physics are grandiose, but poorly studied. For too long, science has followed the dead-end path of quantum mechanics, which is the reason for its current problems and stagnation. Not only have the experimental foundations of quantum physics (photoelectric, Compton, and tunneling effects) turned out to be unreliable, but quantum mechanics, as it turned out, is generally incapable of explaining a number of phenomena. Therefore, only classical physics will finally make it possible to solve the problem of high-temperature superconductivity and create new materials with unique properties, not to mention making everything secret in the problem of resistance clear and obvious.

Finally, let's say a few final words on the history of the issue. P. Drude created his electronic theory of the conductivity of a metal, presenting the current as a flow of an electron gas, in 1900. This theory, firstly, explained all

the features of the conductivity and behavior of the resistance of metals, when conditions change, and secondly, offered a simple interpretation of Wiedemann-Franz law, - the proportionality of the conductivity and thermal conductivity of the metal, always related in the same proportion, regardless of the type of metal. After all, the thermal conductivity of a metal, as well as its electrical conductivity, is determined by the flow of an electron gas, which carries charge (conductivity) and heat, the kinetic energy of electrons (thermal conductivity). It seems strange that scientists so easily abandoned such a simple and elegant theory. But everything will become clearer if we consider that P. Drude died tragically in 1906 as a result of suicide, before he reached the age of 43. This allowed scientists to abandon his classical theory - in favor of the quantum one.

The period 1906-1909, in general, as they said, is very full of numerous and strange deaths of key classical scientists - here both the death from the Curie accident (1906), and the suicides of Boltzmann and Drude (1906), and the departure from the lives of the defenders of the kinetic theory, U. Kelvin and D. Mendeleev (1907), the death of W. Ritz in the hospital (1909). Here, M. Planck's statement that new theories are recognized not by persuading scientists, but only in the process of dying of all those who disagree, according to the principle "no man - no problem", was fully justified here. The death of Drude is a vivid confirmation of this. His suicide not only made it possible to reject the classical theory of metals proposed by him, but also led to the establishment of the dominance of all non-classical physics in general. The fact is that P. Drude was the editor of one of the leading scientific journals of that time, the Annals of Physics, and was the guardian of classical views. However, after his death in 1906, the journal was headed by M. Planck and V. V. V. They played an extremely negative role, since they allowed publications on the theory of relativity and quantum theory without restrictions, in every possible way preventing the publication of their criticism and alternatives [161]. By the way, V. V. is also to blame for allowing Einstein's first articles to be published in 1905. That's it: suddenly and strangely, a revolution took place, which led to the replacement of classical physics with quantum physics. This story still awaits a thorough investigation.

§ 4.18. Phase transitions of the 1st and 2nd kind

I believe that one should introduce into physics the concepts of symmetry so familiar to crystallographers.
P. Curie, "On the symmetry of physical phenomena", 1894

These studies, if they were continued by P. Curie, could probably than work on radioactivity for the development of physics and chemistry.
A.V. Shubnikov [164]

As one of the evidence in favor of quantum physics, sometimes exotic second-order phase transitions are cited. Let us recall that "phase transitions of the first kind" are called aggregate transformations of a substance, proceeding with the release or absorption of energy. In them, the density, heat capacity and other parameters of the physical body change abruptly at the transition point. Another thing is phase transitions of the second kind - they occur without the release of latent heat, and the characteristics of the substance at the transition

point change smoothly, continuously. Phase transitions of the second kind include transitions ferromagnet-paramagnet, conductor-superconductor, normal-superfluid helium and others, seemingly supernatural, from the standpoint of classical physics of transformation. Therefore, it is allegedly possible to explain them - only from the standpoint of quantum physics. But, in fact, as we will show below, phase transitions of the second kind do not differ much from the first and are fully explained within the framework of classical physics and are only more complex transformations of matter, which, in reality, are also accompanied by the release and absorption of heat.

Moreover, the release and absorption of heat in these transitions is mandatory. In exactly the same way as for first-order transitions, such heat release follows from the laws of thermodynamics. After all, any phase transition implies a restructuring of matter. With a decrease in temperature, the substance passes into an energetically more favorable state, reduces its internal energy. That is why this excess energy is released and must be removed in order to transfer matter from one state to another. So, during crystallization, the atoms are arranged in the correct order, which reduces the entropy of the compound and the potential energy of interaction of the atoms. This energy is released in the form of latent heat of crystallization. The same happens, in reality, in second-order phase transitions, say, in the paramagnet-ferromagnet transition. There, the transition occurs without rearrangement of the mutual position of the particles, which is why second-order phase transitions are not accompanied by changes in density and volume. However, this transition is accompanied by deep internal restructuring of the structure of matter.

So, during the formation of a ferromagnet, the magnetic moments of the electrons are aligned parallel to each other. That is, ordering occurs, but not the positions of the particles, but their orientations in space. And ordering is inevitably accompanied by a decrease in entropy, the interaction energy, also released in the form of heat (during the reverse transition, heat is absorbed, on which the principle of magnetic cooling is based). And, although it is believed that phase transitions occur without the release of heat, and that in this they differ significantly from phase transitions of the first order, in reality, as we will show below, they release latent heat no worse. Thus, the fundamental difference between phase transitions of the first and second kind is eliminated, and, therefore, all ideas about the exclusivity of transitions of the second kind collapse, and their entire phenomenological theory, constructed by L. Landau and V. Ginzburg, in many respects becomes meaningless and unnecessary, - based on the quantum approach. In fact, phase transitions of the first and second kind are completely symmetric, similar, having the same classical nature. The difference between them is not fundamental, but quantitative, and it lies in the width of the temperature interval within which the phase transition occurs.

The correct theory of second-order phase transitions and their connection with the degree of symmetry began to be developed by Pierre Curie, as a specialist in physical chemistry, who thoroughly studied crystals and the paramagnet-ferromagnet transition. However, an early tragic death prevented Curie from completing this grandiose classical work, the important role of

which was noted by our outstanding crystallographer A.V. Shubnikov [156]. It is noteworthy that his namesake and contemporary L.V. Shubnikov (through the fault of Landau, who died even earlier and tragically than Curie) was the pioneer of Soviet low-temperature physics and the founder of an advanced domestic cryogenic laboratory, a researcher of superconductivity, magnetism, second-order phase transitions, crystals and the crystallization process, which once again reflects their close relationship. Below, we will consider in more detail some of the second-order transitions.

§ 4.19. Magnetism and ferromagnetism

It remains for me to say by what law of nature can iron to itself attract a stone that the Greeks call it a "magnet" by the name of the deposit ... First of all, the seeds should stand out from the magnet in a multitude, or the current should flow out, breaking with jerks the Air, which lies everywhere between the stone and the iron. As soon as the space between them will become empty, and a lot of Place will be cleansed there, as at once, in a common heap, At first the iron will rush headlong there ... The point is that they are encouraged from outside by their blows ... It is as if the ring is pushed from behind and carried away and driven away. After all, it always strikes the surrounding air objects.

Titus Lucretius Carus, "On the nature of things", 1st century. BC. [77]

The nature of magnetism has already been revealed earlier (§ 1.7, § 3.19). According to Ampere's hypothesis, magnets and ferromagnetic materials are attracted due to the elementary circular molecular currents existing in them. The interaction of electric currents, carried by the streams of rheons and arheons, emitted by magnets, causes their attraction (or repulsion). What is most surprising, such a hypothesis of magnetic interaction was put forward by Democritus and Lucretius two thousand years ago, who said that it is carried out by elementary particles of magnets and iron, by means of currents emitted by them, penetrating the fabric of the magnet and iron. According to their hypothesis, the same tiny seeds, particles (rheons) that are constantly emitted by bodies and carry light, also have a magnetic effect, which has an electrical origin, in full agreement with the Ritz hypothesis. It would seem that these outflows are only capable of repelling objects. But Lucretius was surprisingly able to explain the attraction by the fact that the atoms of iron, constantly being hit by particles of the surrounding air, when the magnet is brought up, experience more such impacts from the outside, since the particles emitted by the magnet clear space with their impacts to the iron body. This is exactly how, according to the rheon hypothesis, attraction is carried out: the arheons ejected by the positron clear space to the electron, and, therefore, the impacts of the external, converging rheon stream push the electron towards the positron (§ 3.20). The slight prevalence of this attraction of charges over repulsion gives rise to the force of attraction of the magnets. Lucretius was the first to classify bodies according to their magnetic properties, similar to the modern division into dia-, para- and ferromagnets. This ancient researcher and popularizer of the atomistic doctrine of Democritus guessed that there is no fundamental difference between magnetic and non-magnetic bodies: just some react to magnetic currents to a greater extent, while others - to a lesser extent - bodies

have different magnetic susceptibility and permeability [77]. Amazing epiphany!

What is the reason for the presence of magnetic properties in some bodies and the absence in others? Currently, magnetism and ferromagnetism are ranked among quantum phenomena, although, in reality, they are ordinary, classical phenomena. No wonder, the first explanation of ferromagnetism was given a century ago by Pierre Curie - entirely within the framework of classical science. He explained ferromagnetism by spontaneous magnetization. The magnetic moments of atoms, mutually influencing each other, are equally aligned along one direction. As a result, their magnetic moments add up, thereby creating noticeable magnetic fields of the substance. With an increase in temperature, from the random motion of atoms, the magnetic moments are mismatched and the spontaneous magnetization above a certain temperature (Curie point) disappears. There is a ferromagnet-paramagnetic transition. This phase transition does not contain anything supernatural and there is no need to consider it a transition of the second kind - this superfluous essence introduced by Ehrenfest and Landau, contrary to Occam's principle. In fact, in the process of the paramagnetic-ferromagnet transition, heat is released, as in all first-order transitions. However, this transition does not occur abruptly, but is extended in a certain temperature range, therefore, the release and absorption of heat is perceived as an increase in the heat capacity of a ferromagnet. Heat capacity tends to infinity with approaching the transition point (Curie point). Therefore, the latent heat of such transitions can be found as the area enclosed under the heat capacity curve. This issue will be discussed in more detail in the next section (§ 4.20).

In such a transition, heat cannot but be released, since the formation of a ferromagnet is associated with a higher degree of ordering: atoms and electrons in them are arranged in an ordered manner not only in their coordinates, but also in directions, forming a crystal of a higher degree of symmetry - a "supercrystal". Separately with the ordering in the coordinates and in the directions of the particles (their moments), we meet in ordinary and liquid crystals, and in ferromagnets these properties are combined in the form of a supercrystalline state of a higher order. It is this ordering that inevitably leads to a decrease in entropy, with the release of the corresponding energy in a certain temperature range. And, just because this heat release is stretched, it is interpreted as an increase in heat capacity. To cool by one degree, it is necessary not only to take away the heat associated with the kinetic energy of the random motion of atoms, but also the internal heat that is gradually released during the transition. The existence of the latent heat of transition also confirms the magnetocaloric effect - the release of heat during magnetization of a ferromagnet, as if during crystallization.

The fact that ferromagnetism has nothing to do with quantum theory, but is explained purely mechanically, using classical theories, follows from the existence of the piezomagnetic and inverse piezomagnetic effect, that is, the magnetization of ferromagnetic materials under the influence of pressure, deformation. It is due to this effect that, over time, the tips of scissors,

screwdrivers, and meat grinder knives are magnetized. This is due to the fact that plastic deformation leads to a rearrangement of the internal structure of the metal and a purely mechanical ordering in the arrangement of its atoms and grains, which is clearly visible on etched metal sections. Mechanical ordering in the arrangement of atoms leads to the co-directional arrangement of their magnetic moments, previously oriented randomly. Plastic deformations cause permanent rearrangements of the atomic structure - into an energetically more favorable one, which reduces the interaction energy, which is achieved with a co-directional arrangement of the magnetic moments of the atoms. It will not be difficult to explain from the classical point of view all other features of ferromagnetism, including the magnetization curve, as well as the phenomena of para-, dia- and antiferromagnetism.

It should be noted that the classical theory of ferromagnet-paramagnetic transitions was constructed by Pierre Weiss and Pierre Curie [50], which was preceded by the creation of Curie's theory of crystals and crystallization (first-order phase transition), as well as the symmetry theory important for these processes [156, 164]. However, Curie died in 1906 and now the theory of this kind of phase transitions, based on the theory of symmetry, is more often associated with the name of L.D. Landau, who essentially stole and perverted Curie's ideas on a quantorelativistic basis. This happened more than once with Ritz's ideas. Now one can only regret the early deaths of W. Ritz and P. Curie. Both investigated the same question from different angles and were close to unraveling the secrets of the structure of matter. If Ritz built a magnetocrystalline model of the atom, then Curie established the connection between crystals and magnetism. Had they both lived a little longer and combined their efforts, people a hundred years ago could have got their hands on an adequate theory of the atom and nucleus, and, together with them, a completely classical picture of the universe. So, magnetism, in general, and ferromagnetism, in particular, are quite explicable within the framework of classical laws. Moreover, it is the classical theory of the atom, based on the Ritz model, that makes it possible to understand why some materials and elements have the properties of ferromagnets and antiferromagnets, while others do not (§ 3.3, § 3.19).

§ 4.20. Superfluidity

This liquid seems to be weightless, almost non-existent. Or maybe there is none at all - liquid?

G. Kamerling-Onnes on superfluid helium [61]

Another unusual and still unexplained property of matter is superfluidity, which has so far been observed only in helium. It is symbolic that this miracle of low temperature physics was discovered in our country, famous for its frosts. It is even more symbolic that it was discovered in 1938 not by a theoretical physicist, but an experimental physicist, practitioner, engineer - Pyotr Leonidovich Kapitsa, a graduate of the St. Petersburg Polytechnic [62]. After all, quantum theory could not only predict, but even explain superfluidity clearly, as well as superconductivity. This is the main reason for the limited use

of both in life and technology. All the successes in the discovery of superfluidity, superconductivity, the creation of ever higher-temperature superconductors, we owe only to experimenters who intuitively, by chance, blindly grope for compounds and alloys with the desired properties. The role of theory in this search is insignificant and is reduced to an explanation (formally fitted) that has already been discovered. Therefore, as many people point out, the quantum theory of superfluidity and superconductivity has not justified itself. And a fundamentally new theory of these phenomena, different from the quantum one, is vital.

So, helium, as you know, this inert gas is the most stubborn of all gases. Its atoms do not want to bond with each other or with the atoms of other elements. The stubborn reluctance of helium atoms to interact explains why this gas was the last to surrender its positions and succumb to liquefaction (helium has the lowest critical temperature $T_K = 5.25$ K). But even in a liquid state, it retained its stubbornness, becoming the only substance that does not solidify even at absolute zero (only under a pressure of 25 atmospheres it is possible to obtain solid helium). It is in this transcendental state, below the temperature $T = 2.17$ K, that helium acquires the amazing property of superfluidity, in other words, it loses its viscosity and, even through the thinnest capillaries, flows practically without friction.

Superfluidity is often compared with superconductivity, which also occurs near the point of absolute zero [71, 134]. After all, the electrons that generate the current scurry about inside the metal, like the atoms of a gas. Therefore, they began to talk about the current, the flow of "electron gas". Its viscous friction, when it "oozes" through the pores of the crystal, and previously explained the resistance of the conductors (§ 4.17). Even Ohm introduced a visual hydrodynamic analogy of current: a conductor is a pipeline; current strength - liquid (gas) consumption; potential difference - pressure difference; conductor resistance - pipeline resistance; the release of Joule heat - heating from the viscosity of a liquid (or gas), etc. And in a superconductor, the viscous friction of an electron gas, like helium, disappears, and it flows through the conductor without resistance and energy loss.

The fruitfulness of the classical current model makes it useful today. It is it which reveals the connection between the phenomena of superconductivity and superfluidity, and, therefore, their nature. True, in a conductor they speak of an electron gas, while superfluid helium is considered a liquid. But this is something you can argue with. Everything indicates that superfluid helium is, in fact, also a gas, and the analogy with an electron gas is complete.

To begin with, for all gases with a drop in temperature T , the viscosity η , in contrast to liquids, does not increase, but decreases according to the law $\eta \sim T^{1/2}$. It was with this that the temperature increase in the resistance of metals was once associated: with an increase in temperature, the viscosity of the electron gas increased (Fig. 177). As it is easy to see, this theory also predicted the complete disappearance of resistance near the point of absolute zero, at $T = 0$ K. Therefore, it is natural to assume that helium, when cooled below the critical temperature of 2.17 K, goes into a superfluid state due to its transformation into

a gas, having under such conditions almost zero viscosity η . And exactly, the experience of E.N. Andronikashvili showed that as the temperature drops, the viscosity of superfluid helium decreases according to the law $\eta \sim T^{1/2}$, down to zero at $T = 0$ K [134]. But for some reason this experiment was interpreted as confirmation of the absurd two-fluid Ginzburg-Landau model, according to which helium consists of normal and superfluid components: the proportion of the latter increases upon cooling, reaching 100% at absolute zero, which supposedly explains the zero viscosity. In fact, only a classical and long-predicted drop in the viscosity of gaseous helium was observed.

It would seem, why would liquid helium, obtained by cooling gaseous helium, again become a gas upon further cooling? But, knowing the stubbornness of helium, its unwillingness to remain in a liquid state, we can expect any trick from it. So, on the phase diagram (Fig. 181) showing the state of helium, depending on pressure and temperature, it can be seen that the line AC of the transition of normal helium (He I) to superfluid (He II) - starts at the same point A, from where and line AB of liquid-gas transition. This proves the close connection between superfluid and gaseous helium. Then C will be a triple point, at which the solid, liquid and gaseous states of matter converge, and which, as physicists believed, is not present in helium alone.

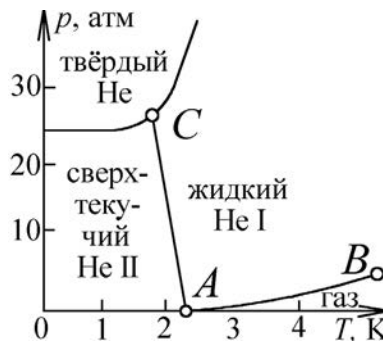


Fig. 181. The phase diagram of helium shows the connection of superfluid He II with solid helium and gas.

Physicists are accustomed to asserting that the transition of helium to a superfluid state is fundamentally different from simple liquid-gas phase transformations (boiling), liquid-solid body (crystallization), etc., accompanied by the absorption or release of a certain heat and called "phase transitions of the first kind" ... And the He I – He II transition, which does not release heat, is already called a "second-order phase transition" (§ 4.18). But this is a mistake: the transition of helium to a superfluid state requires the removal of some standard amount of heat from it, and the same amount of heat must be returned to transfer the helium back to its normal state. Physicists missed this truly latent heat of transition, since they are used to dealing with phase transitions, where all latent heat is transferred at a constant fixed temperature. Thus, the temperature of melting ice will not move from 0 °C until it absorbs all the heat of melting. And, building the curve of the heat capacity of water, at the melting point, apart from the jump in the heat capacity, one should also depict a very sharp peak (the so-called delta function) corresponding to an infinite heat capacity, because at

the melting point the heat input does not increase the temperature. After all, the heat capacity of a unit of body mass is, by definition, the ratio of the supplied heat to the increase in body temperature.

In helium, the heat capacity at the transition point (Fig. 182) also tends to infinity, creating a peak usual for phase transitions [134]. However, this peak is already slightly blurred, which indicates an extension of the phase transition itself, but a first-order transition accompanied by heat transfer! Its quantity q is equal to the area S enclosed under the heat capacity graph - within a narrow temperature band at the transition point (Fig. 182). Such "diffuse" phase transitions do exist, especially in complex two-phase, two-component systems.

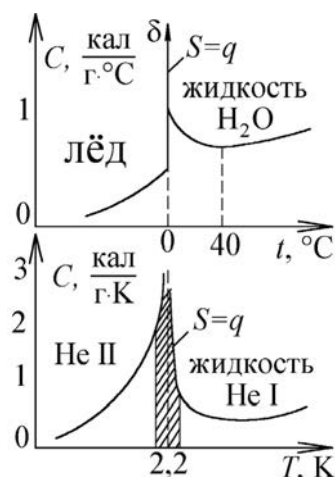


Fig. 182. The peak on the graph of the heat capacity of water and helium corresponds to a phase transition, and its area S - to the latent heat q of this phase transition.

Thus, the melting of ice crystals (containing heavy isotopes) suspended in water, stretched over a wide temperature range, was also named as a possible reason for the anomalous behavior of the density of water near the melting point [120]. Another water anomaly is evidently caused by the same. Its heat capacity does not increase with increasing temperature, as in all liquids, but falls, reaching a minimum at 40°C , and only with further heating does it begin to increase (it is believed that this sets the standard for the temperature of the human body and all warm-blooded animals [138]). The abnormally high heat capacity of water and its decline in the range from 0 to 40°C can also be associated with the melting of heavy ice crystals, which requires additional heat of ice melting (80 cal/g). Moreover, this excess amount of heat 0.14 cal/g , found as the area of the segment under the left branch of the heat capacity curve (Fig. 183), is exactly equal to the heat of melting of heavy isotope ice enclosed in water. Contained in 1 g of water 0.0018 g of heavy ice H_2^{18}O absorb, as it melts, just $0.14\text{ cal} = (80\text{ cal/g}) \times (0.0018\text{ g})$. It turns out that for water without heavy isotopes, both the density curve and the heat capacity curve would have a normal course. It is interesting that water with superfluid helium is related by the very rare property of decreasing the volume when heated. Note that natural helium also contains an isotope, but, unlike water, not heavy, but light - ^3He in an amount from 10^{-4} to $10^{-8}\%$.

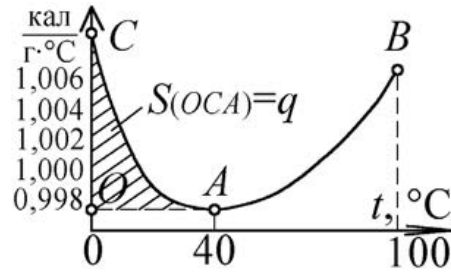


Fig. 183. Peak of heat capacity C of water from melting of heavy ice.

So, the transition of helium to the superfluid state may well be a simple phase transition with the removal of heat. Probably, monatomic helium at low temperatures forms di- and polyatomic molecules He_2 and He_n . Moreover, this state of a polyatomic gas below $T = 2.17$ K turns out to be energetically more favorable than a monatomic liquid, and, therefore, helium again becomes a gas. That is why, turning from a liquid into a gas, helium does not absorb, but releases heat, which must be removed. And, for sure, a single helium sometimes forms diatomic molecules. Thus, He_2^+ ions were detected in the discharges. And the transition of ^3He to the superfluid state is believed to be possible only when its atoms merge into pairs, like electrons in a superconductor [134].

But, rather, helium atoms do not even combine in pairs, but form giant complexes numbering thousands and tens of thousands of atoms. These, in fact, are no longer molecules, but microcrystals that do not have a constant number of atoms and move like Brownian particles, the collective of which behaves like a gas of large molecular weight. The size of such crystals should be about ten times the diameter of a helium atom, i.e. - about $10 \text{ \AA}$ or 1 nm . This means that helium, nevertheless, goes into a solid state (with which the release of heat is connected), but behaves in this case - like a gas, since the thermal motion and the weak bond of inert helium atoms interfere with the growth of crystals and their agglomeration. The result is a cross between a gas and a crystal - "gas ice", aerosol from crystals, snow dust, ice vapor. In fact, this is a new state of aggregation of matter. This is the reason for the similarity of the properties of helium and water containing ice microcrystals [120, 138]. Similar intermediate states of matter, in the form of rigidly bound crystalline complexes, have already been considered for the case of solids and hydrogen (§ 4.15, § 4.16).

Crystals nucleate already in liquid helium, and their number and size increase with decreasing temperature. The diffuse peak of the heat capacity of helium is associated with crystallization. And experiments have shown that crystals containing hundreds of atoms float in liquid helium (as in water) - "snowballs" and "ice flocs" [12, 138]. Like any crystals, they grow around the nuclei of crystallization: ions and electrons. The growth of crystals in liquid helium, as shown by the physicist Atkins, has purely classical reasons [12]. As the crystals grow larger, the distances between them grow and, at a certain temperature (2.17 K), they turn out to be so great that the liquid transforms into a gas (Fig. 184), moreover, due to the smoothness of the transition, without changing the

density, as if in the critical point where the properties of the liquid and vapor coincide.

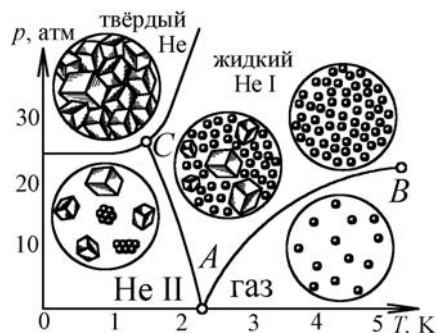


Fig. 184. Depending on the pressure and temperature, microcrystals growing in liquid helium either move away, forming a "gas" phase, or freeze into a single "snow" mass of helium.

But could physicists confuse gas and liquid? This is quite possible in the case of helium. It is just that gases cannot usually be observed under conditions when the gas should resemble a liquid. Due to the low temperature, its molecules will have an insignificant speed, insufficient even to fly out of the vessel after overcoming the force of gravity. Such gas no longer possesses the main property of gases - to fill the entire provided volume, but accumulates, like a liquid, at the bottom of the vessel. On a large scale, this happens to the Earth's atmosphere, which cannot leave the Earth and is poured over it as an air ocean. So, the He II gas near absolute zero looks like a liquid: it can be poured from glass to glass, it flows like a liquid, and even has, due to a noticeable refractive index (density 146 kg/m^3), a ghostly, barely visible and an undulating "interface" (Fig. 185). In about the same way, already at room temperatures, you can "pour" carbon dioxide or greenish-yellow chlorine gas from a glass into a glass, like a liquid, and also observe how heated air (which has a slightly different refractive index) takes off from a fire with a "fountain of jets", or, - as the mist spreads, flows along the ground, steam from the cooled air.

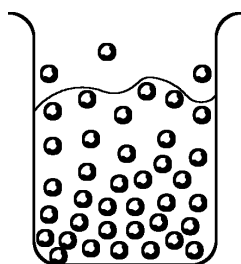


Fig. 185. Gas from helium particles unable to leave the vessel.

At the same time, liquid helium He I itself strongly resembles a gas. It is so transparent and light (the density is ten times less than that of water) that you doubt whether it is a gas? As stated in Kartsev's book [61], such a doubt gripped Kamerling-Onnes, who discovered liquid helium: "... and now the vessel is filled almost to the brim with a boiling liquid so transparent that it is almost impossible to see it. weightless, almost nonexistent. Or maybe there is no liquid

...? ". The same doubt is raised with regard to superfluid helium. Although outwardly superfluid helium He II, as a cross between a gas and a solid (Fig. 181), really should resemble a liquid. That is why, observing helium near absolute zero, it is easy to confuse a gas with a liquid, especially if this substance cannot be "felt", studied directly.

The fact that superfluid helium is a gas, not a liquid, is at least convinced by its inability to boil, bubble, which any liquid is capable of. This can only be explained by the fact that this substance is a polyatomic gas, which does not need to boil to transform into ordinary monoatomic helium and which simply cannot form bubbles without having a surface tension. However, physicists explain the inability of superfluid helium to boil by its enormous thermal conductivity. And, after all, they have direct evidence of the transformation of liquid helium into a gas during the transition to a superfluid state. Thus, if the pressure over liquid helium is reduced at $T < 2.17$ K, then violent boiling will arise in it, which ends only with a transition to the superfluid state [134]. Well, doesn't that prove superfluid helium is a gas? Indeed, in the same way, with a decrease in pressure, it boils, forming vapors, water and all other liquids. But physicists, having such clear evidence in front of their noses, will not even be surprised: why would liquid helium suddenly boil with gas bubbles upon cooling, especially since it still turns into a liquid (albeit superfluid), and since, in their opinion, at temperatures below 2.17 K, helium in the form of a gas and gas bubbles does not exist at all?

Unfortunately, here, as in many other "nonclassical" phenomena, theorists began to complicate things by inventing a bunch of absurd objects (phonons, rotons, quantum liquid), artificial hypotheses (say, the formal division of helium into superfluid and normal components). And all this - instead of properly understanding, conducting experiments and finding a simple, visual, and, therefore, the most probable explanation. However, the conclusions of quantum physics and the theory of relativity have always been hasty and inconsistent. Supporters of these absurd theories rejected any classical explanation only because of its classical nature, even if it was simpler, more accurate and more natural than their own.

If superfluid helium is a gas, then all its "oddities" will find a simple and natural explanation. For example, it is known that when a test tube with superfluid helium is immersed in a vessel, the difference in helium levels gradually levels out. This is usually explained by the formation of a thin film of helium on the surface of the test tube, in which helium flows according to the principle of a siphon. But even without this, helium can easily pass from the test tube to the surrounding liquid and vice versa, since the glass of the test tube is not ideal, it always has a lot of defects and microcracks, due to its thinness serving as an insurmountable barrier for all liquids and gases, except for superfluid helium. Through such pores, glass cracks, helium flows out (Fig. 186).

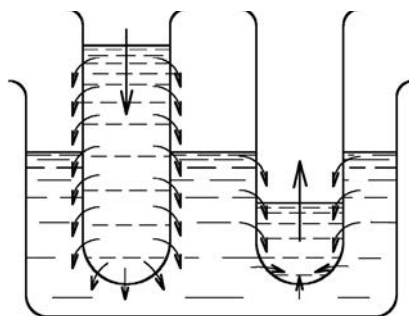


Fig. 186 Alignment of the levels of superfluid helium oozing through the walls and flowing down them in the form of an illusory film.

Therefore, the flow rate of helium depends, as experiments have shown, not on the path length of the imaginary film, but on the number of glass defects - cracks and scratches. In the same way, it was found that superfluid helium, due to its negligible viscosity, easily passes through the walls of a closed ceramic vessel, oozing through its finest pores. Even at room temperature, gaseous helium easily passes through the smallest cracks and pores of sealed vessels [90], and at zero temperature and viscosity, this gas is even more nosy.

The mechanothermal effect is interesting: if two vessels, filled with superfluid helium to different heights, are connected with a tube with emery powder, then, when the levels are equalized, the temperature in the vessel from which the helium leaves grows, and where it flows in, it falls. This is usually explained by the fact that only the superfluid component of helium, which does not carry heat, flows through the tube [134]. Theorists contradict themselves with this, since the enormous thermal conductivity of helium is associated precisely with the superfluid component, which produces ultrafast heat transfer. This inconsistency is characteristic of all quantum physics. In fact, the nature of the mechanothermal effect is trivial. As it was said, the viscosity of a gas increases with temperature - with an increase in the speed of molecules. Therefore, in the gap between the grains of emery powder, helium molecules pass more easily at the lowest speeds, forming helium with a low viscosity. Fast molecules carrying viscous helium hardly penetrate the pores, "get stuck" in them (it is not for nothing that superfluidity is noticeable only in thin capillaries, where there is no access for fast particles). Therefore, the vessel from which the helium is leaking heats up: the percentage of fast molecules there grows (Fig. 187.a). And in the vessel, where helium arrives, the proportion of slow molecules grows, and it cools down.

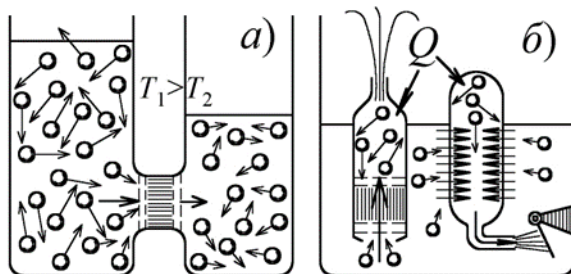


Fig. 187. a) The leakage of slow, "cold" helium molecules through a fine-pore filter creates a temperature difference; b) Heating of the ampoules leads to the inflow of superfluid helium into them and its ejection through the nozzle.

A fine-pore filter essentially separates molecules by velocity. We observe a similar phenomenon during the evaporation of a liquid. So, if you drop alcohol on your hand, then, due to the escape of more energetic molecules from the surface, the liquid quickly cools: its energy leaves, and slow molecules begin to prevail.

There is also a thermomechanical effect. In it, on the contrary, the heating of one of the two vessels connected by a filter leads to the inflow of superfluid helium into the heated vessel (Fig. 187.b). This is due to the fact that heated helium, having a high viscosity, practically does not pass through the filter, while helium from a cold vessel, due to its low viscosity, easily passes through the capillaries into a heated vessel, increasing the level of helium in it. With a strong heating of the vessel, the inflow of superfluid helium into it is so strong that the jet gushes out like a fountain through the nozzle.

The interesting experiment of Kapitsa, where a jet from a heated vessel immersed in superfluid helium, deflected a light wing, is explained in a similar way. Through the pores and cracks of the glass, superfluid helium entered the inside of the heated vessel, while simultaneously flowing out through the nozzle (therefore, the level of superfluid helium in the vessel did not change), as in the case of gushing. The jet from the nozzle and repelled the winglet. As we can see, classical physics is quite sufficient for the interpretation of these and other anomalies of superfluid helium. So we are dealing, albeit with a rare, unusual, but - a classical phenomenon, which can be understood without a complex representation of superfluid helium as a quantum liquid of two incoherent components. And, soon, the classical interpretation of the properties of helium will find an exact quantitative justification.

In addition to the fact that the phenomenon of superfluidity can become a key to unraveling superconductivity, it is also of independent interest and can have important practical applications. However, just as in the case of superconductivity, this requires an increase in the transition temperature to the "superstate". And, therefore, it is necessary to look for new substances and conditions that give rise to superfluidity. Helium is hardly an exception. The reason for its superfluidity is only in the ability of helium to remain in a liquid and even gaseous state near the point of absolute zero, which other substances are not capable of. But now physicists, albeit with great difficulty, have learned to conserve atomic hydrogen in the form of a gas up to $T = 0.08 \text{ K}$ [134]. And, therefore, there is hope to find superfluidity in it. In addition, hydrogen is the second gas after helium with the lowest temperature of transition to liquid and solid state (Table 12).

It was possible to transfer the helium isotope ^3He into a superfluid state, although superfluidity occurred in it only at temperatures below 0.0027 K . Such a low transition temperature is associated, apparently, with a 25% lower mass of the isotope atoms. Accordingly, the speed of motion of ^3He atoms, at the same temperature, is greater than that of simple ^4He . It is not without reason that gaseous ^3He transforms into a liquid only at temperatures below 3.35 K . For the same reason, ^3He atoms merge with great difficulty, giving rise to "gel ice" and a superfluid state. Superfluid helium also has similarities with rheon fluxes, also

gas	liquefaction		hardening	
	T, K	$t, ^\circ C$	T, K	$t, ^\circ C$
^3He	3.2	-270	$p > 35 \text{ atm}$	
^4He	4.2	-269	$p > 25 \text{ atm}$	
H_2	20.6	-253	14.2	-259
Ne	27.2	-246	24.	-248.6
N_2	77.2	-196	63.2	-210
O_2	90.2	-183	54.4	-218.8
O_3	161	-112	22.2	-251
CO	81.7	-191.5	68.2	-205
F_2	154	-119.7	53.2	-220
Ar	87.2	-186	84	-189.2
Table 12. Candidate gases for the discovery of their superfluidity properties.				

flying through the pores of bodies without resistance, due to inertia, lack of interactions. This analogy of an electrodynamic medium with superfluid helium, proposed by Sotina and Boldyreva [22], goes back to the ideas of another researcher of low temperatures and critical transition states of matter, D.I. Mendeleev, who compared particles-carriers of light and gravity, which penetrate bodies without friction, with atoms of helium and other inert gases (§ 1.5, § 3.21). It turns out that the classic Mendeleev, in contrast to the quantorelativists, was able to predict in his works the phenomenon of superfluidity of these extravagant elements.

So, it makes sense to look for superfluidity in other inert gases, say, neon, which is in third place (after helium and hydrogen) - in terms of low boiling and melting temperatures and is increasingly used as a refrigerant. The reason for the ultra-low viscosity of liquid oxygen, which also has one of the lowest boiling points, melting points and unusual magnetic properties, is mysterious. So, the discovery of new and even high-temperature superfluid gases is quite possible. Many are amazed how in the century that has almost elapsed since the moment when Kamerlingh Onnes - the same hard worker-experimentalist as Mendeleev and Kapitsa - discovered superconductivity and carried out the liquefaction of helium, these two phenomena never made a revolution in technology. It can be seen that only the rejection of the quantum theories of superconductivity and superfluidity created by Landau and Ginzburg will open up new ways of applying and studying superstates, which were closed and frozen for almost a century by quantum mech.

§ 4.21. Superconductivity

Ehrenfest and his friend Walter Ritz made a joint trip to Leiden. It must be said that Leiden of that time was famous not only for Lorentz, but also for Kamerling-Onnes, the director of the cryogenic laboratory, in which fascinatingly interesting studies of the low-temperature properties of solids were carried out. And so, together with Ritz, Ehrenfest came up with an ingenious method for choosing topics for dissertations: they took a physics textbook and turned to the subject index. One read out the terms collected there, and the other added the sacramental: "at low temperatures."

V. Ya. Frenkel [171]

In many ways, the phenomenon of superfluidity and magnetism is reminiscent of the phenomenon of superconductivity [71], discovered, like liquid helium, by Kamerling-Onnes. As many have noted, the quantum theory of superconductivity is fundamentally wrong, which explains the extremely limited use of superconductors, which, in theory, should have revolutionized technology long ago. Therefore, great hopes have recently been pinned on the classical theory of superconductivity. Any gas, including electronic, gradually loses its viscosity with a drop in temperature (Fig. 177). That is, according to the classical theory, at absolute zero, the resistance should become zero, then the metal will go into a superconducting state. But in reality the superconducting state sets in, even - a little short of absolute zero. The electrons forming an electron gas, like the atoms of ordinary gases, have different velocities, obeying the Maxwellian distribution (Fig. 188). Therefore, in the metal there are always electrons with almost zero speed. At room temperature, they are negligible. However, near absolute zero, the percentage of such electrons is already noticeable, and they are able to create currents of sufficient magnitude.

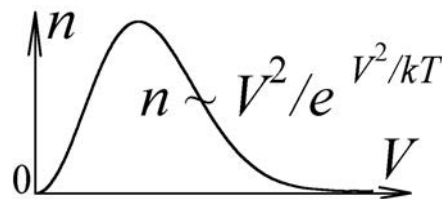


Fig. 188. Velocity distribution of electron gas particles.

Of course, there are more fast electrons, but, forming an electron gas of high viscosity, they are filtered by the "micropores" of the metal (§ 4.17), creating only weak currents in comparison with the currents of slow electrons, so that the resistance they introduce is negligible. The separation of the gas of slow electrons, generating a superconducting current, is the more efficient, the thinner the "pores" of the metal through which the electron gas oozes (fast and slow molecules of superfluid helium are also separated in the pores of the filter § 4.20). Therefore, alloys and metals such as tin, mercury, lead, tantalum, niobium, which usually have high resistance, easily go into a superconducting state (and superfluidity is manifested only in fine-pored filters, which provide increased resistance to the current of normal liquids), while in metals of low resistivity (silver, copper, gold), the transition to the superconducting state is difficult. The presence of currents of slow and fast electrons is similar to the flow of current through two parallel resistors, the first with a low resistance R_1 , the second with a large R_2 : almost all the current, choosing the path of least resistance, will go through the resistor R_1 , and the resistance of the second will hardly affect the current if $R_2 \gg R_1$ (Fig. 178). However, it is fast electrons that can generate negligible, but tangible superconductor resistance. It is possible that their current sets the value of critical currents and magnetic fields that destroy superconductivity. Apparently, they are also associated with the low (in comparison with the normal state) residual thermal conductivity of the

superconductor [90], since the main current of slow, low-energy electrons almost does not transfer heat.

The real snag for quantum theory was the discovery of superconductors, which in their normal state, at high temperatures, are dielectrics. But, according to the classical theory, at low temperatures the dielectric may well become a superconductor. A dielectric does not conduct current only because there are almost no free electrons in it: all electrons are bonded to atoms. It was believed that, according to the classical theory, dielectrics do not conduct current at all [32, p. 22]. In fact, and in the classics, due to the spread of velocities (Fig. 188), the dielectric always contains electrons with a velocity sufficient to detach from atoms. With an increase in the temperature and speed of electrons, an increasing part of them is separated from atoms and transfers charge, which is associated with an increase in the conductivity of dielectrics during heating. But in dielectrics with a high degree of thermal expansion, a noticeable increase in conductivity is also possible upon cooling. After all, a cooled dielectric, decreasing in volume, brings atoms closer together, their fields overlap more and more, releasing many electrons (§ 4.17). For these dielectrics, compression by cooling is analogous to compression by pressure, which turns them into conductors (due to the socialization of some of the electrons and the release of the rest), as, for example, in the case of sulfur. So, at low temperatures, dielectrics may well open up metallic and superconducting properties, since, as found above, substances that usually have increased resistance become superconductors easier. And a dielectric, which in its normal state presents the same serious obstacle for the current as a microporous filter for a gas, due to its "narrow pores" can become a superconductor even with a lower degree of cooling than a metal. The temperatures of the transition to the superconducting state for different crystalline modifications of the same metal, having different densities, also differ from the different widths of the interatomic "pores" (§ 4.17).

So, the behavior of electrons in matter is fully consistent with the laws of classical mechanics and thermodynamics. And quantum mechanics is not only "crazy", but also often gives false predictions, although theorists are used to saying that the quantum approach is better than the classical one. Quantorelativists are trying to convince everyone that modern semiconductor electronics is created according to quantum theory and the band theory of a solid developed within its framework. But this is the same blatant lie, like a tale about the key role of the theory of relativity in the creation of nuclear power (§ 3.13), or as a statement about the role of quantum theory in the construction of lasers (§ 4.9). In fact, all these inventions of the XX century. were built not thanks to, but - in spite of quantum physics and the theory of relativity, with serious interference from their apologists. So, a semiconductor radio based on kristadin back in 1922 was created in the Nizhny Novgorod radio laboratory by O.V. Losev. Around the same time, he built the first transistor (the basis of modern electronics), having studied the physical mechanism of its operation, and also discovered the phenomenon of electroluminescence in semiconductors

(built and investigated the first LEDs, without which modern technology is inconceivable).

And most importantly, Losev gave quite adequate explanations of the operation of all these devices on the basis of classical physics and his experiments (see the collection "Ahead of Time". Nizhniy Novgorod: NNSU, 2006). But it was precisely this independence, originality and originality of Losev, who ignored the complex quantum approach, that led to the fact that the introduction of his inventions into practice was delayed for decades. And the supporters of the quantum theory, headed by A. Ioffe, were to blame for this. If Ioffe's involvement in the tragic fate of Ritz is still questionable (§ 1.1), then about Losev we can definitely say that the delay in the introduction of his inventions into practice and the death in besieged Leningrad entirely lie on the conscience of Ioffe, who stood at the head of Soviet electronics and instilled delirium in the country quantorelativistic theories, and, therefore, had a negative impact on the development of domestic science and semiconductor electronics, which by the middle of the XX century had turned from the advanced into backward.

In general, concluding Part 4, we can say that various properties of substances, even the most exotic, any "quantum" effects, including those associated with the radiation of matter and the wave properties of particles, are quite understandable within the framework of classical mechanics and physics. The reason for its previous imaginary inconsistencies was not the "fallibility" of classical science declared by the apologists of Quantum Mech, but - in the absence of an adequate theory, model of phenomena, - from ignorance of the structure of the atom and the mechanisms of various processes, and, quite often, due to deliberate ignorance, concealment and oblivion such successful classic models. Likewise, all other phenomena that will still be discovered someday can be easily explained classically. Quite often, the quantum explanation is noticeably inferior to the classical one, which makes it possible to understand and predict many more effects. All this means that the classical approach has far from exhausted itself in thermodynamics, radiation theory, solid state physics and the theory of the structure of matter. If it is deeply developed properly, it will make it possible to predict new properties of bodies, to create new substances with the required characteristics. Quantum theory is deprived of such a possibility, moreover, its "predictions" are often erroneous and harmful, since they can lead to accidents. That is why until now it was necessary to look for substances by blind fortune-telling, "by the method of scientific poking", using only empirical rules. However, even these achievements were "retroactively" presented as "triumphs" of quantum theory. This is what led to a prolonged stagnation in the most promising areas of the development of science. Therefore, it seems that only the classical approach developed by Ritz, Stoletov, Drude, Curie and others will make it possible to get out of this crisis, stagnation, frozen state of science.

KEY IDEAS OF PART 4

1. The Ritz magnetic model of the atom makes it possible to easily and naturally explain the black body spectrum and Planck's law on the basis of the classical laws of radiation of electrons vibrating in the atom, rejecting the quantum interpretation.
2. The photoelectric effect, the Compton effect, the Franck-Hertz experiment and other phenomena that supposedly proved the reality of photons, the quantization of the energy of light and atom, find a simple classical explanation in the Ritz magnetic model. The quantum interpretation of these experiments turns out to be unnecessary and even erroneous, since does not explain a number of their features (selective, nonlinear photoelectric effect, etc.).
3. Lasers, masers, solar cells and semiconductor devices were created by classical physicists and operate exclusively on classical principles, in accordance with Ritz's model of the atom. Quantum physics did not help, but interfered with their creation, giving incorrect predictions and explanations of the principle of their work.
4. The electron and other elementary particles have only corpuscular properties, and experiments that "prove" their wave properties have been misinterpreted. A detailed analysis allows the experiments to be given a simple classical explanation and to reveal a number of features that reject their wave interpretation.
5. The Ritz magnetic model of the atom makes it possible to easily and naturally explain the black body spectrum and Planck's law on the basis of the classical laws of radiation of electrons vibrating in the atom, rejecting the quantum interpretation.
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8. The electron and other elementary particles have only corpuscular properties, and experiments that "prove" their wave properties have been misinterpreted. A detailed analysis allows the experiments to be given a simple classical explanation and to reveal a number of features that reject their wave interpretation.
9. The tunnel effect and a number of other phenomena, allegedly confirming the Heisenberg uncertainty principle, admits a simple classical interpretation: the processes in the microworld are deterministic, regular and, if they contain elements of probability, then only of a classical, statistical nature, for example, from the trembling of an electron under the impact of rheons, like a Brownian particle - under the blows of atoms.
10. The classical theory of the atom on a unified basis describes the structure of matter and the mechanism of communication between its particles - atoms, nucleons, electrons and positrons due to electromagnetic forces. This opens up

the connection between the scale of distances in the microworld and the scale of energy release in chemical and nuclear processes.

11. The classical model of the atom and the structure of matter reveals the real mechanisms of changes in the electrical conductivity and heat capacity of bodies, without involving quantum theory and revealing its inconsistencies with experience.
12. The classical model of the atom reveals a unified mechanism of phase transitions of the first and second kind, revealing a number of important features of superfluidity and superconductivity that contradict quantum theory, but are easily explained in the classical theory, which opens up new possibilities for their application.

Part 5.

PROSPECTS AND CONCLUSIONS

Books teach to dream, fantasize ...

A designer, above all, must be a dreamer. Exactly in dreams new ideas and designs are born ... To achieve dreams to come true - this is the greatest meaning of human life, and the constructor especially.

A. Yakovlev on the education of scientific imagination [69]

In the preceding sections, the enormous potential of ballistic the theory of Ritz and classical physics in terms of explaining the phenomena radiation and interaction, Cosmos and microworld, atoms and light. Topics by doing so, we have shown that there was no need to accept such complex and absurd theories like quantum mechanics and the theory of relativity. It is much easier and more accurate to explain everything on the basis of the familiar, visual and easy-to-use classical physics. However, it was all more in terms of theoretical physics.

An explanation of the already known phenomena, and more accurate, simple and adequate, of course, is necessary, at least in order to correctly describe and calculate them in practical problems. But **the value of the BTR is much higher in terms of predicting new, as yet unknown phenomena and principles of physics**, which open up fabulous prospects for terrestrial technology and science. The book has repeatedly shown the great predictive power of the BTR in relation to many phenomena of space, macro- and microworld, which were later really discovered. However, it is even more interesting that Ritz's theory predicts fundamentally new and completely unexplored phenomena.

Indeed, due to the fact that for a whole century we have been using the erroneous theory of relativity and quantum mechanics, earthly science has lagged behind in its development by a hundred years. It is very likely that many natural phenomena were not discovered precisely because of this: most of the discoveries of the 20th century (semiconductors, superconductivity, superfluidity, lasers, etc.) are not the result of a systematic search based on the then accepted quantorelativistic theories, but in mostly random finds of persistent experimenters. To make discoveries, you need a compass — a guiding theoretical concept that guides the experimenters' quest. This is how, on the basis of the periodic table, new elements were predicted, on the basis of Newton's laws - new planets, really open. If we use a bad theory, a broken compass, it will either lead nowhere, or it will lead us into a swamp, into an abyss, into a dead end. In this case, a chaotic experimental search would be blind wandering. Whereas a purposeful experimental search, guided by the correct theory, is effective and quickly, economically leads to the goal. False theories, such as the theory of relativity, 481 quantum mechanics, only obscure phenomena, hinder their understanding, prevent penetration into the secrets of space and microcosm. But correct, true theories lead to an adequate understanding of phenomena, significantly advancing science and technology. That is why they say that there is nothing more practical than a good theory.

That is how long time, while the geocentric system of the world of Ptolemy and the mechanic of Aristotle dominated, stagnation reigned in science. But as

soon as Copernicus, Galileo, Kepler, Newton discovered a new, true system of the world, science moved forward with leaps and bounds, and discoveries fell like a cornucopia. Therefore, it does not even lend itself to imagination what fantastic possibilities will open to us when the new ballistic picture of the universe is accepted and correctly applied. Then Humanity is guaranteed another breakthrough into the unknown. Apparently, it is the BTR that will finally allow people to go into distant space, to master not only the near-solar space, but the entire Galaxy. Similar fantastic perspectives are revealed in this last part of the book. Many of them are in the nature of guesses and bold hypotheses. Therefore, we ask the reader to treat them critically and condescendingly. Of course, many of these guesses may not be confirmed in the future, but it is interesting that in the BTR there is a fundamental possibility of creating all kinds of amazing devices and solving the secrets of nature, man and society.

If in the previous parts, with the help of BTR, they conquered and explored already open areas of knowledge, then here we enter the area of the unknown. Therefore, here the BTR performs a kind of reconnaissance in force, opening up fantastic horizons and unusual directions of research that can lead to a breakthrough in science. Following the ballistic analogy, the BTR apparatus can be likened to the explosive substance of a bomb, and the science fiction ideas and prospects discovered by the BTR can be likened to the detonator, the fuse of this bomb, which detonates the ugly structure of modern physics, thereby clearing the way to creative freedom and leading to a revolution in science and technique. Together with the BTR we are entering the age of supertechnology, passing into the stage of a highly developed civilization.

§ 5.1. *Fantasy and reality*

First inevitably come: thought, fantasy, fairy tale; they are followed by scientific calculation, and in the end, execution is crowned with thought.

K.E. Tsiolkovsky [69]

So far, only in fantastic works do we read about interstellar spaceships, about time travel and teleportation, about force field generators, antigrav devices and other amazing devices. Meanwhile, it became clear long ago that any, even the most audacious, scientific fantasy will sooner or later come true. Tales of airplane carpets and a flying mortar, magic crystals and mirrors, tangle-navigators and a saucer with a colored apple that gives a scan of images, of running boots and a self-propelled smoking oven, samogud psaltery and a self-sawing sword are no longer a fairy tale, but reality. We are no longer surprised by an airplane, a hovercraft and a rocket, an LCD TV and navigation spy satellites (§ 2.1), a car, a CD player and laser weapons. All human dreams come true sooner or later, if you apply an adequate engineering and scientific approach. And therefore, the fantastic devices listed at the beginning, it is quite possible that they will find real embodiment in the coming years thanks to the use of BTR. The most interesting thing is that much of the predicted by Ritz's

theory can be found in fantastic works. In particular, this concerns the bipyramidal model of the atom.

The role of science fiction and fantastic ideas presented in this section is also to liberate our mind, imagination, open the way for them, throw off the yoke of dogmas and free ourselves from inertia of the mind. It was they who at all times hindered the assimilation of new progressive ideas, hindered making discoveries. As in the story of R.F. Jones "Noise Level", opening the gates, filters of thinking and imagination, we open the way to the implementation of bold ideas, the invention of amazing devices that seemed fiction before. One has only to admit that they can be built, reject the prohibitions hanging over them all the same Einstein's theory of relativity, and then there is a simple solution to the problem. It is interesting that even Einstein himself noted that, as a rule, a discovery is made not by a specialist, but by an outsider who does not know about the existing prohibitions, it is he who makes a discovery that seemed impossible, because he does not know that it cannot be done.

A discovery, an invention is always made by those who infinitely believe in a dream, in the feasibility of their plan, no matter how impossible it may seem to others. This is how Ritz, thanks to his boundless optimism and belief in classical ideas, was able, contrary to the opinion of the majority, to solve the riddles that tormented people for centuries about the nature of light, electricity, magnetism, gravity, about the structure of the electron and atom, which have not yet been resolved by scientists. The more unrealizable, fantastic the dream, project, concept seems, the more grandiose their embodiment, invention or discovery will be. Therefore, a person must dare, choose a task within his shoulder (Big Dream) and have boundless enthusiasm, optimism, firm confidence in his idea, a critical approach to the prevailing dogmas in science and the preconceived opinion of the majority for its implementation. Only in this way, over the centuries, creative people have been able to overcome the inertia of thinking and the obstacles that stand in the way. Such courage and optimism, striving for the "impossible" to make it possible, is what the reading of science fiction develops in a person.

As shown in Jones' story, only a researcher with a critical mind, rich imagination and imagination, an unbiased and independent opinion, an unconventional, original, unexpected approach to a problem is capable of discovery. Everything that could be discovered by thinking in a standard way is already open. However, one should not confuse the original thinking with the perverse, sick, mentally ill people who are not capable of understanding simple, beautiful, obvious things and everywhere seek to impose their delusional, ugly and abstract fantasies instead of them. That is why the sick should not be considered dissidents, but those who think unnaturally, not harmoniously, not wisely. Mental disorders are especially dangerous among scientists who are called upon to bring order and clarity to science, but sometimes instead, rejecting simple natural mechanical schemes, inventing some unimaginable supernatural entities to explain the phenomena of nature. These include the ether of Aristotle and the scholastics, the otherworldly forces of alchemists and astrologers, as well as an abstract-immaterial electromagnetic field, curvature of

space, time dilation, indefinite wave particles and other mystical nonsense of quantorelativist scientists. It is precisely the perversely thinking scientists at the beginning of the 20th century. threw science to several centuries ago, returning to the dark mystical superstitions and scholasticism, put the Earth on the brink of nuclear and environmental disaster. As the whole history of science and Jones's story shows, real discoveries are being made simply, gracefully, wisely, but without philosophizing slyly, without being carried away by mathematical formalism - this analogue of astrological cabalism, and in free flight of thought, uninhibited imagination, bold imagination. It is not physical laws or weak scientific and technological development that interfere with making discoveries, inventions, but social, psychological laws - inertia, inertia of thinking, the dominance of dogmatists and mystics in science. No wonder Democritus and other ancient atomists, who had a bold critical mind, were able to outstrip the development of science by millennia (§ 5.5). Bold fantasy, imagination, belief in miracles, fairy tales, dreams, the desire to realize them, realize them, and drive science. But a fairy tale is a fairy tale, and therefore the fantastic discoveries, insights and inventions of scientists are just as strikingly different from the impossible mystical nonsense of quantorelativists, as healthy colorful dreams and dreams are from nightmares and the drunken delirium of a madman. Fantasy should be not only bold, but also healthy, natural! This is the reason for the reality, the predictive power of science fiction and fairy tales, which contain the centuries-old wisdom of the people, and not empty inventions.

It is no coincidence that many scientists and engineers have chosen the scientific and technical path and made great discoveries with inventions under the influence of fantasy and fairy-tale motives, inspired by books and films. Thus, K. Tsiolkovsky was inspired by the novels of Jules Verne to create rockets. And the inventor of holography, Y. Denisyuk, developed methods of volumetric display under the influence of ideas from the book of I. Efremov. And there are hundreds of such examples. Until now, science fiction has a gigantic charge of brilliant, but not yet realized ideas and projects. It is shown below that many of these ideas of science fiction writers find justification and ways of implementation on the basis of a BTR. Moreover, it is the BTR that provides the key to the construction of many fantastic devices. Of course, here we are stepping on a slippery path of hypotheses and assumptions. Therefore, much of what is described in the last part may seem pure fantasy to the reader. And yet it is remarkable that it is the BTR that offers, if not yet technical, but at least a fundamental possibility of creating fantastic machines, removing fundamental prohibitions and restrictions. Ritz's ballistic theory is precisely what helps turn fantasy into reality.

§ 5.2. *BTR in ancient games*

A nation that does not remember its past has no future.

Plato, IV c. BC.

It is known that children learn about the world while playing. As it is now becoming clear, adults and scientists learn about the real world through games. That is why only enthusiastic, inquisitive and endowed with a rich imagination, playful imagination, researchers made great discoveries in the course of a kind of game of intellect, gymnastics of the mind. So, Mendeleev opened the table of the same name, playing solitaire from cards with the names of chemical elements. For a scientist, scientific research is a complex game with its own rules. Its meaning is to solve the riddles of nature, lay out a mosaic, assemble a puzzle of facts. Even the setting up of experiments and experiments contains a number of game elements. But this is not an abstract, formal play of the mind without rules and not a senseless riot of fantasy, as in Einstein, Eddington, Bohr, but an honest logical game with nature in an attempt to reveal its secrets, to establish real-life relationships. This playful way of understanding the world has always existed and was practiced in many ancient cults and games. Modern children's games and puzzles serve the same - Rubik's Cube, tag, constructor, cubes, puzzles. All of them teach children how to create and combine elements of the world, establish connections, and build a holistic picture of the world. The role of such educational games (tops, puzzles, magnets) in the formation of a child's deep ideas about the structure of the world and the sharpening of its perception is reflected in the film "The Last Mimzy of the Universe", based on the story of G. Kuttner. In other words, games are miniature models of the world. It is in this capacity that since ancient times they have served people who begin to model the big world in the process of playing from the very childhood.

Perhaps the most ancient scientific game of man is the game with fire, pyrotechnics, which has been used more than once to illustrate the ballistic model (Fig. 7, Fig. 139, Fig. 141). It may very well be that the external assimilation of the electron to a sparkler, exploding in a cascade of sparks, has a profound meaning. As it turned out, carnival pyrotechnics (rockets, fireworks, fiery wheels) have a very ancient origin. It is believed that gunpowder and pyrotechnics were invented in China more than two millennia ago. But in reality, it is probably a much older invention. After all, the compass, gunpowder, paper, as it now turns out, were not invented in China, but came there as a heritage from much more ancient civilizations, just like many "inventions" of the Arabs, borrowed from Europe, where they were forgotten in the medieval era of barbarism.

Most likely, gunpowder and pyrotechnics came from India, where they performed not only as entertainment, but also an important military and ritual function. The Indian origin of pyrotechnics is already indicated by the name "sparkler". And exactly, just as the Russian Katyushas were famous in the Great Patriotic War, the Indian rocketry used against the British colonized India was famous back in the 18th century. There were even special missile troops in India [68]. The Indian origin of pyrotechnics is also confirmed by the fact that it was there that the cult of fire, the Sun and fire worshipers was most developed. This

is where the fakirs and torchlight processions came from, and the very word "fire" is believed to come from the name of the fiery god Agni, who was worshiped by the ancient Aryans. In Indian rituals, fire and pyrotechnics played an important ritual role. Such a great and serious importance attached to fireworks suggests that the fire had a hidden, sacred meaning. And therefore, it is possible that the fireworks served precisely as a model, an illustration of the knowledge of the ancients about the emission of light, about the structure of the electron, exuding, like a Bengal fire, a stream of spark-rheons (§ 1.4). And rather, it is not even just a model, but, like many games, is the key to understanding the mega- and microcosm and a kind of active interaction with Nature.

The same is true of the spinning wheels of fire, whirled by jet streams of sparks. It is this kind of spinning mechanism that is apparently realized in the electron and gives it spin and magnetic moment (§ 3.19). It is not for nothing that in Russia the word "kolo", "wheel" has always been associated with fire, the Sun and its circular motion. Suffice it to recall the fiery wheels launched in Russia from the mountains on the day of the summer solstice and other Russian fire games, confirming the connection with ancient Indian culture noted by N. Roerich. The rotation and rolling of the Sun was symbolized by both the Old Indian and Old Russian swastika - the most common pattern among our ancestors. Therefore, the previously mentioned toy, the spinning ion-windmill (Fig. 141.c) and the swastika have a deep meaning, surprisingly accurately reflecting the real four-sector picture of the magnetic field lines of the circling Sun and the streams of the solar ionic wind emitted by it. If the electron spinning goes by the same mechanism, this will be the best illustration of the similarity of the micro-, macro- and megaworld. There is another similar toy - a four-sector pyramidal spinner made of paper, balanced on a needle and, when brought up by the right hand, spontaneously spinning counterclockwise, like the Sun and an ion-wind spinner [94, p. 119].

Thus, pyrotechnics was previously not just a game and a spectacle, entertainment, but, apparently, carried a deep hidden scientific meaning, knowledge about the structure of light, electricity, about the structure of the lower and upper floors of the world, and, possibly, was a symbolic language of communication with these worlds. It turns out that ancient Indian pyrotechnics, rocketry and ballistics, like the BTR, can represent the correct model and instrument for the exploration of the microworld and space (§ 5.11). Evidence of this can be seen in the fact that Democritus created his atomic theory, which speaks of the propagation of light in the form of tiny particles emitted by luminous bodies, largely under the influence of Indian magicians and fakirs, from whom he studied [31, p. 103]. This deep knowledge of the Hindus about the structure of the universe is also noted in the above-mentioned story by R. Jones "The Noise Level".

Sports ritual games are adjacent to games with fire. The Olympic Games, which originated in ancient Greece, are imbued with the symbolism of fire. The eternal, inextinguishable Olympic flame, quite likely, symbolized the basis of our world - inexhaustible charges, electrons emitting an eternal flow of energy,

spark-rheons (§ 1.5). And the relay race, the transfer by the runners of the torch, sparks from one Olympic flame to another is a complete analogy of the exchange interaction of charges connected by sparks, the rheon runners who support each other (Fig. 7). This model of impulse exchange is especially clearly reflected in games with a ball and shuttlecock flying from player to player, say in tennis, ping-pong, badminton, where the very name of throwing projectiles suggests the idea of a ballistic analogy of radiation: ball (English "ball ") and " racket ". And in these games, athletes skillfully use the ballistic principle, knowing that the speed and force of the ball hit depends both on the speed of the throw and on the general movement of the thrower, which additionally gives the ball its speed, as well as the movement of charges imparts additional speed to the rheons. It is no coincidence that R. Feynman, having borrowed from Ritz the ballistic exchange model of the interaction of charges, cited as its illustration the transfer of the ball between two players.

The same exchange model is reflected in team games with the transfer of the ball between players, goals, baskets in volleyball, hockey, football, basketball, known in different versions from antiquity, for example, among the Mayan Indians. Note that among the Maya, known for their pyramids and deep scientific knowledge of nature, the "game" was of an important ritual character and was conducted by priests (scientists), enclosing their imaginative ideas about the world. By the way, in the most important Olympic competitions, such as throwing a disc, a shot or a javelin from a run, the ballistic principle for light is reflected, the rays of which have been compared from ancient times to throwing projectiles (Zeus, or Perun, to whom the Olympic Games are dedicated, threw the light of fire lightning like arrows) ... The abandoned body, according to the ballistic principle, increased the speed and range of flight due to the takeoff of the thrower, which since ancient times was used in battles by horsemen-spearmen and archers, who fired from racing horses and war chariots, these ancestors of motorized rifle equipment. By the way, military chariots, like other military weapons, were also used in sports competitions, in chariot races, which have now been reborn into racing car competitions. Concluding the story about the symbolism of the Olympic Games, we note that the award for winning the games itself - a wreath, a bunch, a bundle of stems with a narrow constriction (common in any coat of arms), or the Olympic Cup - symbolized another important basis of the world - an atom with its bipyramidal shape (Fig. 191).

Another ancient game related to sports (military) and containing a deep meaning, the ideas of the ancients about the structure of the world, is chess. In chess, two armies, pieces of two colors, move along the squares of the chessboard. This is very reminiscent, as was said, of the step-by-step displacement of electrons and positrons along the electron-positron grid of an atom during spectrum generation (§ 3.2). The chessboard is an electron-positron grid, electrons are black pieces, positrons are white (Fig. 101, Fig. 105, Fig. 109). And the chess pieces themselves have a biconical, bipyramidal shape of the atom. Checkers have no less similarity, where all the figures are of the same type, but are also divided into black, corresponding to particles, electrons, and

white, depicting antiparticles, positrons. Moreover, the number of black and white pieces on the board is initially the same, like particles and antiparticles in an atom and in the world in general. Finally, just as electrons stick only to positrons in the grid, and positrons to electrons, so the checkers always move along the cells of the original color.

It resembles a chessboard and square electron layers in an atom, on which electrons and positrons can, depending on the element, form different configurations, similar to positions in chess (§ 3.3), and generate different spectra (§ 3.2). And, as if in chess, where different combinations are possible (ways of movement of pieces), in the atom, the key for generating the spectrum turns out to be the combination principle of Ritz, which sets the permitted types of motion of electrons along the grid of the atom. Finally, the number of cells, nodes in the extreme - 6th and 7th electronic layers (key for elements of the last periods) - corresponds to the number of cells on the chessboard. These are the same squares of $8 \times 8 = 64$ cells (Fig. 105), half of which (32 black cells opposite the positrons) are assigned to electrons (Fig. 109). That is why there are 32 elements in the 6th and 7th periods. Therefore, it is possible that chess, the similarity of which was still in Ancient Egypt, carries a hidden, forgotten meaning and knowledge of the ancients about the structure of the atom (§ 5.3). The role of chess in an adequate understanding of the world is already indicated by the example of the well-known chess player E. Lasker, who scientifically criticized the theory of relativity and believed that in an absolute vacuum, in the absence of a speed-reducing substance (§1.13), it is possible to detect a difference in the speed of light from $c = 3 \cdot 10^8$ m/s, and arbitrarily large [58].

In ancient chess, apparently, the unity of atomic and nuclear properties is also reflected. On the one hand, electrons and positrons are like chess pieces of two colors walking on the chessboard of an electron-positron grid (§ 3.3), but on the other, there are also protons with neutrons sitting in the same grid (§ 3.6). Only 4 types of particles, figures, four armies of almost equal numbers. And it should be noted that in the original ancient Indian version of chess there were figures of exactly 4 colors, 4 armies, based at the corners of a chessboard, at which four were playing (Fig. 189). That is why chess was called "Chaturanga" - "four armies", symbolizing 4 forces of influences, 4 elements. This suggests the thought that the scheme of ancient chess reflects forgotten ideas about the structure of the atom, still reaching us in the form of the once popular game Rich-Rach in Russia, where chips of 4 colors walk along the cross, like electrons in the Ritz model (§ 3.1).

Also, in chaturanga and Rich-Racha the random nature of the movement of the electron generating the spectrum along the grid nodes is reflected, since the figures there do not move randomly, but depending on the number of points thrown out on the dice, in this ancient example of a fortune-telling game and a random number generator. However, "chance" in this case was associated with the manifestation of a higher will, with predestination, natural law (§ 4.13). Recall that the intensity of a given spectral line of an element is specified precisely by the probability of an electron staying at a given site, which is determined by the stability of its position (§ 3.4). Such a probabilistic law of

motion of particles and figures in chaturanga [18], depending on the number of points dropped out, although not preserved in modern chess, it remained in other games with chips, for example, in Trick-Truck (backgammon) or in the same Rich-Rache. A pair of dice in a chaturanga randomly sets two integers that determine the course of a figure, just as the combination of two integers sets the position of an electron in an atom and the frequency it generates according to the Ritz combination principle, which predicts the spectrum of hydrogen (§ 3.1).

This relationship of chess, chaturanga with other games and predictions, with the model of the micro- and megaworld, and especially with the magnetic model of the atom, follows from the works of J. Needham, who, back in 1962, wrote about the deep connection between the magnet and chess. One of the chapters of his book was called "Magnet, Prediction and Chess" (see I. [Linder, Chess in Russia. M.: Nauka, 1975, p. 23](#)). Niedem's thesis about the relationship of chess with a magnet, a compass, a balance of world positive and negative forces, is quite consistent with the magnetic model of the Ritz atom, where the number of positrons and electrons is also balanced, and where magnetism plays a key role with natural randomness. This connection between magnets and chaturanga has now reappeared, at least in the form of pocket chess with magnetic figures.

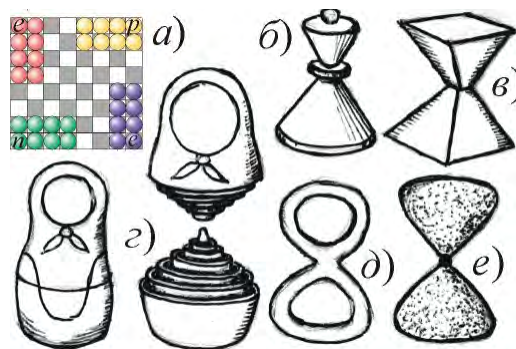


Fig. 189. a) chaturanga; b) a chess piece; c) bipyramid; d) matryoshka; e) eight; f) p-orbital of the atom.

The connection between chaturanga, chess and checkers and the world of battles and atoms is also evidenced by the once popular game "Chapaev", in which not only the initial positions of electrons and positrons in the nucleus are simulated, but also their collisions with the escape from atoms (§ 4.6), as well as the collisions of the atoms themselves. It is no coincidence that, following the example of this game, the collisions of atoms and elementary particles in physics textbooks are illustrated by the impact of checkers on the chessboard, as well as by the impact of billiard balls. Billiards and the seemingly frivolous game of "Chapaeva" actually have deep roots and meaning, originating from the ancient Indian game called "carrom", which, like chess, had a square field and four pockets in the corners, instead of six pockets in billiards.

Perhaps these related games (Carrom, "Chapaev" and billiards) not only illustrate particle collisions and the exchange model of their interaction, but reflect the real ideas of the ancients about atoms, electrons and their structure. It is no coincidence that the chips, checkers and balls in these games are initially

lined up in a crystal correct, pyramidal order. And when sent with a bat or cue, they simulate the process of emission of rheons by electrons, their transfer of momentum with a finite speed and absorption by another electron or positron, when this carrier of momentum hits another ball, checker, or is "absorbed" by a pocket. The connection of these games with chaturanga is also evidenced by the use of dice in them, but not playing cube, but round, also thrown or pushed as a bat and bringing an element of randomness into the game. Elements of throwing dice, models of exchange interaction and the crystalline, pyramidal structure of hitting particles can be traced in the old Russian games of grandma and rounders, now preserved in the form of a game of bowling pins and towns (and in the west - baseball). Perhaps the reason for the popularity of all these games, even among adults, is hidden precisely in the fact that they carry the knowledge of the ancients inherent in them about the structure of the universe, atoms, about the laws and mechanisms of nature. People intuitively feel this deep meaning and therefore with great passion, interest and pleasure play these, at first glance, simple analogs of ancient Indian carrom and chaturanga.

The presence of four main primary elements, four multi-colored armies of the chaturanga is reflected in modern playing and fortune telling cards, also of the most ancient origin and exactly 4 suits, each of 14 cards. In the cards and solitaire games, laid out in the correct rows-tables, in accordance with strict rules, the fortune-telling, random nature of the electron's movements along the atomic grid, however, is subject to certain laws, is again reflected. Therefore, it is not surprising that it was Mendeleev, as a lover of solitaire games that teach systematization, who became the discoverer of the law of the same name, which is directly related to the structure of the atom. And in ancient times, gambling and fortune-telling games, unlike their modern counterparts (roulette, cards, erroneously serving the purposes of deception and enrichment), helped a person to learn the structure and laws of the universe. Is this why a pair of dice cubes so closely resemble Lewis-Langmuir cubic atoms with dotted electrons on their faces [139]? And in the dominoes, these dots on the dice, drawn from the faces of a pair of dice in different combinations and depicting electrons of atomic levels, reflect the nature of the connection of atoms into molecules, crystals and extended chains according to the principle of similarity of shapes, the correspondence of the number of dots-electrons in neighboring dice-atoms (§ 4.14).

Another ancient gambling game, Lotto, is also closely related to the structure of the atom and the population of its floors with electrons according to the laws of chance and order. The cells inscribed with numbers on special Lotto cards are occupied with chips until one of the cards is full, similar to the filling of cells with electrons at the levels of atoms. Moreover, the chips can form on the cards only strictly defined configurations, given by the arrangement of the numbers when they coincide with the numbers of the casks taken out blindly. This corresponds to different arrangements of electrons at the atomic level, giving, depending on the configuration, different spectral lines, especially in many-electron atoms, where strict rules for the selection of possible combinations apply (§ 3.4). The placement of particles in an atom and Lotto have a lot in

common with the game of tags and magic squares, also filled with numbers according to certain laws. It is no accident that especially stable configurations of protons and neutrons in the atom are called "magic" (§ 3.6), which, as in magic and semi-magic squares, is associated with a certain symmetry, the harmony of filling the squares.

Another example of the similarity between games and the structure of the atom is given by the Russian nesting doll - seven shell figures nested inside one another. Isn't it a model of the atom, reflecting the presence of seven electron layers-shells that surround the nucleus from two sides (two parts of a bipyramidal atom) and are responsible for 7 periods of the periodic table? And what is not the model of the macrocosm, correlating with the ancient Indian scheme of the world: the center of the world in the rings of seven mountains and seas (the same scheme of the structure of the world is presented in the beginnings of Russian fairy tales: "Over the seven mountains, over the seven seas ...")? In addition, nesting dolls are made in the shape of a figure eight, close to a bicone and a bipyramidal atom. Even in quantum physics, this eight dumbbell appeared in the form of a p-orbital of an atom [46]. Mysterious identical spirals often drawn on nesting dolls, arranged in an orderly manner on the shells, can depict electrons, with their periodic placement at the levels of the atom and rotation, generating a magnetic (vortex) field that emanates from each electron in the form of a stream of rheons (points into which the spirals break). Also, the matryoshka reflects the axial structure of the atom, allowing the rotation of external electrons in the magnetic field of the atom along circular orbits (similar to the rotation of the halves of the matryoshka around the axis in the plane of their connector). But the matryoshka is a very ancient element of Russian culture, which for some reason modern science is trying to produce from Japanese dummies.

Another analogy is the ancient Chinese game, now called "Pythagoras", which arose more than 4000 years ago. In it, different figures-objects are made from triangular pieces. Moreover, the number of pieces in the puzzle is equal to seven - according to the number of electronic levels. Isn't it an ancient model that displays the construction of bodies from atoms, but atoms from flat triangular layers? Indeed, it is from the flat triangles formed by electrons and positrons that the bipyramids of atoms and molecules with their triangular faces are formed (Fig. 107). I also recall Plato's model of atoms (§ 5.3), who considered them to be pyramids composed of triangles of the same type, and above all respected geometry [144]. It was not for nothing that in China the puzzle served not just as a toy, but taught children geometry, which is key to understanding the structure of the world [94].

Pyramids were revered everywhere and had a sacred meaning also because they have long been associated, at least by the same Plato, with fire - hence the words pyrotechnics, feast, pie. On the one hand, this emphasizes the connection between the BTR and the ballistic model of the electron with ancient Indian fire worshipers, and on the other hand, it suggests that the ancients, presenting the atom in the form of a pyramid, may have known about the explosive atomic energy contained in it. In general, a pyramid is a symbol of a hierarchy - a

multilevel structure of the world. Even a children's pyramid - 7 multi-colored rings, set on an axis by floor - is, in fact, the same model of the world, a 7-level atom. Therefore, the games children play are much deeper than it is commonly believed: they are also models of the world. All of these games - "Pythagoras", chess, chaturanga, Rich-Rach, cards, pyramid, matryoshka - used to have a sacred meaning, they were "played" in temples (which played the role of our "temples of science" - libraries, institutes and laboratories), following a strict ritual, the priests, who originally performed concurrently and the functions of scientists, custodians of knowledge. Games have always helped people to deeply delve into the essence of the universe, as shown in the movie "Games of the Gods". It is no coincidence that one of the authors of this film, Valery Nikitich Demin, was one of the first to support and began to develop the ballistic theory in our country (see his book ["Secrets of the Universe"](#) and [44], written together with Prof. VP Seleznev).

Another game example of a bipyramidal, biconical model of an atom and a spinning electron is an ordinary whirligig, a top - a cone or bicone rotating on a thin stem. This toy, known since ancient times, also has a sacred meaning. Even millennia ago, the players of Ancient Greece and Ancient Russia launched a top-top in the form of a coil-bicone, which was spun with a whip and drove on a flat surface, sometimes knocking several heads together. This is how the expression "roll head over heels" and the name "dice", also randomly scurrying along the surface and depicting an atom, arose. Jumping, randomly tossed kubari tops are a beautiful model of chaotically moving, colliding atoms that have the same shape and are also periodically spurred by the energy of incident electrons, spirally winding orbital loops around the atoms. The fact that our ancestors a top-top served as a model of an atom and a spinning electron is also confirmed by another name for a top-bottom - "point" (atoms and electrons, as the smallest particles of matter, were often called "points", § 1.4). It is no coincidence that the atomist Lomonosov, who had a deep understanding of ancient Russian culture and the structure of atoms, compared microparticles with tops (§ 4.1, § 4.15). Close to the bipyramidal model of the atom and another type of top - diabolo (yo-yo) - two cones connected by vertices in the form of a coil, hourglass, and untwisted by a thread that encompasses this coil [148]. It is very possible that in these simple, but spectacular toys (ion-wind turntables, whirligig, spinning tops, cubes, yo-yos), the structure of the Thunder Temple is also reflected, which, as we will see, is also directly related to the shape and structure of the atom (§ 5.3).

Finally, in such games as dominoes, cubes, puzzles, children's construction set, in fact, the principles of the connection of atoms and the construction of matter from periodically arranged particles connected by flat faces or joint to joint are reflected. The same model of construction based on the principle of geometric correspondence, mutual complementarity of the shapes of parts, their bulges and depressions, is reflected in the popular computer game "Tetris", as well as in some other logical computer games that develop spatial imagination and designer skills.

In the light of what has been said, it becomes clear how important the selection of suitable toys is for a young child, whose mind and picture of the universe are still just being laid - for the adequate education of his intellect and ideas about the world. The background of development and learning a person had in childhood and how well he remembers the lessons of adolescence directly depends on how successful he will be in maturity, in the future. Childhood memories are the brightest. They accompany and teach a person all his life. That is why toys and games should not be just fun, but are needed to educate, develop physically, spiritually and mentally. These are the so-called educational games. And the best candidates for their role are those that our ancestors played. It is not for nothing that the same toys are sometimes passed down from generation to generation. Such games preserve the tradition and carry ancient knowledge, for the time being not realized. Our future directly depends on how well we remember the past, the lessons of the history of science and mankind, as Plato wisely noted. And, indeed, it is the knowledge of the ancients, conveyed to us, correctly understood and enriched with new knowledge, that will make it possible to make a breakthrough into the future, create an absolutely fantastic technology for the future and restore the harmony of the world.

§ 5.3. *BTR in ancient cults and hidden knowledge*

If, as a result of some world catastrophe, all the accumulated scientific knowledge were suddenly destroyed, and only one phrase would pass to future generations of living beings, then which statement would bring the most information? I believe this is an atomic hypothesis.

R. Feynman

Strange as it may seem, we also find ballistic performances in ancient cults, especially in ancient Indian Vedic philosophy based on the Vedas, the greatest cultural monuments of the ancient Aryans. This was first noticed by Nikola Tesla, who, as follows from his works, either took Ritz's ideas or came to them on his own. In particular, Tesla denied the existence of the ether in the form that other physicists accepted it, and believed that space is filled with particles of a gaseous medium, analogous to rheons (§ 3.21). Therefore, on the basis of his experiments, he argued that electromagnetic influences "travel in the form of longitudinal, bullet-like impulses and, thus, carry much more energy than was attributed to the transverse Hertz waves" [110, p. 144]. In fact, the Ritz Tesla model also expounds in his other statement about the decay of an electron to small particles of matter (rheons § 1.4, § 3.18), with their impacts producing electrical repulsion and carrying electromagnetic waves: frequencies ... Streams are formed from matter in a primary or elemental state ... The lumps of matter pushed out by the [electron] act as inelastic bodies, like many small lead bullets. These lumps break into fragments so small that they completely lose some of the physical properties that they had before. Is it possible that in the X-ray phenomenon we are witnessing the transformation of ordinary matter into ether? Or, before us there is a dissolution of matter to some unknown primary form, Akasa from the old Vedic philosophy "[110, p. 222].

Tesla's similar references to Vedic beliefs and their applications to physics are found in his other works, reducing all phenomena to two Vedic concepts: prana (life force, which can be called the energy of motion - kinetic energy) and akase (by which Tesla understands "particles of the ether" - rheons, elementary matter § 3.21). Tesla not only accepted this ancient Vedic philosophy, but was also guided by it in his scientific searches, owing to it many of his ideas and discoveries, and believed that this concept can be proved strictly mathematically. Indeed, in contrast to the biblical concept, close to the irrational views of Aristotle, medieval scholastics and the current relativistic science, including the Big Bang theory, the Indian Vedic concept denies the birth of the world from emptiness and claims that the creation of something from nowhere is impossible (in fact, this is the law of conservation matter and motion) [110, p. 218]. Therefore, according to the "Cosmogonic Hymn" of the Rig Veda, the world and nature exist eternally, without beginning, end and boundaries: the Universe is infinite in space and time, which also corresponds to the BTR and the opinion of the most progressive thinkers (§ 2.7). Also, in contrast to the Aristotle-biblical system, which placed the Earth in the center of the world, Nicolaus Copernicus gave the palm to the Sun in full agreement with the cult of the Sun of the ancient Indians and Rus, who considered the Sun to be the central element, which is reflected in the ancient solar symbol (swastika). The ancient Indians, following the cult of the Sun, knew thousands of years ago that the Earth has the shape of a ball, which revolves, moves, and the heavens and the sun rest, as was said in the Rig Veda and in the teachings of Indian sages [18, pp. 254, 257].

In ancient Indian texts, Tesla also found confirmation of his idea of nuclear decays induced by external radiation (§ 3.14). All-pervading particles fired by cosmic sources (rheons and particles of cosmic rays associated by Tesla with the Vedic Akasa) are absorbed by nuclei, initiating their decays [110, p. 535]. The idea of the ancients that akasa (ether particles according to Tesla) are the fundamental principle of matter, again finds justification in the ballistic theory, if by this substance we mean rheons (§ 3.21). It is from rheons, as found above, that electrons are built, which in turn form in the form of crystals and all other particles and atoms. But even long before Tesla, this point of view was adhered to by Democritus, Lucretius, and also Kepler, who was the first to guess about the atomic nature of the regular shape of crystals [63]. They all believed that bodies ultimately consist of ether, which, coming in a continuous stream from space, feeds stars and earthly bodies with energy and matter. And this point of view is fully justified if we consider these streams as rheons feeding electrons with energy and matter (§ 1.5). The ancestors of the Indians also knew very well about eternity, inexhaustible matter, about atomic and subatomic particles and their sizes, which is reflected in the Vedas, the very name of which, akin to the Russian word "to know", speaks of the content of this ancient storehouse of knowledge.

Thus, in the ancient Indian beliefs, akin to the pagan faith of the ancient Rus (echoes of it were preserved in Orthodoxy, at least in the structure of Russian churches, reflecting, like the sacred Mount Meru of the Indians and the

Thundering Temple of the Slavs, the key principles of the universe: four domes around the fifth central dome) , unlike much later biblical ones, we find many rational grains consistent with the theories of Ritz, Tesla and other progressive thinkers. All this concerns not only the electrodynamic part of the BTR, but also the atomistic doctrine, the theory of the structure of the electron and the atom by Ritz, in many respects similar to the planetary crystal theory of the Tesla atom, which he built 10 years before Rutherford [110].

Unlike modern abstract religion, the ancient faith, like the ancient science, was based not on mystical, transcendental entities, but on completely real ones: people worshiped not fictional creatures, but forces, laws of nature, the law of world harmony and interconnection. The personification of these physical forces-elements (light, fire, water, wind, thunderstorm, rain) were the ancient Indian and ancient Slavic deities, whose names served simply to designate natural phenomena, as they now say about the great power of Electricity, Magnetism, Gravity. Moreover, an important feature of Hindu mythology was that all these deities (forces of nature) were considered as different manifestations (hypostases, incarnations, avatars) of one main, usually Vishnu, which translates as "all-pervasive". Likewise, Ritz's concept reduces all natural phenomena and physical forces to the manifestations of one basic, electrical, created by the all-pervading flow of rheons (§ 3.16). It was this world harmony, the harmony of the universe that the ancients revered, reflecting this in the structure of the temple (including the Thunder Temple), where, unlike the present church, they glorified not foggy mystical essences, but the universal order and harmony of nature. It is no coincidence that the word "temple" or "chorus" itself, akin to the words "chorus" (order, structure of voices), "good" and the Greek word "harmony", reflected the harmony, beauty of the universe, and the temple itself served as a model-symbol of the universal world-building. That is why the expressions "temple, or workshop of nature", "temple of the universe" are still preserved in our language.

It turns out that the concept of the ancient Indians and glorifying under the external figurative, symbolic, anthropomorphic description of the world (similar to the current concept of forces) hides a completely scientific materialistic basis. It is no accident that, according to the views of the ancient Indians, it is matter that is recognized as the fundamental principle of the world [18, p. 86]. The foundation of ancient Indian mythology was based on the objective laws of the world, it was materialistic. Such a concept was accepted by the mind and soul, being consonant with them, and not imposed by force, like the current religion and non-classical science. And the ancient faith was inseparable from science, therefore Democritus, being a materialist, did not deny the soul, but found a natural scientific explanation for it, linking mental, mental activity with electrical processes caused by the movement of the atoms of the soul - electrons and ions, which are also responsible for the discharges of lightning. And today's largely absurd science is a parallel to the equally irrational modern religion. And just as the ancient faith was supplanted by religion, the ancient knowledge was replaced by the Aristotle-Einstein science.

But let us return to the ancient faith and science, the outstanding achievement of which was the discovery of the atomistic structure of the world. The ancient Greek scientist Democritus is deservedly considered the creator of atomism, who, as it was repeatedly shown in the book, came to the correct ideas about the atomistic structure of matter and light, close to the ballistic theory, 2.5 thousand years ago. He brought the foundations of the doctrine of atoms and light from India, Babylon and Egypt, the land of the pyramids. Another ancient Greek, Plato, who also visited Egypt, represented five primary elements (atoms) - invisible to the eye particles of water, fire, earth, air and ether in the form of figured pyramids [63], regular polyhedrons - Platonic solids. He even derived the formula for water H_2O from this model [144]. According to the ancient ideas set forth by Plato in his dialogue "Timaeus", a particle of water has the form of an icosahedron - a regular polyhedron composed of 20 equilateral triangles. In "Timaeus" it is shown that a particle of water can be obtained by combining two particles of air (hydrogen H) - 2 octahedra, each of 8 triangles, and one particle of fire (oxygen O - an invariable companion of combustion) - a tetrahedron of 4 triangles : $2 \times 8 + 4 = 20$ (Fig. 190). And water, according to Plato, can be decomposed again into hydrogen and oxygen (say, by electrolysis).

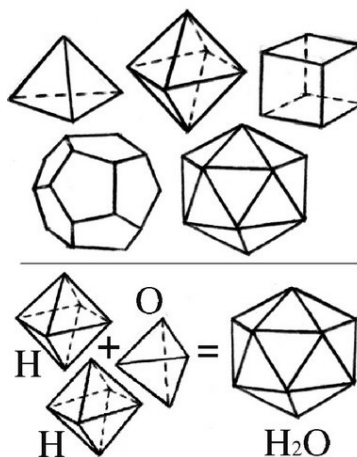


Fig. 190. Five Platonic solids-elements and the formation of a particle of water according to Plato.

Insight-guess or natural discovery? Perhaps, the ideas of the ancients about the microcosm are not just mysticism, but only distorted and half-forgotten knowledge of ancient civilizations? It is no coincidence that Plato, talking about the shape of atoms, mentions the death in a global catastrophe of the legendary highly developed civilization of Atlantis and its ancient knowledge, partially set forth in Timaeus. In any case, these ideas contain grains of truth. It is not for nothing that Kepler, who discovered the correct atomic structure of crystals, attached great importance to regular polyhedrons in space and microcosm [63]. And modern scientists are increasingly turning to the crystalline, geometrically correct model of the nucleus and the atom, realizing that it is impossible to describe the microcosm on the basis of quantum-mechanical ideas. Indeed, as

seen (Part 3), according to the BTR, the atom must have a multifaceted, crystalline form that explains many of its chemical and nuclear properties.

Speaking about mysticism, it is worth noting that, in the light of the above, many mystical teachings appear in a completely different form, giving the impression of forgotten ancient knowledge, the meaning of which was lost and transformed into the attributes of a cult, into mystical concepts. Suffice it to recall the ideas of Plato, Pythagoras and the pyramid. The pyramids were not just cult, ritual structures, but were temples, models of the world, depicting its basis [48]. And the universe is based on atoms - this is its foundation, without which the world would have collapsed. So the pyramid is, perhaps, a model of the atom, which the ancients sought to perpetuate and convey to posterity. And they were able to do this, because the pyramids are the most ancient and majestic of the surviving structures, immediately attracting attention. Scientists are still debating how these megalithic structures were created, which are problematic even for modern technology. And many of America's pyramids are generally built of stone blocks that could be mined only hundreds of kilometers from the place where they were stacked. But after all, the Indians did not even know the wheel, and therefore a hypothesis often sounds about the use of anti-gravity technology for the construction of pyramids (therefore, wheels were not invented - there was no need for them). The use of antigravity to move huge stone megaliths is also told in the legend about the construction of Stonehenge. And this is quite likely if the ancients knew the deep structure of the atom (§ 5.7).

The pyramid is, moreover, a symbol of fire, explosion: remember the word "pyrotechnics", which has the same root. It is not for nothing that Plato, following the example of the fire-worshippers of the East, considered the particles of fire to be pyramids (Fig. 190). Did the ancients really know not only about atoms, but also about the powerful explosive force lurking in their depths - about atomic, nuclear energy? Evidence for this is found in the Bible, and especially in the ancient Indian epic, Mahabharata, which describes amazing types of weapons. Is everything new in this area really well forgotten old? And even in the Russian expression "between two fires" and the biconical top diabolo (which translated from Latin means "between two burning or throwing") [148], it is possible that knowledge about the bipyramidal structure of the atom and the ballistic model of the interaction of charges through crossfire (Fig. 7). The very word "devil" in the previous, pagan beliefs did not have a negative connotation and acquired it only with the advent of Christianity, which sought to demonize the pagan gods, including this god of fertility and life-giving power. The dark religion and the sacred fire of our ancestors attached a negative meaning, placing it in hell. In the same way, Lucifer (translated from Lat. "Luminiferous") - the light god of the dawn, the morning star (Venus) was demonized in the Old Testament. In the new religion, in contrast to the pagan religion, all power is given to the chthonic, dark, dead, underground deities. The same lifeless, dark cult penetrated into science.

There are many similarities between the pyramids and the proposed model of the atom. First, the pyramids are also made of blocks and have a stepped

structure. If in the Egyptian pyramids it is weakly expressed (more clearly in the ancient versions, like in the pyramid of Djoser), then in the American pyramids of Peru it is very clear. And the number of steps, levels, as in an atom, is often equal to seven. At the top of the pyramid there is an altar with a ritual fire - this is the heart of the pyramid, a concentrator of energy, just as the atom at the top of the pyramid has an atomic nucleus - a concentrator of energy and mass. This structure is reflected in modern religious buildings in the form of the Eternal Flame (for example, on Red Square), burning at the top, in the center of the pyramidal-stepped star-altars. Many were surprised how two independent cultures - the peoples of Egypt and America - could have the same religious buildings. And it is often assumed that the connecting link, or rather the source of this knowledge, was just Plato's Atlantis, which plunged into the abyss of the Atlantic Ocean during the cataclysm.

Ziggurats have a similar pyramidal, stepped structure, which include the legendary Tower of Babel, which included seven levels of different colors. According to legend, the Hanging Gardens of Babylon, which were also located in Babylon and contained seven levels of terraces, had the same structure. Perhaps the very name of the building reflects its structure (distinguishing five of the seven wonders of the world), and not just the name of the queen: SEMIRAMIS - SEVEN-level pyramid, later called the Tower of Babel? Ancient Greek, Roman and Etruscan temples were also erected on a pyramidal-stepped pedestal and were decorated with rows of columns, the pyramidal base and capital of which, directed oppositely, can also reflect the structure of atoms and their ordered arrangement, it is not for nothing that the columns symbolize the axis, the basis of the world. Chinese pagodas also have a tiered pyramidal roof structure. Likewise, Russian towers, temples (say, the Cathedral of St. Basil the Blessed), erected in the traditions of folk architecture, have a pyramidal-tower, tiered structure. Yes, and Russian fortresses, the Kremlin-Detinets, their towers, and even military vehicles arranged by analogy - tanks and armored personnel carriers - have just such a tetrahedral, pyramidal, multi-tiered, ledge shape. All such buildings reflect the ideas of the ancients about the structure of the world, which, according to the most common version, had 7 floors-levels (hence the expression "to be in the seventh heaven"), inhabited by the corresponding creatures [18, 48]. Such a floor-by-floor settlement of seven levels of the universe is reflected in the Russian folk tale "Teremok". Isn't this model of the world just a stylized model of the atom, which also has 7 levels, layer by layer populated by electrons, hence the 7 periods of the periodic table? After all, the pyramid itself is a symbol of a hierarchy - a multi-level device. Speaking of the seven-level pyramids, it is worth, along with Plato, again to recall Democritus, who also learned a lot from the Egyptian geometers and priests. It turns out that Democritus, who invented atoms (which means "indivisible"), did not consider them to be the most elementary particles, but represented them as composed of even more elementary point particles of the same type, amer (dimensionless units), which correspond to units of matter - electrons and positrons [31]. The same was said in his letter to Herodotus and the follower of Democritus, Epicurus [77, p. 299]. All atoms in Democritus are composed of amers, like a

crystalline atom in a BTR - of positrons and electrons (§ 3.9). That is why, according to Democritus, atoms have different shapes and sizes - it's all about the different number and location of Amer. Moreover, he assumed the number of amer structures in the atom to be equal to seven, which corresponds to seven electron shell-layers. Where did Democritus, Plato, Epicurus and the ancient priests get all these ideas about the atom?

In addition to buildings, hills, mountains, age-old trees (particular incarnations of the Cosmic Mountain, the World Tree, - a paradise or miracle tree) were often revered as a model of the universe [48]. They all had one thing in common: it was a model of the foundation of the world, which had characteristic features - a pyramidal shape and multilevel structure (terraces on the mountains, steps on pyramids, tiers of branches on trees with their fruits). For example, the legendary space mountain Meru had, according to legend, a pyramidal tetrahedral shape [48]. At the same time, in many teachings, a pyramid, a mountain or a tree were supplemented with the same, but looking downward, like stalactites grow from the ceiling in caves towards stalagmites, and exactly like two pyramids directed towards each other in the bipyramidal model of the atom. Interestingly, among the ancient Slavs, the world space tree, which served as a symbol of life, was depicted by the letter "Zh" ("You live") - this is, in fact, a side view of a bipyramid (Fig. 191). It remains to be wondered if all these mythical images had anything to do with the structure of the atom. But it is already interesting that in the ancient Egyptian doctrine the world mountain was called Atum, which even sounds similar to the word "atom" introduced by Democritus [48]. Likewise, the world tetrahedral Mount Meru of the Indians is consonant with the "amers" of Democritus.

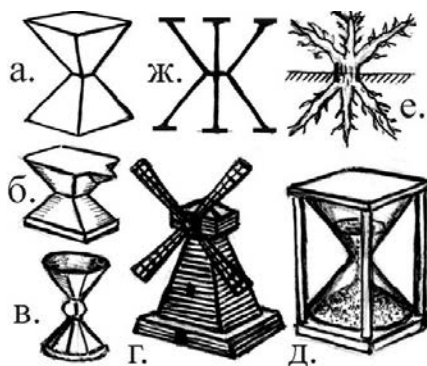


Fig. 191. a) bipyramid; b) anvil; c) a goblet or chalice; d) mill; e) hourglass; f) the cosmic tree of life; g) the letter J.

By the way, the ancient Indians themselves, from whom Democritus learned the concept of atoms, called them similar words "anu" and "atman", meaning the eternal and unchanging beginning of things, their invisible subtle essence, which determines the properties of bodies. Atman, according to the views of the Indians, set forth in the Upanishads and Vedas, is a common basis of the world and man, making them related to each other, "atman is that which is less than the kernel of a millet grain and is larger than all the worlds" (Albedil M.F. wisdom ". M., 2003). So in the concept of "atom" for the Indians, just like for modern science, small and great were combined (since the whole world is

atoms). Therefore, it is not surprising that they had a giant world mountain as a symbol of the atom. The views of Indians and Tibetans on the structure, the structure of the atom are reflected, apparently, in the most ancient symbol - the mandala, one of the variations of which is given on the cover of the book. Mandala, being a symbol of the universe, is analogous to the world tree, mountain, temple (K. Korolev. "Encyclopedia of symbols, signs, emblems", Moscow: Eksmo, 2003). It is no coincidence that many temples, for example the Buddhist sanctuary of Borobudur on the island of Java, are built in the form of a mandala, which has a square shape and a step-level pyramidal structure, which is clearly visible on the relief images of mandalas. The characteristic elements of mandalas-yantras are triangles-pyramids directed by their tops towards each other, forming a seven-step structure and reflecting the bipyramidal structure of the atom with its seven electronic shells. No wonder, according to the beliefs of the Indians, the mandala depicts the center, the beginning of the world, the source of its energy, which, according to scientists, is precisely the atom with its nucleus. Likewise, the pyramidal mountain Meru, which is personified by the mandala, according to legend, fed the Universe through four rivers flowing down from its four slopes (symbolizing, similarly to chaturanga, four forces-elements, § 5.2), as well as an atom and four types of particles forming it serve as a source of four types of interactions carried around the world by streams of rheons (§ 3.21). Thus, having thrown off the cover of mysticism from the ancient symbols, it is possible to discover their deep scientific content, reflecting the forgotten and encoded knowledge of the ancients about the foundations of the universe, as depicted in the aforementioned film "The Last Mimzi of the Universe". And the mandala, since ancient times revered as the key to the universe, may have served exactly the purpose that Feynman formulated in the epigraph.

It is interesting that in ancient Russia, in addition to the universal tree and the world mountain, the idea of a special structure - the Thunder Temple, or the Thunder millstone, which, according to the description, had a structure close to a bipyramidal one and was located, like Mount Meru, at the North Pole, was preserved in Ancient Russia. This shape of the temple and its placement (at the pole, the magnetic field of the Earth is most intense) reflect the ideas of our ancestors about the structure and magnetic properties of the atom. And to this day, the symbolism and form of the Thunder Temple are reflected in the mills: counter millstones, a pyramidal, four-sided ledge shape, a rotating tower, like a pyramidal tank tower. Likewise, its other name, the Thundering Mill, is related to the main element of the mill - the millstones. And in terms of function, the mill, where energy is released, the movement of the same type of grains, their splitting, corresponds to nuclear power plants, grains of matter (atoms, nuclei, electrons) and nuclear laboratories. It is not for nothing that the mills were considered places of power, but very dangerous. Even inside the mill, in the form of feed chutes and grain bins, we find this model. Bipyramidal and biconical forms can also be found in fishing and ship tackle in the form of coils and winches, as well as in modern radio technology and film and photographic equipment - in the form of sound and radio-emitting or light-absorbing

pyramidal horns, hoods and cameras. Two light-ray pyramids with a common top in the lens (or pupil) have long become the basis and symbol of projection technology, a symbol of the eye, as Leonardo da Vinci showed. In aerodynamics, biconical, bipyramidal shapes are also common, which give, for example, rocket nozzles. So the structure of the Thunder Temple may reflect, in addition to the ideas about the structure of the atom, other scientific achievements of our ancestors, including the technology of space travel.

The bipyramidal structure is also reflected in the form of an anvil (analogous to the altar). This blacksmithing analogy is perhaps even deeper. Both the anvil and the hammer have a bipyramid shape characteristic of nuclei (Fig. 192). Forges themselves were revered before as sacred places, and blacksmiths - as sorcerers, capable of controlling the metamorphoses of matter, combining and crushing substances, forging (transmuting) some objects into others. Therefore, it is possible that the symbolism of forges is a kind of relic of the former nuclear laboratories and knowledge about the structure of matter. It was in the transmutation, transformation of matter and energy that the main function of the Thunder Temple consisted. In this regard, it is appropriate to recall the Russian Shrovetide ritual-play action - "Reforging old people into young", carried out by a blacksmith. Interesting in this vein is the myth of the blacksmith Hephaestus and Prometheus (in Greece they were often identified), who brought fire to Earth, possibly atomic. No wonder one author wrote the following lines "Oh, spark of Prometheus's fire, a breakthrough to Olympus from the darkness, but, possessing it thoughtlessly, we caused an atomic explosion." Not understanding all the secrets, the meaning of atomic energy, we used it unwisely, like playful children - matches (§ 5.17).

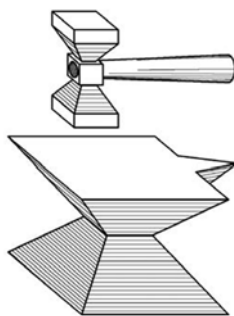


Fig. 192. Hammer and anvil - an illustration of the collision of nuclei and their bipyramidal shape.

It is worth noting that the aforementioned Nikola Tesla, being the inventor of the high-frequency transformer, tried to build and partially implemented a certain analogue of the Thunder Temple - a giant pyramidal transformer structure tied to the ionosphere and the transformation of huge energies (the so-called "Tesla tower") [110]. Tesla's continuation of these works is considered by many to be the American project - the HAARP or ARFA stations, located in the auroral, polar region and capable of strongly influencing the Earth's climate. However, in the hands of unrighteous scientists, these stations, like the Death Star battle station from the Star Wars so beloved by the Americans, are used as geoclimatic weapons (to destabilize the climate) and serve only for destruction,

not creation and stabilization (including climate of the Earth) - this primordial function of the Thunder Temple. It is not known where Tesla drew his ideas from - whether from ancient sources (he spent a lot of time in libraries, being interested in sacred knowledge) or from his visions, which he often talked about, but he definitely knew about the structure of the world a lot of what he knew ancient. Some researchers deny the enormous potential of Tesla's tower station, since it is unclear where he could draw giant energy from. However, Tesla invented, among other things, devices for capturing the energy of cosmic rays (§ 5.10), the flow of which is most intense precisely in the auroral region surrounding the North Pole, where, according to legend, the Thunder Temple was located, Mount Meru [18], and now station "HAARP", and where by maximizing the density of geomagnetic lines of force and the flux of cosmic particles, a global impact on the Earth's climate is realized. The very name "Thunder Temple" speaks of its connection with electrical discharges, with the processes of ionization of the atmosphere, as well as at Tesla towers and HAARP stations.

But let us return to the bipyramidal model of the atom and its reflections in household and cult objects. The most distinctly bipyramidal, biconical shape can be traced in the form of a goblet, a glass, and especially a chalice-chalice, which the Holy Grail supposedly had (Fig. 191). Finally, and in the form of an hourglass, which have long served as a symbol of the universe and the world order, eternal transformation, overflow of one into another, exchange of two vessels of sand, like electrons with rheons, the bipyramidal model of the atom and the ballistic model of the interaction of charges are well traced. It seems as if the ancients really had knowledge about the structure of the atoms underlying the universe and the electrons that form them. Only over the centuries this knowledge was forgotten, lost its original meaning, and their surviving traces acquired cult, mystical forms. Crystals have always been revered in the same way, praised their correct form, associating it with the possibility of releasing high energies, albeit in the form of magic. However, magic was understood as a very wide range of phenomena, including the most common physical processes, including magnetism - hence the word "magic" itself. Likewise, the ancient alchemists, not understanding the meaning of chemical transformations, gave them a mystical meaning, and astrologers were engaged in astronomy.

Today's scientists have a lot in common with the ancient priests. Both those and others possessed hidden knowledge about the world and by all means protected this knowledge from the uninitiated. Scientists, priests alone wanted to have information, since knowledge is power, power, as Bacon said. And therefore, until now, scientists zealously protect science from "amateurs", believing that here is the lot of only a select few who have gone through all the stages of training and have mastered the apparatus of the current absurd quantorelativistic physics. They are especially afraid of those who bring this knowledge to the masses, especially if this knowledge is alternative, not corresponding to the one that they forcibly instill. For them, this is the most terrible thing, since it undermines the foundations of their power over minds (and, therefore, over many other things) and prosperous existence. As a result,

with respect to the products of intellectual labor, the same situation develops as with respect to the products of physical labor: honest researchers obtain knowledge and bring it to people, and traders and priests from science appropriate it for themselves, limiting its use in various ways to please their interests.

An interesting situation arises: science and mysticism have changed places. Now science, which according to modern concepts is supposed to be rational, has acquired the form of religion, filled with the absurdities of the theory of relativity, quantum fog, mystical delirium. And on the contrary, in the mystical ideas of the ancients, rational grains, quite sound scientific ideas, are found, if one reveals the outer, superficial layers. The little that has come down to us from the ancient concepts of the foundations of the world makes more sense than in the mountains of literature on quantorelativistic physics. Therefore, it is worth paying more attention to this long-forgotten knowledge, for in them, perhaps, the key to understanding the structure of the atom and the world-distribution is hidden. It is no coincidence that the Third Reich was so interested in the occult secrets of ancient civilizations, which sought to achieve a synthesis of science and magic. And the American special services, in turn, were interested in German developments, which sent a lot of data, devices and scientists related to the atomic problem and other topics to the United States. This informational looting was carried out by the American group "Alsos", which included S. Goudsmit, as a "physicist" known for plundering other people's ideas (§ 3.19), and as an "Egyptologist" - for plundering Egyptian tombs [156].

But the secrets of ancient civilizations were never fully revealed. As soon as people come close to a certain understanding, eating the fruits from the tree of knowledge, something begins to limit them. Let us recall the legends about the expulsion from paradise, about the tower of Babel, about the death of the same Atlantis. And only amazing traces-messages, let's say in the form of the same pyramids, from ancient civilizations remain to us a reminder of their former power and the key to it. Let us also recall the persecution of Democritus, Bruno, Ritz, the concealment or destruction of their works.

Note that there is nothing anti-scientific or sensational in such a hypothesis about the existence of ancient, pre-Egyptian civilizations, which possessed super-deep knowledge of the structure of the world. Many scientists, including serious and authoritative nuclear physicists, say F. Soddy, admit, on the basis of historical data and archaeological finds, the reality of such ancient highly developed civilizations, once dead or degraded. So now we, perhaps, are only repeating the path of development they have traveled long ago and are still far from its completion [139]. What was this ancient civilization? Historical, linguistic and ethnographic evidence and legends, as well as many material traces found in the Urals and in India, allow researchers to assume that this was the legendary Hyperborea (see Demin V.N. In Search of the Cradle of Civilizations. M. Veche, 2004). It was a giant power located mainly on the territory of modern Russia and, moreover, stretching far south (up to central Africa) and north, including the entire polar region around the North Pole,

where the sanctuary of the ancient Rus and Hyperboreans was located - the Thunder Temple. It is our ancestors, ancient Rus, that the majority of researchers of the Hyperboreans consider. And traces of this ancient civilization can still be traced in Russian culture, rituals, everyday life, symbolism, folklore and the ancient Russian language [166], as well as in the tales and traditions of the Slavic peoples and countries that were formerly part of the Old Russian State. It turns out that the antiquity of different peoples and cultures that really have a single origin is determined not so much by material traces (which can be destroyed, hidden, attributed to others) and written history (often fake), but by the degree to which the people were able to preserve the spirit, culture, language and knowledge of ancestors, their originality and originality.

Concluding the story about the ancient faith, cults and sacred knowledge, we note that materialism does not reject the soul, spirit, ideas, but simply explains them as particular manifestations of matter, which is primary. Also, for example, electricity, magnetism, for which mystical explanations were previously offered, the materialistic theory of Ritz reduces to natural, mechanical reasons. In other words, materialism fully admits the existence of various "supernatural" phenomena, up to the existence of the soul and God, but offers them natural explanations, explaining them as consequences of the physical laws of nature (§ 5.16). It was in such a synthesis, the harmony of the material and spiritual, physical world and the world of ideas-symbols, that ancient cults and science coexisted before. And mysticism, irrationalism arose only when the material world, the laws of nature were rejected as a primary element, giving primacy to the world of abstract concepts and energies, when they mixed, inverted the functions of these two worlds. So, physical phenomena, instead of simplifying them, making them roughly material, mechanistic, began, on the contrary, to complicate, explaining with the help of transcendental, irrational essences, energies (such as an electromagnetic field) - hence the direction of energetism and all non-classical physics - theory relativity and quantum mechanics (§ 5.14).

At the same time, the spiritual world, the world of the human psyche, ideas, on the contrary, began to impoverish, coarse, simplify, reduce to the level of mechanical animal instincts, say, in Freud's psychoanalysis. While in reality the intellect, soul, mind are, as you know, the highest forms of development of matter, a large number of connections of which gives a completely new quality, which cannot be described with the standards of matter alone. It is not for nothing that for highly moral, spiritually developed people, base material values mean little in comparison with intellectual and spiritual ones: a dream, honor, high ideals. For the same reason, the opinion is erroneous that power over the physical world, the world of things, gives power over the spiritual world of a person, over truth, thoughts, ideas. It is not matter itself that turns out to be decisive, but its form, structure, connections, that is, information, spirit, intellect, thinking - as the highest level of organization of matter. Matter is a lower, simple form, and preferring it to spiritual values is like preferring clay to bricks and bricks to a finished house. Only the control of the spiritual over the material ensures the harmony of the world, as the ancient Indian materialists

discovered, who well understood that this does not at all contradict the primacy of the mother, as the physical basis of the world. It is this harmonious view of things, developed by Democritus, that dialectical materialism establishes. One of the advantages of Ritz's theory is that it restores the original order, eliminates confusion, inversion of the worlds. On the one hand, the BTR explains simply and clearly the physical, material world, clearing physics from non-materialistic concepts and transcendental entities. On the other hand, it enriches the world of ideas, reveals the meaning of ancient spiritual knowledge, religious buildings, etc., which have a completely scientific materialistic basis. Ballistic theory restores balance, harmony and subordination of the material physical-mechanical world and the spiritual world of the ideas of our ancestors.

As you can see, the ancients were probably wiser than us and had deep knowledge of the structure of the universe. But the death of archaic knowledge in global catastrophes, the purposeful destruction and concealment of the sources of discoveries by the dominant scientific schools, carried out to this day, leads to oblivion of these storehouses of wisdom and the degradation of mankind. Fortunately for us, in addition to short-lived written sources of information and material traces of culture, there are much more reliable ways of transmitting ancient knowledge. We will talk about them in the next section.

§ 5.4. BTR in fairy tales and fiction

A fairy tale is a lie, but there is a hint in it - a lesson for good fellows.
Russian folk wisdom

The book examined many mysteries of space and microcosm, which seemed supernatural even within the framework of modern science. However, as the history of science shows, the phenomena seem incredible and mystical only due to the incompleteness of our knowledge about them, and in reality, they have a simple natural explanation, which you just need to be able to find. Indeed, if the cognition of the cosmos is hindered by large scales, then the understanding of the microcosm is extremely small. And the mystery, temporary incomprehensibility gives rise to mystical, supernatural explanations. As a result, due to the lack of clear visual representations, the current physics of the nucleus and elementary particles, as well as the physics of space, no longer resembles a science, but a fairy tale with its magical transformations, disappearances and appearances of objects (the universe, stars, particles). This is reflected in the "scientific" terminology: "dark matter and energy", "magical", "charm", "weirdness", "magic numbers", absurd "quarks" from a delusional dream, and similar mysticism that always arises there, where scientific concepts, being inadequate to nature, cannot rationalize its phenomena [165]. The universe here arises from emptiness, energy magically disappears, turning into mass, and mass disappears, turning into energy. Scientists accepted such absurd theories not from a good life, but from impotence, believing that materialistic, classical science would not be able to explain a number of phenomena. But, as it was shown in the four previous parts, it is the classics that brings clarity to the "miracles" of Nature, explaining all the mysteries of the microworld and space.

On the other hand, fairy tales, as well as science fiction (this modern substitute for fairy tales and myths), contain many interesting, rational ideas that resonate with those presented in this book. Suffice it to recall an electron (or positron), similar to a self-shaking purse from Russian fairy tales, which, shaking, scatters rheon coins without decreasing in size (Fig. 9). Or you can recall the comparison of the electron with the bottomless barrel of Danaids from ancient Greek myths (§ 3.11). Moreover, both the self-shaking purse and the Danaid barrel come from the underground, lower floor of the universe - from the microworld, the world of eternal decay of particles. That is why in a number of folk and author's tales [16, 48] there are floors, stages of the universe - the lower, middle and upper world (micro-, macro- and megaworld, Cosmos in the terminology of scientists), which are visited and mastered by fairytale heroes. Similarly, in the fairy tale "Teremok" there is a settlement by animals of different weight categories of seven levels of the pyramidal universe - similar to the gradual filling of seven levels of the atom with ever larger sets of electrons (§ 5.3). This seven-level scheme is also reflected in other cumulative fairy tales: "The Turnip", "The Winter House of Animals", "Kolobok", as well as in fabulous beginnings and folk expressions: "behind seven locks (or seals)", as if locking electrons in the levels.

Finally, the same crystal seven-level structure of the atom is reflected in the tales of Koschey the Immortal, whose death is hidden on the island, under an oak tree, in a crystal chest, where, like nesting dolls, a hare, a duck, an egg containing a needle are located in layers - the death of Koscheev ... The magnetic needle, which has been used since ancient times as a compass needle, symbolizes the magnetic rod structure of the atom, its nucleus, which controls the movement of electrons and radioactive properties, the power and destructiveness of which, apparently, are reflected in the fairy tale. The very same crystal chest hangs under an oak tree on four golden chains, located like the edges of a pyramid (with the base of the chest) and apparently symbolizing the chains of electrons and positrons from the atomic skeleton-pyramid (Fig. 95, Fig. 108). And by the island and the oak, as many authors believe, they mean again the legendary island at the North Pole (which also reflects the connection with magnetism), where, according to legend, Mount Meru or the World Sacred Tree is located - other symbols of the atom. The same island, oak, or spruce, appears in Pushkin's "The Tale of Tsar Saltan" (written based on folk tales), where we also find a symbolic description of the splitting of atoms, their crystal core, surrounded by a shell of electrons (associated in ancient times with gold, amber, resin, § 1.7, § 2.7): "And the nuts are not simple, all the shells are golden, the kernels are pure emerald."

Similar analogies can be found in science fiction. For example, the idea of the possibility of influencing the decay rate of particles and nuclei using radiation from space (§ 3.14) is reflected in the story of B. Shaw "Journey to the Epicenter". And in the famous fantastic adventure-adventure films "Total Recall", "The Fifth Element", "Hudson Hawk", "The Mummy", "Librarian", "Spy Children" contains a hypothesis about the connection between the pyramids and the structure of the atom, about what is in crystals, the pyramids

contain a powerful source of energy and a way to transmute elements. In addition, the "Fifth Element" reflects the symbolism of the Thunder Temple - the temple of the four primary elements: fire, water, air and earth, grouped around the fifth informational and transforming element. This corresponds to the arrangement of 4 types of elementary particles (electrons, positrons, protons and neutrons) around the information structuring element of the atom - the atomic core, the nucleus in the form of a pyramid (§ 3.2). **The similarity of the pictures independently drawn by science fiction writers, filmmakers and artists proves that their fantasies are not just fiction, but an idea that has a real common basis**, intuitively, from subtle traces and fragments, guessed by these talented creators and visionaries.

The symbolism of the Thunder Temple - the sanctuary of the ancient Rus, Hyperboreans, who possessed knowledge of the structure of the world - is even more fully reflected in the old film "Sinbad and the Eye of the Tiger". This temple, called in the film "the sanctuary of the four elements", has a four-sided ledged pyramidal shape with a gold hub-top and is located in an oasis at the North Pole, like the legendary Mount Meru from Indian legends. Moreover, the temple according to the film serves not only cult and sacred, but - more practical, scientific purposes, being a climate stabilizer, energy generator and converter of matter, which is not surprising if the ancients knew about the structure of the atom, reflected in the shape of the temple. The idea of a reserved oasis in the middle of the desert, with a pyramidal, multi-tiered mountain in the center (at the base of the world), is also found in the film "Mummy II", in the story of V. Bryusov "Mountain of the Stars", as well as in the cycle of fairy tales by L.F. Bauma about Oz. No wonder this country was divided into parts of four colors, according to the number of elements, cardinal points and sides of the pyramid, with a crystal temple (Emerald City) in the center [16]. The idea of the key role and sacredness of the North Pole (a place of pilgrimage, to which, under the influence of ancestral memory, both people and animals aspire), where an oasis with a powerful energy-releasing mountain was previously located, is also reflected in the novels of Jules Verne ("The Journey of Captain Hatteras"), V. Obruchev ("Sannikov Land", "Plutonium"), A. Tolstoy ("Aelita"), A. Belyaev.

Once this topic of global polar power plants was very popular and actively developed, including N. Tesla (§ 5.3, § 5.8), but from the middle of the XX century. began to be gradually forgotten with the coming to power of non-classical physics, the irreversible loss and deliberate concealment of ancient knowledge during the revolutions, world wars, especially strongly affecting Russia. However, rudimentary traces of this knowledge were present at the end of the Second World War: when on May 7, 1945, in honor of the successes of domestic radio engineering and the discovery of A.S. Popov, Radio Day was established along with the award "Honorary Radio Operator of the USSR", then on the badge of this award there was a giant multi-tiered pyramidal radio-emitting tower station at the North Pole of the Earth, corresponding to the description of Mount Meru, the Thunder Temple and Tesla's emitter tower. The pilgrimage to the sacred energy-releasing Mountain located in the center (pole)

of the Earth is reflected in many ancient myths, fairy tales, works of classics and science fiction writers. Moreover, a volcano often acted as such a mountain, which, during the eruption, had a bipyramidal appearance from a column of fire and smoke spreading upwards. It is not for nothing that volcanoes, for example Fujiyama among the Japanese, were especially revered as sacred mountains and it was to them that the heroes Obruchev, Jules Verne, Dante [48] rushed, crossing several tiers, respectively inhabited (as atomic levels).

Revealed in science fiction films and the deep meaning of chess, games with chips, which, as seen, reflect the movement of electrons through the cells of the atomic grid. For example, in the fairy-tale film "Jumanji" a game is shown, in many ways reminiscent of the ancient Indian chaturanga (§ 5.2), where four types of figures are discretely displaced along the cells, around the central element (nucleus), in accordance with the number of points dropped on the bones. On the one hand, this element of randomness, introduced by throwing the dice, reflects the magical, divinatory nature of ancient chess, chaturanga, and on the other, already as a model of the atom, reflects the random nature of the movement of an electron and its stay in a given node, a cell of an atom. Recall that the intensity of a given spectral line of an atom and its valence, chemical and nuclear properties directly depend on the stability of the corresponding position of an electron, positron, proton or neutron, that is, on the probability of their being in the corresponding square of the atom (§ 3.4). The connection between chaturanga and magnetism, the magnetic model of the atom, is also reflected in the film "Jumanji".

All this might seem like a fiction: you never know who invents something in fantastic works and films - can these coincidences have a scientific basis and illustrate the real structure of the world. However, the number and accuracy of such coincidences, their repetition in a variety of works and legends throughout the history of mankind indicate that they are not accidental, but natural and have a real basis. No wonder that many of the predictions of science fiction writers have come true. The thing is that **nature is arranged simply, and therefore storytellers, science fiction writers, these artists of the pen, having a subtle sense of reality, often understand the phenomena of nature deeper than scientists**. So an attentive reader can find ready-made recipes for inventions and even be able to implement them.

So, we see that the inversion of the worlds took place here too: science has changed places with a fairy tale. If all modern science based on SRT and quantum mech looks more and more like an invention, a senseless speculative fantasy, then ancient fairy tales, on the contrary, appear as carriers of hidden and forgotten knowledge about the structure of the world, space and microcosm. No wonder they say "A fairy tale is a lie, but there is a hint in it - a lesson for good fellows." Usually this phrase, given here as an epigraph, is taken too literally. They say that fairy tales, although fictional, contain morality. But in reality, it is the essential component of the fairy tale, its parallel plots, archetypal motives, unusual creatures and objects, ritualized formulas that are the hint, the key that the fairy tale must first of all convey. It was in this way that ancient knowledge and rules of life were allegorically laid in a fairy tale.

Folk tales convey the ancient idea of the multi-storey, multilevel nature of the universe, teach the universal interconnection of phenomena, reflecting the unified structure of the universe (§ 5.16). Russian folk tales are unmatched in terms of the number of plots, their archaism and preservation. They should be recognized as very ancient and close to the original. Therefore, fairy tales serve as a great storehouse of knowledge, the concentration of the wisdom of our ancestors. It is possible that just because of the spiritual closeness, continuity, the transfer of ancient knowledge and the style of thinking of ancestors to descendants in the form of fairy tales and folklore, it is among the Russian, Slavic scientists that there are so many outstanding inventors and discoverers of the deep laws of nature: N. Copernicus, M. Lomonosov, G. Mendel, D. Mendeleev, A. Michelson, N. Tesla, K. Tsiolkovsky, M. Curie, A. Belopolsky and a number of other names mentioned and not mentioned in this book.

One of the features of Russian folk tales is their kindness, luminosity, the struggle for the sun, light, fire, as well as the hero's selfless desire to free energy generators from the clutches of dragons (magic crystals, millstones, a wonderful mill, a pot), so that, having brought them from heaven, make the property of all people and disperse the darkness, obscurantism. Similar motives can be traced in ancient Indian legends, and in the ancient Greek myth about Prometheus (the heavenly fire similar to people), and in the Finno-Karelian epic "Kalevala", and in the well-known fairy tale "The Stolen Sun" by K. Chukovsky, which has deep roots and was compiled from Old Russian subjects. It was the sun, light, fire that were the main symbol and object of worship of our ancestors - the Rus, the Slavs, whose name, according to one of the versions, just comes from the words sun, light, bright (hence "fair-haired"). It is no coincidence, first of all, that Russian names are associated with the discoveries of the nature of light and devices for its use and release - solar batteries and light-emitting devices. Here are the most famous among the Russian Prometheans: Kulibin (powerful searchlights), Petrov (opening an electric arc), Yablochkov (the first electric arc lamp), Lodygin (the first incandescent lamp with a carbon and tungsten filament), Ulyanin (the first semiconductor photocell - a solar battery), Vavilov (theory and creation of the first gas-light, fluorescent lamps), Losev (discovery of electroluminescence of semiconductors - the first LEDs), Fabrikant-Basov-Prokhorov (invention of the first lasers), Prokhorov (invention of the first semiconductor lasers and light-emitting diodes), Alferov (light-emitting diodes and lasers on heterostructure semiconductors). Thus, it is to the Russian people that mankind owes the invention of all conceivable light sources from the first incandescent lamps to LEDs and lasers, the reason for which, perhaps, is the cult of reverence for light, instilled from childhood by Russian fairy tales. Likewise, in understanding the laws of optics, the nature of light, the merit of the Slavs, Russian people is great: Lomonosov (who discovered the electric wave nature of light), Mendeleev and Tsiolkovsky (who created the kinetic theory of light), Stoletov (who studied and explained the photoeffect), Lebedev (who discovered the pressure of light, and hence, the materiality of its carriers), Belopolsky (who revealed the rhythm effect of reddening and dispersion of light in space), Duplishchev (who experimentally proved the validity of the ballistic

principle for light). And to this day, Russian science is adequately represented, discovering and carrying into the world the secrets of the world, such people as V.I. Sekerin, S.P. Maslikov, M.G. Ivanov. Likewise, the desire of our people for the sun, the stars, clearly manifested in the works of Tsiolkovsky, Tsander, Korolev, Keldysh, who paved the way into space, can in many ways be inspired by folk tales read in childhood.

It is very possible that it is the depth of ideas and knowledge inherent in fairy tales, consistent with the subconscious understanding of the nature of things by man, that determines the vitality of the genre of the tale and its plots. And the perspicacity and archetypal nature of the motives of sci-fi works determine their popularity and whether they will become a one-day bestseller, or will go down in history and will enjoy the attention of many generations of readers and viewers. We accept well precisely those works that touch the deep strings of the soul, being in tune with both it and the mind, that is, those in which a deep meaning, truth, reality is felt, distinguishing a real fairy tale, fantasy from an empty and absurd invention. And therefore, an empty work that does not contain deep ideas, if at first has a resounding success, is quickly forgotten. A real fairy tale, fantasy allows you to capture the imagination thanks to its realism, despite all the fantastic. It seems that it is in this realism, predictive power that the main reason for the success of the works of L.F. Baum, Jules Verne, A. Belyaev, who recreated the worlds of the past and the future with the power of imagination. Therefore, they fell in love with their fantasies, because they correspond to the reality that once existed, either they have already come true, or they will come true.

So, the meaning of a real fairy tale and fantasy is to allegorically, under the guise of fiction, convey real knowledge about the structure of the world, about its past or future state, albeit with the use of fantastic, fairy-tale elements. Therefore, a true (corresponding to his vocation) storyteller, fantast is the same scientist. He learns the world in the same way, carefully observing, making generalizations, discoveries, inventions, the ideas of which he expresses in his works. M. Gorky spoke about this, who saw in a fairy tale a prototype of scientific hypotheses.

Note that a fairy tale, passed down from generation to generation orally, reproduces the texts much more accurately than the written tradition. It is no coincidence that the ancient Greeks and Indians relied more on memorized texts than on notes [18]. After all, any written sources, material evidence can be easily forged, hidden, destroyed, falsified, which was carried out on a large scale throughout the existence of writing. Almost the entire chronicle history of Ancient Rus was destroyed by the zealots of the new "history". As a result, since the time of Peter I, non-Russian academicians who had been registered at the RAS for a long time invented a completely artificial inadequate history of Russia. Against this forged story, M.V. Lomonosov, who wrote a work about the real past of Russia, was also later hidden.

However, in order to destroy the information contained in the fairy tale, transmitted word for word from generation to generation, it would be necessary to destroy an entire nation. The tale was not an empty amusement, not a

primitive morality or an abstract parable, but a bearer of coded ancient information about the structure of the world, about the essence of things, about prehistory. We are talking here, first of all, about Russian folk tales, which represent the widest canvas of plots that have a deep root and meaning. If you skillfully decipher the information inherent in the language, rituals, graphic symbols, folklore (fairy tales, conspiracies, songs, lullabies, proverbs, counting rhymes, jokes, etc.), you can largely restore the ancient fundamental knowledge of our ancestors. A kind of "coding" of information in fairy tales arises not so much because they reveal the truth, sacred knowledge only to a select few ("good fellows"), but more because not everything can be conveyed by the language of a fairy tale, or because it has become less understandable. For some miracles, there are simply no suitable words and descriptions, as they say "neither in a fairy tale, nor describe with a pen." That is why in fairy tales, a figurative, symbolic description is usually used, with the help of metaphors, comparisons (invisible hat, self-assembled tablecloth, a hut on chicken legs, stupa), which carry a hidden important meaning, which has yet to be understood. Having mastered this ancient knowledge about the structure of the world, we will one day make reality more amazing than any fantasy, as Jules Verne dreamed about it.

§ 5.5. Lucretius "On the Nature of Things" and the Phenomenon of Democritus

The entire history of science at every step shows that individuals were more correct in their statements than entire corporations of scientists or hundreds and thousands of researchers adhering to the mainstream views.

V. I. Vernadsky

In this book, the bold guesses of Democritus and quotations from the poem "On the Nature of Things" by Titus Lucretius Carus, who popularly expounded the atomistic teachings of Leucippus, Democritus and Epicurus, were used as an example. The work of Lucretius is rightfully considered the first popular science book, moreover, a deeply scientific book, with its wisdom surpassing not only the "scientific and philosophical" treatises of such scholars of antiquity as Aristotle and the scholastics of the Middle Ages, but in many respects also modern science. This scientific advance proves that the truth is simple and easy to comprehend, and all complex vague, mathematically confusing abstract concepts are erroneous (§ 5.15). It was not for nothing that Rutherford, who rejected the theory of relativity, said that the scientist who cannot explain the essence of his work to a five-year-old boy from the street, a simple cleaning lady from a laboratory, should be driven into three necks. And the modern theory of relativity and quantum mechanics are just such that, according to this rule, all their adherents, starting from the top, must be dismissed.

It should be remembered that Lucretius Carus is only a retelling and popularizer of the teachings of Democritus. He could perceive the Democritus concept in an already distorted form, with numerous gaps and inaccuracies. After all, the works of Democritus, as you know, were bought up and destroyed

by his opponents, primarily the followers of Aristotle. That is why not a single work of Democritus has come down to us - we know about his views only from references to him by other authors. Therefore, one can imagine how grandiose, centuries-old concept was the original Democritic theory. It was not for nothing that when Democritus read to the people on the square the fragments from his "Big Peacebuilding", everyone was so fascinated by his concept of the universe that the author not only escaped punishment for squandering the inheritance for scientific purposes, but also received an award with recognition. This proves once again that the truth is always simple, beautiful and understandable by any person, in contrast to the absurd quantorelativistic theories, the lack of understanding of which is trying to be attributed to the "limitedness of the human mind."

Even judging by the little that has come down to us from the legacy of Democritus, it seems incredible that one person would have made so many scientific discoveries ahead of the development of science by millennia. Here are just some of the ideas of Democritus ahead of their time [31, 105]:

- 1) atomistic teaching (there are only atoms and emptiness in the world);
- 2) atoms move continuously and chaotically (mechanical theory of heat);
- 3) interlocking with the help of protrusions-depressions, atoms form all known bodies;
- 4) light is a stream of tiny particles emitted by luminous bodies at great speed and forming periodic layers, films (wave fronts);
- 5) the movement of particles in space with superluminal speeds (cosmic rays);
- 6) laws of conservation (indestructibility) of energy, motion and matter;
- 7) the concept of a plurality of worlds (including inhabited ones);
- 8) the concept of infinity of space, matter, the Universe;
- 9) cosmogony of cosmic vortices (galaxies, stellar systems and their evolution);
- 10) eternal life of the Universe from constant renewal, birth and death of the worlds;
- 11) denial of spontaneous generation of organisms (nothing is born out of nothing);
- 12) survival of adapted organisms, development from protozoa (theory of evolution and natural selection);
- 13) the processes of thinking take place in the brain, and nervous sensitivity is of an electrical nature - sensations are transmitted by the atoms of the soul (electrons and ions scurrying in the air and, upon contact, creating fire, lightning);
- 14) the calculus of infinitesimal - the search for volumes of bodies using integral analysis.

In fact, the list goes on and on. But Democritus, judging by the poem of Lucretius, did not give his theory as a set of speculative, from nowhere, following hypotheses or from considerations of mathematical ideals, as was customary in his and in our time in non-classical physics. On the contrary, Democritus deduced each of his statements from experience, backing them up with numerous observations and accompanying them with graphic illustrations, parallels, analogies from life. Therefore, his ideas are strictly scientific. This, apparently, was the main reason for the amazing scientific perspicacity of Democritus. He did not try to create, like many philosophers of his time, his own model of the world - more complicated and fanciful. He did not invent his theories, did not try to fit the facts into the theory, but only tried to understand and explain the nature of phenomena, to find their origins, to get to the bottom of it. That is why, in the poem of Lucretius, several possible explanations were sometimes offered for one phenomenon, when the available data were not enough to accurately establish the cause of the phenomenon. Likewise, in this book, if sometimes we give several explanations, then they are given only as options that over time, in the light of more complete experimental data, may disappear until one, the most accurate explanation remains.

Democritus used observations, mechanical models, applied a materialistic approach, rejecting all irrational, abstract, transcendental explanations and seeking to find simple, natural ones. It was in this rational approach, continuous learning and self-study, in exhausting everyday work that the main reason for the success and futurism of his theory was. However, this breakthrough into the future was so impetuous and unusual that the theory of Democritus was treated with hostility: it was rejected and destroyed. It was too ahead of its time. Moreover, the ancient atomists were far ahead of the current state of physics when they spoke of the existence in space of elementary free-flying particles with velocities much greater than the speed of light [77] (see the epigraph to § 2.15). What is this if not an exposition of the theory of the superluminal velocity of cosmic ray particles (§ 1.21, § 5.10)? Or recall the integral calculus of infinitesimal discovered by Democritus, which made it possible to calculate the volumes of bodies [31]. This method was fiercely criticized by Aristotle, as well as other discoveries of Democritus, including his corpuscular theory of light and matter. Therefore, integral calculus was forgotten for a long time and only two thousand years later it was rediscovered by Newton, who took over a lot from Democritus and in terms of physics.

It seems incredible that one person would discover so much, and each discovery was ahead of its time, not even centuries, but millennia. How could he know all this? There is an assumption that Democritus only expounded the information already known to him, brought from the future, from another planet, or from the repositories of ancient forgotten knowledge. Let us recall what was said above about the traces of the bipyramidal model of the atom in the cults and games of the East. Democritus traveled for a long time and studied in Egypt, India, Persia, Babylon, got acquainted with the scientific achievements of Egyptian and Indian priests, magicians and Chaldeans [31, 105]. On this he spent all his substantial fortune. Here he is a clear example of a worthy and

effective investment of money! After all, there is nothing more valuable than truth, information, knowledge. And it is precisely this information that those in power want to deprive the people of first of all.

As a result, one may get the impression that Democritus only expounded, voiced the already known, but carefully hidden, knowledge of the ancients protected by the priests. And yet, I think this is not entirely true. In Lucretius's poem "On the Nature of Things", not naked knowledge is given, but the whole complex path of obtaining it with all the mistakes, wanderings, dead-end paths is shown. In essence, the method of scientific cognition, the search for truth, in which the knowledge obtained by Democritus played only the role of auxiliary guidelines is given. All this convinces of the enormous possibilities and power of the human intellect, the carriers of which, undoubtedly, were Leucippus, Democritus, Epicurus and Lucretius. This confirms the simplicity, accessibility, cognizability of the truth. As Newton noted, in order to make discoveries, you just have to constantly think about them, not indulge in empty entertainment and senseless idleness. Therefore, it is not the early discoveries of Democritus, Lucretius and other thinkers of antiquity that should surprise, but inert thinking, human stupidity, especially those who accepted the theory of relativity and quantum physics. It is stupidity, inability to think critically and independently that is a deviation from the norm.

We will only add that it is also necessary to think correctly, constructively, otherwise such freaks as the same theory of Aristotle, the theory of relativity, quantum mechanics are born. Just the correct constructive method of thinking is set forth in the poem of Lucretius. No wonder this poem was so revered by scientists who made really great discoveries - Galileo, Newton, Lomonosov, Mendeleev, Tsiolkovsky, Vavilov, who admired the work of Lucretius, and borrowed a lot from him for their discoveries (even the corpuscular theory of light and the idea that white light is a mixture of the colors of the rainbow, gleaned from there by Newton). All these scientists were distinguished by space philosophy, when one person with a single gaze covered the whole world, the entire Universe from galaxies to the smallest particles of matter - all floors of the universe on all scales of space and time. And such scientists as Einstein, Bohr, Pauli and many other figures of non-classical science, either did not know this work, or because of their limitations could not perceive it, and therefore invented a mountain of speculative absurdities, rejected by Democritus. It seems that many mistakes of modern science could have been avoided if Lucretius's poem were passed in high school along with other scientific and artistic works of ancient classics such as Giordano Bruno, Galileo. After all, it is impossible to imagine that modern scientists would start talking seriously about the finite expanding Universe and other mystical nonsense if they read in their youth Lucretius's poem with "Dialogues" by Bruno and Galileo.

In general, it is worth noting that in literature lessons at school it would be much more useful to read popular science and science fiction works than those mountains of novels, mainly describing a small historical period (XVIII-XIX centuries) of the life of the nobility and intelligentsia, isolated from the traditional Russian culture and endowed with an incomprehensible, alien to the

people way of life, psychology and aspirations. The literature of the traditional school course, for all its artistry, is largely sterile, anemic and useless, and therefore is quickly forgotten.

It would be much more useful to study fairy tales, especially Russian folk tales and the author's tales created on their basis by A. Pushkin, N. Gogol, P. Ershov, A. Tolstoy, K. Chukovsky, as well as the works of the classics of science fiction: Jules Verne, G Wells, V. Obruchev, A. Belyaeva, R. Bradbury, I. Efremov, S. Gansovsky, K. Bulychiev, whose novels and stories are not only highly artistic, but also have great educational value, reveal the characters and relationships of people, tell about joys of physical and mental labor. These works instill useful skills, provide necessary, vital practical knowledge in astronomy, geography, medicine, technology, physics. It is myths, epics, fairy tales, this ancient science fiction, and modern fantastic works that most fully reveal the human character, placing a person in unusual conditions, moving in space, in time, throwing them to other planets, to the worlds of utopias and dystopias. Against this background, all our earthly problems, aspirations and worries look petty and worthless. Science fiction teaches us to calmly perceive the unusual, the new, gives a kind of psychological hardening, immunity in our crazy, rapidly developing world of frantic speeds and stormy streams of information. It was fairy tales that at all times taught not only a simple, open, kind attitude towards people, animals, nature, but also developed imagination, ingenuity, the ability to solve riddles, scientific and life problems, find a way out of "desperate" situations, which are now complete and in science.

It is science fiction and popular science works that develop curiosity, awaken thought, make people seekers, purposeful, give a craving for new knowledge, for space exploration, teach them to bold and non-standard thinking. Therefore, the books of such popularizers of science as Ya.I. Perelman [94, 95]. That's why an important part of the literature of the future is fiction and science fiction. It is **living** literature for intellect, soul and dreams.

It is not true that science fiction is needed only for dreamers and idealists - it is necessary for all people like air. Only the striving for a dream, fantasy makes a person a person and constitutes, as the designer Yakovlev correctly noted, the meaning of his life. Without a fantastic dream, a person will forever remain just a thinking monkey, who sees the meaning of life in satisfying his base animal instincts. Unconsciously, a person builds exactly the kind of world that works of art bring up in him. If this is, albeit a difficult, dangerous, but bright world of the distant future, then we will get such a world in the end. As it is sung in "The Ballad of Struggle" by V. Vysotsky: "If you cut through the path with your father's sword, you wound up salty tears on your mustache, if in a hot battle you experienced what for how much, then you read the necessary books in childhood." And indeed, science-adventure fiction educates courageous thinkers, fighters against untruths, dreamers striving for the stars, but dreamers of a special kind - dreamers of action, making active efforts to make dreams come true, transforming the world, science and technology with a dream, in fact, building the power of imagination a new world. Such a dreamer of action was K.E. Tsiolkovsky, who opened the way for people to space. He embodied his

dreams and romantic aspirations not only in his scientific works, but also in the fantastic story he wrote. Another space explorer is also known who, in parallel, created fiction and correct scientific theories, Fred Hoyle.

Literature, folklore - fairy tales, myths, legends, epics - was just such, fantastic and at the same time popular science, setting out ideas about the world, educating, giving the necessary practical knowledge. Mainly in such a fantasy form, the fiction of the future should exist. Only in this way, allegorically, with examples, illustrations that stick into memory for a long time, can you convey to a person something really important and deep, which is not in the bulk of modern literature.

The poem "On the Nature of Things" is the first and, moreover, a wonderful scientific and artistic work that reveals the fascination, romance of scientific research and brings great knowledge and qualities to Man. The poem is also useful in terms of studying the history of science, its thorny path, an example of how correct concepts are rejected and forgotten for many millennia, and erroneous ones prevail. For the same reason, it is useful to read any other original scientific works of scientists of the past, their biographies and books on the history of science, which are of great educational value and show the development of scientific thought and scientists, their path to science, to discovery, their insights and mistakes. All this literature (fairy tales, science fiction, biographies, books on the history of science, and especially the poem of Lucretius) contains ready-made discoveries and recipes for inventions - you just need to be able to find, see and develop them. Just like fairy tales, many seemingly naive ideas of Lucretius turn out to be, upon closer examination, filled with deep meaning and find justification within the framework of the modern physical concept, especially on the basis of the BTR.

The popular exposition of the ideas of Democritus, undertaken by Lucretius, had another important significance. Since all scientific ideas were presented there in an artistic, poetic and very figurative form, they became available to a wide range of people, were easily assimilated, memorized and transmitted not only in writing, but also in oral form. And if not a single original work of Democritus has reached us (due to purposeful destruction), then the poem "On the Nature of Things" has survived to us. This proves once again that an oral, allegorical way of transmitting information is much more reliable than a written one (§ 5.4). Lucretius was fully aware of all this and therefore deliberately, as he himself writes, gave the information an artistic, poetic and easy to remember form.

It is these popular books that the apologists of the prevailing false doctrines fear most of all. That is why the church attacked Galileo so fiercely when he expounded in his Dialogues the teachings of Copernicus - not only in lively and clear Italian (instead of the dead learned Latin), but also in a popular, entertaining form. And until now, many scientists, being supporters of the dominant non-classical views, look askance at popular science literature, especially if it offers ideas that are different from generally accepted ones. So, Einstein, this modern Aristotle, - fiercely scolded the famous popularizer of astronomy K. Flammarion, who admitted superluminal speeds in space [73, p.

178]. The same Einstein criticized Galileo for his "Dialogues", the battle with the clergy and the popularization of Copernicus' teachings among the people, which he contemptuously called the "crowd" [58, p. 117]. Einstein himself got the recognition of the theory of relativity easily, without a fight and sacrifice, thanks to the support of higher forces. We know that it is to this open and courageous struggle between Galileo and Bruno, which attracted public attention, that Copernicus's theory owes its early recognition. Therefore, the great role of popular science literature, defending new revolutionary ideas, is undoubted. And the poem of Lucretius "On the Nature of Things", in spite of its prescription, remains the main and reliable bastion of classical materialistic science.

§ 5.6. Antiparticles - the key to the riddle of time and chronoporters

Likewise, there is no time in itself, but objects themselves lead to the feeling of what has happened in centuries, what is happening now and what will follow later.

And it is inevitable to admit that no one can feel Time by itself, outside the movement of bodies and rest.

Titus Lucretius Carus, "On the nature of things", 1st century. BC. [77]

As Lucretius, a follower of the atomistic doctrine of Democritus, correctly noted, the concept of "time" is inseparable from bodies, matter, mass and their motion. Above, it has already been repeatedly mentioned about the connection between mass and time, these two great mysteries of the world (§ 1.6, § 1.15, § 1.18, § 3.11). One of the amazing properties of mass was the possibility of the existence of anti-mass in antimatter - mass with a minus sign. And from the connection between mass and time, which has a completely classical and not relativistic nature, it follows that, perhaps, for a minus-mass (say, for a positron, - an electron-inverted, § 1.6) and the direction of the flow of time is opposite - time flows backward. Indeed, antiparticles are often considered the same particles, only moving backward in time, which is why all processes for them flow in the opposite direction. So they behave the other way around, as if in a movie set backwards. You can read about the assumptions of scientists in relation to anti-mass and antiparticles in the book by R. Podolny "How does the world hold on?" (M., 1978, p. 172).

Thus, it is possible that not only the nature of matter, but also the nature of antimatter will be revealed by geometry, but not spatial, but temporal [35, 54, 160]. Indeed, the positron was predicted by Dirac not as a positive electron, but as an electron with a negative mass. It is the minus mass that makes it possible to explain the annihilation and attraction of opposite charges (§ 1.6). A particle with a minus mass M under the action of a force F must move with an acceleration $a = F/M$ in the direction opposite to the motion of an ordinary particle. This gave rise to the assumption that antiparticles differ from particles in that they move backward in time (cinema-vice versa) [150, p. 207]. For example, suppose a positron emits a stream of arheons. Since each arheon, like the positron, moves back in time, the areons hitting the electron from the side of the positron are like rheons flying in the opposite direction and hitting the electron from behind. Thus, arheons will push the electron towards the positron.

Due to the symmetry of matter and antimatter, the positron will also go towards the electron under the impact of rheons.

The creator of the droplet model of the nucleus, physicist J. Wheeler, who together with R. Feynman rediscovered the Ritz exchange model of charge interaction, even assumed that numerous electrons and positrons are one and the same electron with a crumpled world line [150]. The movement of bodies is often depicted on a graph, where time is plotted along one axis, and coordinate on the other. This graph of movement is the world line of the body, the electron - its chronicle, a kind of historical film of all its events (Fig. 193.a). Each time section (vertical line) gives one point of intersection: at each moment the electron is in a given place - this is like one frame with the image of an electron in a sequence of frames on a continuous film of time. But if the line is skewed, as in the case of the graphs of the motion of stars (Fig. 81, Fig. 83 in § 2.14), its loops go behind each other, giving the graph polysemy (Fig. 193.b). Then each time section will give many points: at each moment, many identical particles are visible, as on a crumpled film strip from overlapping frames, many images of the same bouncing ball shine through at once. So, from the Ritz effect, instead of one, several identical stars were observed in the stellar orbit. Since all cross sections of the line are equivalent, then all particles have the same mass, charge, etc. This, according to Wheeler, is the reason for the identity of all electrons.

The equivalence, however, is not complete. When the secant is displaced on some branches, the intersection points move along the original direction of the curve, and on others, against the normal course of time shown by the arrow. These points of intersection, moving backward, back in time, correspond to positrons, similar to electrons, but moving backward and forward (for them, the world line of the electron, its historical film, winds backward). In the same way, when stellar images are multiplied from the skew of the radial velocity curve (§ 2.15), some of the images move against the natural course of the star in orbit - backwards and forwards, as if back in time, disappearing when merging with images moving in a natural direction (like points 1 and 2 in Fig. 81.c). Since the intersection of each loop gives an electron and a positron, the particles of both types (with forward and backward motion) will be equally divided, as it should be in the reduced model of the structure of particles and the world, containing equally electrons and positrons. It is not for nothing that Wheeler himself believed that there are equal numbers of electrons and positrons in an atom, since each electron corresponds to a positron sitting in a proton (he was looking for positrons in protons and Dirac discovered antimatter) [150].

With the approach of the secant to the edges of the loops, the points corresponding to the positron and the electron converge faster and faster, as if attracted, and disappear upon merging (annihilation). And vice versa, as soon as the secant line meets a new loop, a pair of points arises, as at the birth of electron-positron pairs (Fig. 193). So, Wheeler explained the nature of electrons and positrons, the unity of their properties, attraction and annihilation. The fact that particles move along the natural course of time, and antiparticles - against it, introduces a kind of asymmetry. That is why there are excess positrons in nuclei and electrons in atomic shells (§ 3.11).

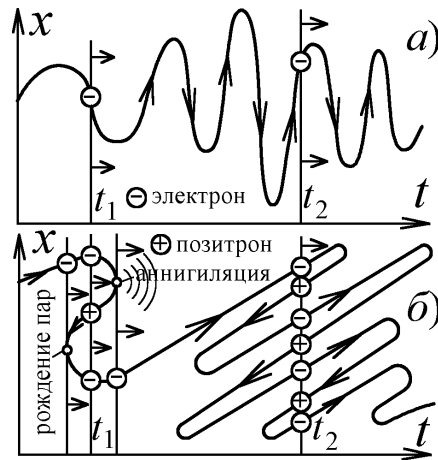


Fig. 193. The collapse of the world line of the electron gives rise to its copies, visible at the same time. Analogy with multiplying the number of images of a star from the skew of the radial-velocity curve.

However, such distortions of space and time are impossible in classical mechanics, where space and time are Euclidean, homogeneous and absolute in the sense of independence from external influences. Therefore, such ideas, as well as the theory of relativity, should still be treated with skepticism. But the very hypothesis that antiparticles are the same particles, but moving backward in time, is quite admissible and interesting in terms of using antiparticles to travel back in time, opening the way to creating a time machine, about which science fiction writers have written so much, starting with H.G. Wells. Indeed, in any body, even in the human body, there is enough antimatter - positrons, of which there are exactly half. If we could subdue them, curb them and rush back with their flow, the goal would be achieved.

Of course, Wheeler's idea is controversial, but interesting because it explains everything in terms of geometry. Even Walter Ritz believed that all physical laws should be reduced to space-time relationships, interconnections. This corresponds to the deep idea of Democritus and Lucretius that time does not exist, does not flow by itself: we know and feel its course only through observing the movements of bodies - a change in their positions in space, through the comparison of various movements, say, the movement of a runner and grains of sand in hourglass. The concept of time outside the movement of bodies is meaningless, just like the concept of energy, temperature, heat, which do not exist by themselves.

Ritz, perhaps, came closest to understanding the physics of time and travel back in time, but due to sudden death he was irretrievably lost to science. It was Ritz who was the first to ask the question of the temporal irreversibility of phenomena (arrow of time) from the standpoint of physics and had a sharp controversy with Einstein in print on this matter, because he believed that physical irreversibility was caused by the direction of electrodynamic radiation processes, radiation friction, and not just molecular friction [161]. And the French physicist L. Brillouin, known for his criticism of the theory of relativity, supported Ritz's point of view in his discussion with Einstein (see L. [Brillouin Scientific uncertainty and information. M., 1966](#)). Ritz explained the

irreversibility of the arrow of time through the direct irreversible flight of arrows of light, rheons from a radiating source that sets the direction of time. The flow of rheons from the source brings information about it always belatedly and never ahead of time. But if we take into account that the BTR gives the phenomena of electrodynamics the same statistical description as the MCT gives the phenomena of thermodynamics, then here, as in the example of Boltzmann (Section 2.7), there may be a loophole for time-reversible processes and a decrease in entropy. Indeed, due to the fact that the Universe is an infinite open system, the rheons emitted by the electron eventually return to it, restoring the lost energy and mass (§ 1.5). And in the properties of antiparticles, positrons and arheons, presumably moving backward in time, one can even see a way to create a time machine (chronoporter). For if the direction of the arrow of time is indeed set by electrodynamics, the direction of flight of the arrows of the rheons, then for their antiparticles (arheons), as has been said more than once, the reversal of the time arrow can be expected.

As R. Fritzius noted, it was Ritz who, in fact, introduced from the standpoint of physics and electrodynamics the concept of the arrow of time, the flow of time - unidirectional and continuous, from which, in particular, the Doppler and Ritz effect followed (§ 1.10). However, intuitively, the concept of the flow of time was formed in ancient times. Therefore, time has long been compared to the movement of a river, the flow of which carries various events past us. Therefore, even in Ancient Greece, the principle of the irreversibility of time was formulated as follows: "everything flows, everything changes", "you cannot enter the same river twice". It was not in vain that the first mechanical watches worked on an uncontrollable stream of sand particles (hourglass) or water (clepsydra clock). Until now, this idea of time as a stream has been preserved in our language, and therefore we say that time "flows", "a lot of water has flowed under the bridge since that time", "all of us are carried by the river of time", "your time has expired." Time flows inexorably, with the same speed in the same direction.

Each electron, atom or object in this river has its own line or tube of current, which is called the world line or the line of life (Fig. 193). These streamlines, as in a river, now approach, then diverge, depicting a change in the relative position of objects over time. This relationship between the relative position of the points and their location along the line of the time stream gives the space-time relationships that Ritz spoke about. Lucretius's assertion that there is no time by itself, and we observe its flow only by a change in the relative position of bodies, means, in fact, that all points of a given streamline exist at once (body positions, or separate frames of a continuous and completely given historical film corresponding to different points in time). And these streamlines are continuous, like time itself. However, due to the presence of rigid spatio-temporal connections, at each moment we observe only one time slice - the section of streamlines by the plane in which we ourselves are (we see the movie not all at once, but frame by frame, sliding in time). Streamlines can bend, return, forming loops, eddies, like the eddies of a real river. Meeting such lines, these reverse currents of time, going in the opposite direction, we perceive them

as particles moving backward in time, that is, antiparticles, for example, positrons.

The river of time itself can also meander, forming, like real rivers, loops and meanders, a kind of folds of the fabric of time. Then ambiguity arises and one time section corresponds to several points of one streamline (Fig. 193). In places where the river loops converge, it is possible for the past, present and future to come into contact. At such crossroads of the space-time continuum, one could move from an early moment to a late one and back: jump through a time loop into the past or into the future. This means that you can still enter the same river twice. These are, so to speak, natural time transitions that allow the distant past to influence the future, or vice versa, the future to influence the past (contrary to the principle of causality postulated by Einstein). Is this the reason for prophetic dreams, prophecies, predictions and *deja vu*?

It is not excluded that it is in the course of such a "leak" of information of the future to ancient civilizations, soothsayers, scientists and science fiction writers, the knowledge of future or past eras. Such an intersection of chrono-streams does not lead to temporal paradoxes and multiplication of realities - there is one single variant of events, just like in a system of two equations with a unique solution. The past defines the future through the first equation, and the future influences the past through the second. As a result, only one variant of events is allowed. The threading model also illustrates this. If the pipe through which the water flows is bent into a loop and welded (Fig. 178) so that later parts of the flow merge with the earlier ones through a small hole, it is clear that after equilibrium is established, the flow will flow in a strictly defined way. So, the connection of times and temporary displacements and loops, long described by science fiction writers, do not lead to contradictions and paradoxes.

In addition to natural time transitions, active movement in time is also possible (without changing the riverbed, which would require too much energy). Such time travel implies getting out of the land state, de-anchoring and sailing away from the river of time on a kind of amphibian (Fig. 37), a time machine (chronoporter), and moving on it either upstream - into the future, or down - into the past. It is worth noting that the most famous film about time travel, *Back to the Future*, proposed a similar principle of travel using a time stream accumulator (fluxuator). The same idea of the 8-dimensional flow of space-time is given in the aforementioned story by R. Jones "The Noise Level", which deals with the implementation of antigravity. Of course, all this is from the realm of fantasy, however, in fantasy, as we remember, surprising guesses and insights are often found (§ 5.4). In any case, it is clear that it is the armored personnel carrier, also called the theory of expiration due to the existence of an eternal and irreversible stream of rheon particles from charges (like grains of sand from an hourglass), that opens the way to understanding the eternal mystery of time, the nature of its flow and, possibly, provides a key to technologies for moving along it.

§ 5.7. *Agravitors, Force Field Generators and Teleporters*

- Brownian motion is disorderly, chaotic. True, theoretically such a case is not excluded when all the molecules will simultaneously rush upward. And then a stone or a person could rise above the ground ...

- And you set yourself the task of mastering Brownian motion, managing the chaotic jumps of molecules ... How did you manage to turn the chaotic motion of molecules into a directed one? Fox asked.

- Physicists consider only the role of heat, ignoring electrical phenomena. I had to delve deeper into the study of the complex play of forces that occurs in the very atoms that make up the molecules, and master this game.

A. Belyaev, "Ariel", 1941

Usually, it doesn't take much time from predicting devices in science fiction literature to their actual implementation. Let us recall how many projects of Jules Verne and Belyaev were triumphantly realized, how the cybernetic and biotechnological fantasies of Lem and other authors were brilliantly confirmed. The reason for this is quite clear: in these areas science followed the right path, developed and therefore at some point reached the heights set by science fiction writers. In the field of fundamental physics, electrodynamics, science went the wrong way and the further, the more and more it came to a dead end and fell into the abyss. Apparently, it is precisely the erroneous ideas about the nature of electricity and magnetism, gravity, about the laws governing them, about the structure of the cosmos and the microworld that slow down the progress of science in these areas, preventing the creation of high-temperature superconductors and other seemingly fantastic devices, such as antigravitors, force field generators, teleportation installations. This idea is clearly reflected in the story of R. Jones "The Noise Level", whereby rejecting the dogmas of the theory of relativity it was possible to create an anti-gravity machine.

Therefore, it is very possible that with the advent of Ritz's electrodynamics, his ballistic theory and the magnetocrystalline model of the atom, progress in these areas will go by leaps and bounds. Above, we discussed the possibility of constructing a time machine to perform time jumps based on the properties of antiparticles. It is possible that the key to teleportation - instant jumps in space - is also hidden in the antiparticles. Earlier it was found that the mass of an electron can, according to Ritz's assumption, have an electromagnetic nature - the inequality of the electrical repulsive forces of two like charges during their acceleration creates a braking force proportional to the acceleration (§ 1.17). But what if we take opposite charges. In this case, the force acting on the pair of charges will be directed in the same direction as the acceleration. That is, the speed of such a system of charges would instantly and indefinitely increase. So, when an electron is combined with a positron, their attraction will make the system instantly accelerate and go to infinity (§ 3.18). Perhaps that is why the electron and positron suddenly disappear and annihilate upon contact.

This opens up a way of instantaneous movement in space, long predicted by science fiction writers - teleportation, or zero-transportation. After all, all bodies consist of electron-positron pairs (§ 3.9), for each electron of the body there is a positron, and if they are brought together for a short time, and then diluted, say, when a powerful electric field is applied, causing polarization, then it will be

possible to instantly move the bodies. However, this will be possible only if the resulting force is greater than the forces of inertia of the electron and positron. In other words, the distance between the particles must be less than their radius - then the particles seem to merge - their mass will disappear, which will make the instant acceleration of the particles possible (§ 3.18). Then one day it is precisely this control of intra-atomic forces that will make it possible to create teleportation devices for instantaneous movement in space. By analogy with chronoporteurs, which serve for instantaneous movement in time, such devices for instantaneous movement in space can be called teleporters, or null transporters. Apparently, approximately such devices, designed for instant jumps of 7 miles, were described by our ancestors in fairy tales under the guise of seven-league boots. And if other fabulous wonders have already been realized, then the teleporter is still waiting for its turn.

If we bring the electrons and positrons closer to a distance slightly larger than the classical radius of the electron, only a partial decrease in the force of inertia and the mass of particles is observed. This is the way to create anti-gravity, levitation, or unsupported hover devices - agravitors. Another method consists in screening the gravitational field, created, like an electromagnetic one, by the streams of rheons (§ 1.17), as Herbert Wells, who suggested this type of agravitor in the story "The First Men on the Moon", was foresighted. After all, it was previously found out that although rheons have a huge path length in matter, they are nevertheless absorbed by its thickness, otherwise the interaction would be impossible. Therefore, it would seem, by taking a sufficiently thick and dense layer of matter, one can screen the gravitational field. But in this case, the shielding layer itself will become a source of a strong gravitational field, since it has such a high density, and therefore will prevent the aircraft from hovering.

Therefore, more rational ways of building agravitors, force field generators and teleporters are still seen in a more thorough and in-depth study of electrodynamics and the structure of electrons. Of course, it is useless to screen the gravitational field, but on the other hand, you can create an additional force with the help of the force field, which will repel the body from the ground, maintaining it in equilibrium at a given height. This is quite possible if we take into account that the electrodynamic forces, as shown by Ritz, depend not only on the first and second degrees of speeds and accelerations, but also on higher ones. Therefore, by setting parts of the aircraft in motion in one way or another, we can create additional forces that will no longer be magnetic or gravitational, but completely different particular manifestations of electrical interaction.

In most modern projects of unsupported motion devices, the authors try to create mechanisms that violate the law of conservation of momentum and Newton's third law of equality of action and reaction. But, since the BTR is fully based on classical physics, these laws should not be violated. Therefore, in order to maintain the body on weight, in spite of the force of gravity or to give it a horizontal speed, it is necessary, according to the law of conservation of momentum, to eject matter towards the gravitating body (towards the earth) or in the direction opposite to the motion. That is, it is necessary to use the reactive

principle discovered by Tsiolkovsky. If the air stream surrounding the vehicle is thrown down and back, then this is an ordinary plane or helicopter. If the flow of fuel stored in the apparatus is emitted, then this is a simple rocket. However, agravitors and unsupported flight vehicles usually assume hovering and movement not only in an airless space, but also without fuel consumption. It would seem that this is impossible, since the jet propulsion implies the obligatory release of matter. And the BTR just gives such an opportunity, since Ritz claims that any body constantly exudes a stream of matter - a stream of rheons and areons ejected by all charges of the body at a tremendous speed. If we could somehow curb their flow, direct it in the direction we need, we would get a device for unsupported movement and hovering. However, as it was pointed out by Ritz, and as follows from many phenomena, the electron throws out rheons randomly, in all directions, and therefore the recoil pulses from the emission of rheons should, on average, neutralize each other. Therefore, the electron only jerks from side to side near the middle position (§ 4.13).

And yet it is possible that the flux of rheons from an electron is anisotropic, inhomogeneous: in some directions more rheons fly out than in others. And only constant random rotations of the electron under the influence of the impacts of rheons lead to the fact that on average in all directions the electron emits the same number of rheons and, like a Brownian particle, randomly rushes in different directions, having on average zero momentum (§ 3.14). Such a selective ejection of rheons in a certain direction may be associated with the presence of a spin in the electron and a magnetic moment caused by its rotation. That is, there is an exclusive direction along the axis of this rotation, and therefore it is very possible that more rheons are thrown up or down along this axis. Even Ritz assumed such a non-spherical structure of the electron and the difference in its interactions in different directions due to the presence of a distinguished axis of the particle [2, 9].

In this case, if the electron is oriented in a predetermined way by an external field, it will eject rheons mainly in the required direction, receiving reactive recoil. The most interesting thing is that such a phenomenon is really known. Thus, ^{60}Co nuclei oriented by a magnetic field (directed upward) more often emit electrons downward (in 60% of cases, § 3.11). The same asymmetry is discovered in decays of elementary particles of π^- and μ^- mesons. The percentage of debris ejected in a given direction is determined by the shape and strength of the corresponding portions of the particle. Similarly, the process of emission of rheons by an electron during its decay can be asymmetric. This makes it possible to control the direction of the streams of rheons. The first way is to orient the electrons with a magnetic field, just like cobalt nuclei. If most of the electrons of the body are arranged mainly in one direction, orienting their magnetic moments in parallel, then this will create a sufficient lifting force. Moreover, it is possible to orient the electrons in this way without constant expenditure of energy. Let's say that all permanent magnets are just such an ensemble of atoms with ordered electron moments (§ 3.19).

It turns out that once magnetized, say, a disk, we could get a permanent agravitor. Thus, even simple magnets can have little lift, albeit much less than

their own weight. Therefore, an experiment should be carried out comparing the weight of ferromagnetic samples before and after magnetization. The lift is probably negligible, but it can be detected with a sensitive balance. To create a greater lifting force, materials are needed, cooled to ultra-low temperatures, at which super-strong magnetic fields, super-ordered, super-crystalline states of matter are achievable (§ 4.19). Including such powerful fields are created by superconducting magnets. And here it is interesting to note that it was in superconductors in cryotechnics that the phenomenon of levitation was first discovered - the soaring of magnets, like the soaring of the coffin of Mohammed. In superconducting magnetic installations, it is possible to suspend even living objects - small insects, spiders. However, in the quantum theory of superconductivity, this phenomenon of levitation is explained by the displacement of the magnetic field from the superconductor [71], despite the fact that weight loss over spinning superconducting disks and in the field of superconducting magnets was discovered not only in permanent magnets, but also in simple, non-magnetic bodies. Therefore, the key to understanding the phenomenon of levitation may be hidden precisely in the fact that superconductivity and superstrong magnetic fields arise due to the ordered orientation of electrons emitting streams of rheons along the direction of orientation. In such a stream of rheons, exerting pressure, bodies soar like a foam ball - in a stream of air atoms from a hair dryer. So, one of the ways to create agravitors is to implement a strong spontaneous or forced magnetization of the samples.

Another way to give all the electrons of a body a given direction is to quickly rotate the body. Indeed, the gyroscopic effect has long been known from mechanics. It consists in the fact that a rapidly rotating top mounted on a turntable, during its rotation, tends to align the axis of its rotation with the axis of rotation of the platform, and so that the rotation occurs in the same direction. This is how the ship's gyrocompasses work, setting their axis of rotation parallel to the earth's axis, giving the direction to the north. In the same way, one can expect that the magnetic moments of spinning electrons, say, inside a metal disk, during its rapid rotation will be set parallel to the axis of rotation under the action of a gyroscopic moment. On the one hand, this will lead to the appearance of a magnetic moment at the disk (the disk will become magnetized) - this is the Barnett effect, discovered in 1909 and the opposite of the Einstein-De Haas effect, declared in 1915 without references to Barnett. On the other hand, the parallelism of the axes and spins of electrons will lead to a directed ejection of the rheon flux and the appearance of a lifting force along the axis of rotation. The most interesting thing is that such an effect has indeed been discovered for a long time: rapidly rotating discs lose weight [59]. However, there is a lot of controversy around this phenomenon, if only because this effect contradicts modern physics. However, it is quite consistent with the BTR and finds an explanation within the framework of this theory.

However, the lifting forces obtained in laboratories for rotating disks and magnets at rest are extremely small. After all, the ordering of the moments of electrons is incomplete - not all electrons participate in it and, moreover, their

spins are not strictly parallel, both due to thermal vibrations that mismatch the magnetic moments, and due to intra-atomic magnetic fields, which order the arrangement of electrons and positrons. Therefore, noticeable effects can be expected only with superstrong magnetization in cryogenic installations, or with superfast rotation of disks. This is also due to the fact that the rheon flux emitted by the electron, if inhomogeneous, is very weak, almost imperceptible. However, if we take into account that the rheon flow carries a huge impulse (only a small part of which we perceive in the phenomena of electrodynamics and electrostatics § 1.14), then even this insignificant asymmetry is capable of creating noticeable forces, such that their practical application in agravitors and unsupported transport will become possible.

It should be noted that the possibility of creating agravitors has long been associated with rapidly rotating discs, as well as with torsion fields created by their rotation. However, there is no theory of this effect, and the existence of torsion fields is generally questionable. On the other hand, the BTR gives all these phenomena a consistent, logical explanation, showing that unsupported transport does not lead to violation of the law of momentum, since it is based on the reactive principle and is associated with a directed rejection of the rheon flow. The possibility of using such forces opens up truly tremendous opportunities - from antigrav transport and gravitational floats to space transport that does not need huge reserves of fuel. The heroes of R. Jones' story "The Noise Level" saw the main purpose of their invention in the possibility of constructing starships. Many believe that it is on this principle that the notorious UFO flying saucers work, the main element of which is believed to be spinning discs [59].

Another way is to use magnetic materials. It is interesting that back in the 17th century, Cyrano de Bergerac, in his fantastic work "Another Light", proposed using a magnetic one for a flight to the moon, along with a rocket engine. At the same time, Cyrano ridiculed the teachings of Aristotle (the former analogue of Einstein's physics), defending the teachings of Democritus, Galileo and Gassendi (the basis of Ritz physics). Likewise, J. Swift, having predicted many discoveries of the future in "Gulliver's Travel", proposed the magnetorotational mechanism of the flying island-UFO. It is interesting that in Swift, as well as in T. Godwin in the story "Necessity is the Mother of Invention", the antigravity device, along with a magnet, contains a diamond - a body of perfect crystal structure (§ 4.16), which is closest to supercrystals with their magnetic properties (§ 4.19). Many science fiction writers foresaw the discovery of magnetic antigrav materials [95], such as an alloy of cavorite (with a Curie temperature of 60 °F) from H. Wells's story "The First Men on the Moon" or lunit-magnetite from "Dunno on the Moon" by N. Nosov. By the way, Wells, like Ritz, asserted the unity of electric, magnetic and gravitational influences carried by streams of matter emanating from bodies. And in the film "Flabber" it was even proposed to use radioactive decay directed by a special device in the levitation apparatus to create a lifting reactive force. If all this is not far from reality, then it is possible that the bold forecast of the creators of the film "Back to the Future", who believed that by 2015, antigrav transport will

exist, will also come true. Well, the first scientifically based scheme of levitators, close to the one described above, was invented half a century ago by A. Belyaev, who proposed in *Ariel* to streamline the random movement of microparticles directly related to electricity, to curb it with electromagnetic forces due to an adequate understanding of the structure of atoms and electrons. It seems that it was not by chance that Jones called his story "Noise Level", meaning by this the use of a background noise, chaotic movement, in order to isolate a useful component from it.

It is characteristic that A. Belyaev in "*Ariel*" and R. Jones in "*The Noise Level*" associated the problem of antigravity with India, Indians and fakirs - famous masters of levitation and control over the internal forces of the organism and nature. Here you will think: maybe the ancient Indians and fakirs-fire-worshippers really were aware of the secrets of the microworld and levitation (§ 5.2, § 5.3)? Yes, and Jules Verne named the Indians as the creators of the technology of the future - who conquered all the elements of Captain Nemo and Robur the conqueror, opposing them to the British and Americans. No wonder R. Jones writes: "The Indians have achieved greater success in uncovering the secrets of the universe than the American research laboratories." Since the problem of levitation, teleportation and movement in time is associated with the control of the behavior of electrons and positrons, of which the atoms of our body are composed, then it is possible that a person can indeed move in space and time without additional technical means, but exclusively only by an effort of will, nerve electrical impulses according to a prescription Belyaev and Indian fakirs? After all, the true possibilities of a person, the possibilities are not mystical, but namely physical and cognitive ones - are far from being studied yet and, possibly, are limitless.

So, when a real and deep understanding of the nature of mass and gravitation, electric forces and the structure of the atom comes to us, the problem of antigravity will automatically be solved, as A. Belyaev spoke about with foresight. And in the properties of antiparticles embedded in the BTR, one can even see the path to the construction of a chronoporter and a teleporter.

§ 5.8. Abundance of energy and HCN

I moved forward in solving the riddle when, in 1899, I received mathematical and experimental evidence that the sun and other celestial bodies equally emit high-power rays, consisting of subtle particles moving at speeds many times the speed of light. The penetrating power of these rays is so great that they are capable of passing through thousands of miles of solid matter with almost no loss of speed. Crossing the space filled with cosmic dust, they emit secondary radiation of constant intensity, which pours out on the Earth from all sides day and night ... I conquered cosmic rays and with their help launched a moving device ... The biggest advantage of these rays is their constancy. They pour on us around the clock, and if we build a station capable of harnessing their power, we don't need the energy storage devices that are needed when using the power of wind, tides or sunlight.

Nikola Tesla [110]

Many researchers noted that the deeper we plunge into the depths of matter, the more energies we encounter [159]. Before, people dealt with relatively low energies of synthesis and disintegration of molecules. They were replaced by

much more powerful energies of fusion and decay of nuclei when we descended to the next floor of the universe. When we descend to the next, subnuclear floor, we are faced with an even more powerful energy of "annihilation", the fusion of electrons and positrons (§ 1.16). We can now imagine what gigantic energies await us on the subelectronic level of the universe inhabited by rheons! And indeed, as Tesla understood already, in life we use only an insignificant part of the rheons moving in space (§ 1.14). This is the energy of light, electric and gravitational fields, released in the corresponding installations. If we learned to use all the energy of the rheons, it would more than cover any conceivable energy needs of humanity. This energy of moving rheons permeates us, all space. It, in fact, can be called that notorious vacuum energy, which is now so much talked about, but which no one has yet isolated and explained its nature. Perhaps the knowledge of the BTR and the structure of the particles will allow, finally, to increase the utilization rate of the energy of rheons - the energy of the electric field.

Another possible way is to use the energy of cosmic particles, which was proposed to be extracted by the same N. Tesla (Fig. 194), who also developed the corresponding devices [110]. The energy of the particles of cosmic rays and the streams of rheons permeating everything is the same free and available energy anywhere on the Earth as the energy of the wind (a stream of atoms), but much more impressive, comparable to the general flow of energy of sunlight to the Earth and available at any time of the day [151]. However, all these projects are undeservedly forgotten, along with the name of the inventor himself, like the name of Ritz, erased from engineering and scientific literature [110]. Perhaps it would be more correct to compare the energy of freely floating particles not with the wind energy, but with the thermal energy. Indeed, unlike the wind, which is a more or less ordered movement of atoms, rheons and cosmic rays move randomly in all possible directions, reminding more of the chaotic, thermal movement of atoms. But it is thermal energy, as it is believed, that cannot be isolated and directly converted into work, according to the second law of thermodynamics. For the same reason, the latent energy of the vacuum, the kinetic energy of the rheons, may remain forever inaccessible to us. Unless the second law of thermodynamics turns out to be unfair in the micro- and megaworld, which will allow it to be circumvented. There is an assumption that the energy of random motion can still be extracted using special periodic lattice, mesh microstructures with a step, a period comparable to the distance between the particles of the substance, the energy of which needs to be extracted.

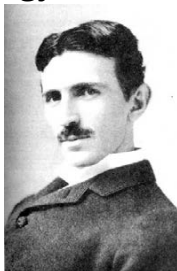


Fig. 194. Nikola Tesla (1856 - 1943).

But the BTR also opens up many other ways of obtaining free energy, as well as simpler and more efficient ways of producing the types of energy already used. Thus, establishing the actual nature of the photoelectric effect would significantly increase the efficiency and reduce the cost of solar cells (§ 4.6). After all, plants that do not use any quantum laws use the light of the sun much more efficiently than people with their modern research laboratories. In addition, the mechanical unity of all types of energies (§ 3.16), possibly, will allow transforming some types of energy into others, bypassing intermediate stages, directly, without losing a significant fraction of energy in each transformation.

Likewise, the knowledge of the secrets of the reactions of decay and fusion of particles will make it possible to find more effective and simple methods for the release of nuclear energy, for example, by carrying out cold nuclear fusion (CNF). Indeed, it is known from chemistry that in reactions, heating is often not necessary to impart activation energy to reagents. Thanks to catalytic substances, many reactions are intense even at room temperature. A good example is the human body - a complex chemical laboratory in which millions of reactions take place at body temperature due to natural catalysts - enzymes. Similarly, for nuclear reactions, in many ways similar to chemical ones, one day it will be possible to find catalyst particles (§ 3.13, § 3.14). Neutrons can already serve as an example of them. It was they who made it possible to carry out the first artificial nuclear processes with their gigantic energy release. Some physicists, such as V.P. Savchenko, they propose to use the tunnel effect for the implementation of CNS. Just as alpha particles are able to overcome the potential barrier and, in spite of nuclear attraction, break away from the nucleus with the release of energy in α -decay, so in fusion reactions it is theoretically possible to merge deuterium nuclei due to the tunnel effect. Again, it will be possible to control this effect only with a correct understanding of its nature.

Usually, in order for the nuclei to react, they tend to be strongly accelerated to overcome the Coulomb repulsion. But the enormous energy of the nuclei upon approaching reduces the effectiveness of the interaction, since during a rapid approach they do not have time to react or bounce off each other. Therefore, it would be more correct to smoothly bring the nuclei closer together until nuclear forces come into play, which will allow nuclear fusion to be carried out at low temperatures. So, for neutrons, the efficiency of interaction with nuclei is much higher if their speed is low, since the interaction time is longer. In addition, with a slow approach, the nuclear field manages to orient the neutron so that the force of nuclear attraction increases [19, p. 319], which happens when electrons in the crystal lattice of a neutron are located exactly opposite the positrons of the nucleus and vice versa (§ 3.12), generating nuclear interaction already at large distances. The same must be true for two merging nuclei: for effective nuclear interaction, they must gradually converge. And now methods of controlling the speed of movement of atoms and nuclei, methods of their acceleration and deceleration by means of laser radiation are really known. It turns out that lasers can indeed be the key to fusion, but not to laser fusion, which everyone is talking about, but to cold nuclear fusion.

Thus, it is the path along which the BTR moves that opens up new horizons in terms of the release and use of hitherto hidden energy. Therefore, in the current conditions of the energy and fuel crisis, environmental pollution by ineffective internal combustion engines, the discovery of new energy sources based on BTRs would be highly desirable. For this alone, Ritz's theory deserves close attention and research into its possibilities.

§ 5.9. *Creation of new substances, elements, particles*

Although atoms remain unchanged in chemical processes, someday a strong and subtle agent will be found that will break atoms into even smaller particles and turn some atoms into others.

R. Boyle

The role of a new view of the world from the standpoint of BTR and in terms of creating new substances with given properties, new particles and elements can be great. If Ritz's theory paints a correct picture of the structure of matter, atoms and correctly explains their properties, then, probably, it is the BTR that will allow exploration of the way to create the materials necessary for cheap solar cells with high efficiency (§ 4.6), high-strength crystals (§ 4.14), high-temperature superconductors (§ 4.21), which until now have been blindly looking for, not knowing how to correctly understand their properties. The use of the laws of the BTR allows, as we have seen, and as noted by J. Fox, theoretically calculate the magnitude of the forces that bind the particles, their strength and lifetime, predict the existence of new particles and their characteristics, such as mass, lifetime, etc. (§ 3.10). Knowledge of the structure of particles will allow them to be designed purposefully according to a pre-developed plan, and not by a simple enumeration of possibilities, - by the method of "scientific poke", as modern scientists often act.

Technically, in solving this problem of purposeful synthesis of new substances and particles, new catalyst particles, "thin agents", predicted by Boyle and gaining reality in the BTR (§ 5.8), can help. Such catalysts will also make it possible to carry out cheap transmutation to obtain noble metals and other valuable elements, as in chemistry they learned to synthesize scarce natural substances, crystals and molecules. It is only necessary to develop on the basis of the BTR a new cheap and energy-saving method of transmutation, taking into account the crystal structure of the nuclei and providing, due to the imposition of an external field, the exact mutual orientation of the reagent nuclei. Knowledge of the structure of particles will teach you how to design new transuranic elements and particles. In the meantime, from the false theoretical basis of nuclear physics and ignorance of the structure of particles, their creation is an expensive method of blind fortune-telling, reminiscent of the receipt of new substances by alchemists. They took different substances at random, mixed, heated, changed conditions, etc. So the current "alchemists" get new particles by a rough enumeration of conditions: to collide one, another, third particles and see what happens. It is time for nuclear physics to overcome the frontier that chemistry crossed a century ago, having learned the structure of molecules that are now synthesized purposefully, cheaply and efficiently. Then it will be possible to generate cold nuclear energy, easily synthesize gold and scarce

elements, using simple, compact installations and nuclear catalysts - analogs of the philosopher's stone of alchemists, created not on the basis of mysticism, but on a strictly scientific basis, as Boyle suggested. To do this, it is necessary, following his example, to abandon all alchemical, mystical theories (including SRT and quantum mechanics) in favor of atomistic theories, otherwise further progress will be impossible, and science will remain in the hands of charlatans.

§ 5.10. Cosmobeam superluminal communication

Wait, but all our devices say that there is no life outside the Earth. I would explain everything, but you earthlings still think that $E = mc^2$

From the movie "My Favorite Martian"

Astronomers and radio astronomers have made tremendous efforts to search in space for traces and signals of extraterrestrial civilizations. But all was in vain: the universe was silent. And this is natural, considering that signals from aliens were sought in the form of radio signals, forgetting about the shortcomings of radio communications in space. Among them, the low speed of the signal and its low power, due to the weak directivity of the radio antennas. Even if a radio pulse takes several minutes to Mars, and several years to the nearest stars, then what an abyss of time and space it will pass to distant inhabited worlds and what negligible power it will have at the end of the path. Therefore, humanity, accustomed to communicating with radio waves and trying to look for connections with aliens on them, is likened to savages from a remote island (where messages are transmitted by the sound of drums), trying to get in touch with us, beating with all their might on tom-toms and trying to hear the sounds of our drums across the ocean ... Even having built a super-drum, they are unlikely to contact us: the speed and power of sound on the scale of the Earth, as well as the speed of light and the power of the radio signal on the scale of the galaxy, are too low.

Since it is pointless to search for artificial radio signals in space, how can we establish contact if we are unable to imagine the communication technologies used by the alien intelligence? After all, we are probably as blind as those natives from the island, past which thousands of our radio messages scurry, unnoticed by anyone, while invisible alien dispatches fly past us. However, the reason for our blindness is not in the primitiveness or weakness of earthly instruments, but in the inertia, dogmatism of the earthly mind and science. After all, a century ago, in 1912, the first signals from space were discovered. They were discovered by the Austrian physicist Victor Franz Hess, who, having boldly set off on a flight in a balloon, discovered by means of a simple electroscope that a powerful stream of charged particles of enormous energy arrives from space to the Earth - what was later called cosmic rays (Fig. 195), or cosmic corpuscular radiation [53, 108, 163].



Fig. 195. The flow of cosmic rays, particles coming to Earth from all directions

Scientists are still wondering where cosmic rays come from, because the energies of some radiation particles are trillions of times higher than those that occur in nuclear decays. Even particles accelerated by the best of modern accelerators (synchrophasotrons and synchrotrons) have energy billions of times less than that of the fastest particles in the cosmic ray [108]. Neither stars nor planets can give such energies to particles. That is why the conclusion suggests itself that cosmic rays are not natural, but artificial, technogenic origin - it is a product of the activities of alien civilizations that have technology capable of giving the particles gigantic energy. It is not for nothing that the particles of cosmic rays have always been compared with particles from accelerators. It was worth developing this analogy, and everything would fall into place. It is strange how physicists studying cosmic rays did not understand their true essence - that these are rays of interstellar communication.

Why is communication on cosmic rays so convenient in space? First of all, due to the enormous speed of the particles, their flow can be very accurately directed to the desired point in space - the deviation of the particle beam from the intended trajectory will be inversely proportional to the speed of the particles, that is, it will be negligible. In other words, the cosmic emitter is truly a long-range weapon with an ultra-sharp directivity pattern, and therefore, even in outer space, the power of the signal transmitted by means of cosmic rays will be enormous. In addition, freely flying streams of high-energy particles, in contrast to radio beams, will not weaken, scattered by the interstellar medium - the probability of collisions of particles with its atoms is so small. Finally, and most importantly for interstellar communication, cosmic rays have a tremendous speed, which is why the signal delay time will not be many years, but on the order of a month or less: it all depends on the power of the transmitter, that is, on the energy and speed of the launched cosmic rays.

The problem of space communication was solved by Tsiolkovsky [159, p. 149]: "Light, however, does not travel fast enough for stellar distances. It needs years to overcome them. But maybe we will find another medium in the ether ... Its invisible fluctuations can reach the neighboring sun not in years, but in days, even hours. So, conversations will be much more convenient than now." By ether, Tsiolkovsky (Fig. 196) understood not that abstract continuous motionless ether in which light waves were believed to move, but a dynamic space environment formed, as in the Ritz ballistic theory (BTR), by myriads of particles flying at the speed of light (§ 3.21). And "other media" are streams of even faster particles, and the best candidates for them are cosmic rays.



Fig. 196. Konstantin Eduardovich Tsiolkovskiy (1857-1935).

Indeed, the main problem with interstellar communication is the low speed of the signals. Light, like any electromagnetic signal, moves in a vacuum at a speed of $c = 300,000$ km/s, which is negligible on the scale of space. According to the special theory of relativity (SRT), nothing can fly faster than light - neither radiation nor particles. But experiments in recent years have shown that light and particles may well move at a speed greater than c (§ 1.21, § 2.1). This means that nothing prevents particles from accelerating to arbitrarily high speeds. Then the SRT formula $E = mc^2$, which connects the energy E and the mass m of the particle, is erroneous, and the classical formula $E = mV^2/2$ is valid for the particles. According to this formula, the huge energy E of cosmic radiation particles indicates not a huge mass m (at a speed V of the order of c according to SRT), but about a superluminal speed V at an ordinary mass, as the BTR claims. If we recalculate the velocities of cosmic rays according to the classical formula, they will turn out to be hundreds of times higher than the speed of light. Even electrons with energies of 10 GeV, already produced in accelerators, must move at a speed of 100 times the speed of light (§ 1.21). Such particles fly interstellar distances in days and hours.

So, the most energetic, fast cosmic rays that cause bewilderment to scientists are, apparently, just rays of superluminal communication. What particles are most convenient to use for cosmic-ray communication, because there are several hundred of them known? The easiest way is to use light electrons, which are easier to accelerate to high speeds. But you can use other types of particles, say, to create many communication channels, just as in radio communication there are many non-overlapping frequency ranges. In this case, the particles must be stable, that is, they must be mainly atomic nuclei, protons and electrons. Emitters must fire only specified types of particles or ions, and receivers must be configured to register the corresponding signals (Fig. 197). Even terrestrial laboratories have such selective detectors that automatically separate out the given classes of particles from the stream, filtering out everything superfluous, like a radio receiver filter.

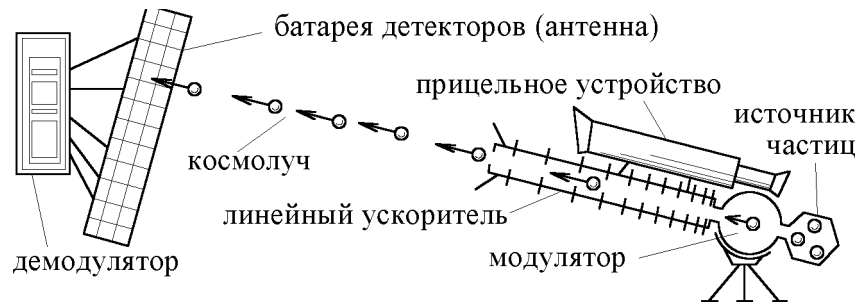


Fig. 197. The principle of cosmological communication: The transmitter forms a modulated stream of particles captured by the antenna (all the equipment is brought into space).

Earlier, we cited experimental evidence proving the BTR and rejecting SRT, together with the formula $E = mc^2$ and the prohibition on exceeding the speed of light c (§ 1.21, § 2.1). However, all this so far proves only the superluminal velocities of cosmic radiation particles predicted by Lucretius (§ 2.15). Is there any evidence of their artificial nature? At first glance, the only argument in favor of such a hypothesis is provided by the enormous energy of particles, which can only be obtained in an accelerator (and even then accelerators have just begun to approach this level). To prove the artificial nature of the rays, it is necessary to investigate the directions of arrival of particle fluxes and reveal the patterns of their variations in time.

Indeed, the only way to encode information in a stream of cosmic radiation particles is to modulate it in terms of density, intensity (similarly, light and radio signals are a modulated stream of rheon particles). Therefore, the variations in the intensity of fluxes of cosmic particles, which are actually observed, should not be random, but in many respects correct, regular. And, the most interesting thing is that these correct variations, patterns were actually discovered, and not by some delicate equipment launched into space or lifted into the mountains, but by the simplest instruments. These patterns are already traced in the nature of nuclear decays, a textbook example of completely random processes. All decays have characteristic frequency spectra (curves of statistical frequencies of a given number of decays per unit time). Theoretically, these spectra should be described by the Poisson distribution (Fig. 198). But there are always fluctuations - deviations from Poisson, which are natural for a random process.

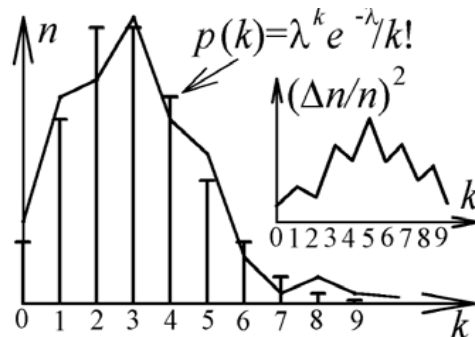


Fig. 198. The deviation of the frequency n of k decay per second from the law of Poisson $p(k)$ gives a range of fluctuations (right), cyclically changing.

However, it is unnatural that the spectra of these fluctuations over time undergo cyclical regular changes caused, obviously, by cosmophysical reasons, and, more specifically, by cosmic rays (as it was found out, capable of inducing decays of § 3.14). It turned out that the spectrum at each moment depends on which point in the starry sky is at the zenith, that is, from which direction the cosmic rays come, which affect the course of decay.

This phenomenon was discovered by the famous Russian researcher of biorhythms, solar activity and cosmic radiation, S.E. Shnoll [167]. But scientists ignore this data and seek to hush up the matter, consigning the facts to oblivion, due to their contradiction to dogmas. All this again proves that the reason for the blindness in relation to extraterrestrial signals is not the blindness of the equipment, but the blindness of the mind, adhering to dogmas and pushing to commit a scientific crime. The Martian was right - we will not find brothers in mind as long as we believe in SRT: those who believe in an absurd theory cannot be considered reasonable.

Note that even Nikola Tesla developed devices for the conversion and use of cosmic ray energy (§ 5.8). He also suggested the possibility of using cosmic rays, due to the superluminal velocity of the particles forming them, for interstellar communication and developed appropriate devices - receivers and transmitters of cosmic rays [110]. Recall that Tesla also assumed that nuclear decays are caused by cosmic radiation, which was confirmed by S.E. Schnolem (§ 3.14).

Variations in the intensity of cosmic rays were first discovered by the same Hess and still have not received a convincing explanation. Therefore, it would seem that back in 1912, at the time of discovery, it would be natural to admit their artificial nature on the assumption that variations in the flux of cosmic rays are signals from extraterrestrial civilizations that astronomers are so persistently looking for. Scientists, one might say, come close to this idea, but never brought it to the end. Here is what, for example, is said in the small encyclopedia "Physics of Space" [151, p. 318]: "Information" recorded "and" carried "by particles of cosmic rays on their way to the Earth is deciphered in the study of variations in cosmic rays - spatio-temporal changes in the flux of cosmic rays." It seems that astrophysicists either feel or know the truth, but fearfully hide keywords in quotation marks. And in order to somehow explain the unimaginable energies of cosmic rays that cut the eyes, such scientists as E. Fermi and V.L. Ginzburg, invent completely artificial, implausible theories of the acceleration of cosmic particles by magnetic clouds of gas and other hypothetical objects invented by chance. For some reason, these names are now associated with cosmic rays, while the name of their discoverer Hess remains in oblivion [163].

So, a century ago, cosmic rays were discovered, a ballistic theory was ready to reveal their meaning. Therefore, at least fifty years ago, we could get in touch with extraterrestrial civilizations, we could create transmitters and receivers operating on cosmic rays. If it were not for the SRT, we would probably have deciphered the code of the cosmic rays long ago and could fly to other stars. Only an inert, blinkered mind keeps people on Earth. Because of SRT and

quantum mechanics, humanity has lagged behind in development by a hundred years, earthly science is mired in the intoxication of metaphysics and self-deception. But, in spite of all the efforts of the supporters of the SRT, new facts come out, demonstrating the precariousness of the positions of the relativists. Therefore, many already have a presentiment that in the coming years a new scientific and technological revolution should break out, which will open the way for mankind to the stars. And this path will be paved by cosmic rays discovered by Hess, leaving their autographs, start tracks, star trails in photographic emulsions. It is the cosmic rays, these messenger particles, that carry us the universal message that there is a higher mind in space.

§ 5.11. Cosmic rays - the path to the stars

... The planet is the cradle of reason, but one cannot live in the cradle forever.

... Humanity will not stay forever on Earth, but in the pursuit of light and space will first timidly penetrate beyond the atmosphere, and then it will conquer all the space around the sun.

K.E. Tsiolkovsky [69]

As the alien correctly formulated in the last epigraph (§ 5.10): it is the belief in the theory of relativity and the absurd formula $E = mc^2$ that prevents us from discovering life in other worlds and getting in touch with them. Moreover, this false formula also prevents us from escaping into deep space, building interstellar ships. The main problem for a ship sent on an interstellar voyage is its low speed and low fuel supply. Both the one and the other problem are solved according to the Tsiolkovsky formula by increasing the speed of the ejection of a jet stream of particles or gases. However, according to SRT, this speed cannot exceed the speed of light. Of course, in modern rockets, the speed of the jet stream is far from the speed of light, but soon the engines will become ionic, plasma, which will bring the speed of emission of particles closer to light, and according to the theory of relativity, this speed will no longer be exceeded. And the speed of the rocket itself would be even more noticeable below the speed of light, and the starships would have to crawl between the stars for centuries like turtles. But if SRT is false, and the ballistic principle is true (Fig. 50), then particles may well fly out of the nozzles of a spacecraft at a speed thousands of times higher than the speed of light, and the ship itself can fly at a speed hundreds of times higher than c . Then the huge interstellar distances are no longer an obstacle!

If someone flies and keeps the connection between the stars, then this is the only way - with the help of superluminal cosmic rays, and not at a snail's pace. The path to space runs through the microcosm (§ 1.21)! And it was aptly noted that cosmic rays are bridges connecting the microcosm and space, the Earth and the stellar worlds [108]. The particles erupting from the nozzles of the spacecraft possessed a tremendous energy comparable to the energy of the fastest particles in the cosmic rays. Therefore, cosmic rays can be partly exhaust, jet jets of distant spacecraft. When the jet strikes the Earth, the instruments register an increase in the flow of cosmic rays, showers of particles

occur, just as exhaust from terrestrial transport contributes to the fallout of simple showers in large cities.

On the whole, we see that the most energetic, fast component of cosmic rays is most likely of a technogenic origin: these are just beams of superluminal communication and exhaust from space transport. So that the exhaust does not drown out communication with interference, different types of particles, of which there are many, must be used for communication and transport by interstellar agreement. Moreover, the particles used for communication must be long-lived (these can be stable light nuclei) so that information is not lost along the way.

Let us briefly consider the structure of spacecraft with cosmoplane thrust. The heart of such starships should be a powerful accelerator that accelerates particles to superluminal speeds and shoots them out of the nozzles of the ship into outer space. Probably, linear accelerators rather than cyclic ones will be more convenient for this purpose (Fig. 199.a). By choosing the geometry of the accelerating chamber-waveguide, it is possible to create a traveling electromagnetic wave in them, the phase velocity of which gradually increases and at the exit of the accelerator noticeably exceeds the speed of light (fast wave). As a result, the particles accelerated by the longitudinal field of the wave, in fact carried by it, outrun the light. The prototype of such engines is the already existing ion and plasma rocket engines, in which ions are accelerated by powerful electromagnetic fields - these are a kind of electron or ion guns [38, 42].

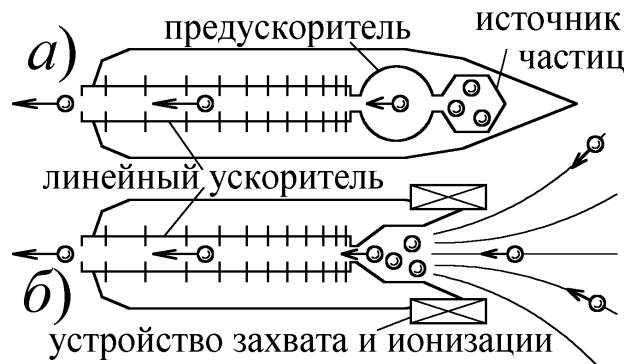


Fig. 199. Space-ray engines.

These engines operate on electric energy [38], but now their projects are mostly abandoned. And in vain, because unlike chemical ones, they can work on any substance, including water. In the engine, when heated, it turns into plasma - an ionized gas, which either immediately enters the plasma accelerator, or is divided into positive and negative ions entering different accelerators, at the exit from which the particles acquire the required speed. The engine can also be used as a transmitter of cosmic rays - the ship can beep with the engine switched to pulsed mode.

The question remains about the power source of the accelerator, which provides the required power and is capable of imparting enormous energy to the particles. Of the known energy sources, nuclear and thermonuclear are suitable.

Modern problems in the creation of new energy sources are associated with the same quantum-relativistic theories, which do not give adequate ideas about the structure of particles and how to get energy more efficiently from their decay and synthesis. This means that from this side the path to space runs through the microcosm, through a correct understanding of its structure (§ 5.8). By the way, nuclear rocket engines were also developed at one time, but then they were abandoned [38, 42]. So, we cut off our paths to deep space and locked ourselves on Earth, as in A. Azimov's novel "The End of Eternity".

But it is precisely nuclear and accelerator technology that would be the most natural in rocketry. Historically, space and rocketry are directly related to ballistics and artillery [10, 68], as can be seen at least from the novels of Jules Verne. Hence the terms: ballistic trajectory and missile, ballistic pendulum, ballistic launch or descent, etc. And powerful telescopes are often compared to anti-aircraft guns aimed at the sky. But nuclear technology is closely intertwined with ballistics. Hence its terminology: cannonball bombardment, cobalt cannon, recoil, target, etc. The discoverer of the nucleus, Rutherford, compared alpha particles to projectiles, and nuclei to armor, and today, powerful accelerators are compared to heavy artillery. Everything goes to the point that it is nuclear physics, high-energy physics that will become the basis for spacecraft [38]. It is interesting that S.P. Korolev investigated the possibility of nuclear rocket engines as an alternative to chemical ones, and discussed this problem with I. Kurchatov. But, if at that time their development seemed risky, due to the tight deadlines of the space program, now there is no longer any obstacle to the development of nuclear engines. Moreover, it is in outer space that the use of nuclear energy would be the safest, most environmentally friendly and efficient.

But this is about the energy for the spacecraft. What about fuel? For superluminal ships, the need for fuel reserves will either greatly decrease or disappear altogether. Indeed, at speeds close to the speed of light, particles of rarefied interstellar gas are encountered quite often, and the ship can collect them on its way, turn them into plasma (say, with powerful laser pulses) and, after accelerating, fire them from the nozzles (Fig. 199.b). Collecting particles from the path is also necessary because at high speeds they offer noticeable resistance to movement and can pose a serious danger. At such speeds, the interstellar medium is perceived as dense, and the spacecraft can fly according to the principle of a jet plane, the turbine of which also sucks in the oncoming air, accelerates it and throws it back with great speed [42].

So, one has only to assume that the classical law of addition of velocities introduced by the BTR is valid for light, and the path to Space will be open (Fig. 200)! The BTR sweeps away all light barriers and paves the way for the stars. There are no, and cannot be, any restrictions on the speed of material bodies and signals in space. And the particles of cosmic radiation are a vivid example of this!

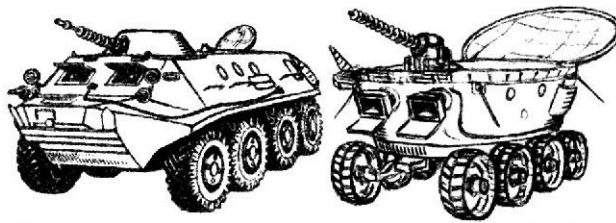


Fig. 200. Into space on off-road vehicles 8×8 ! The Lunokhod chassis (right) was developed by VNII-100, the main scientific base of the armored forces.

All this would seem fantastic and unfounded, if not for the individual experimental data presented above. In addition to such indirect evidence as the absence of natural sources of cosmic rays, the inexplicability of their enormous energy and intensity variations, there are concrete facts proving the possibility of superluminal velocities and the artificial nature of the powerful component of cosmic radiation. Usually, these facts are either ignored or deliberately hushed up, so as not to harm the accepted model of the world.

One gets the impression that someone deliberately prevents a person from entering distant space and, for this purpose, actively supports the theory of relativity, blocking all alternative scientific concepts, such as the BTR. How can there not be a hypothesis about the diversion of aliens, as if in the mentioned film (§ 5.10) causing the death of spacecraft, the same "Phobos" and Mars rovers (§ 2.1)? The real reason, as it was found out, is the fallacy of the SRT. However, if just such forces support the SRT and hinder the BTR, then the filmmakers were not far from the truth.

Therefore, it is reasonable to revise the picture of the world imposed by quantorelativists, which turns people into slaves of ridiculous, unnatural laws that forever lock humanity on Earth. In order not to betray the cosmic parting words of Tsiolkovsky and his views on fundamental questions of physics, one should strive to Space, to the most distant lands, stars and galaxies scattered across the boundless ocean of space. This is how people once aspired to distant islands and continents, this is how Columbus was torn into the unknown abyss of the ocean! And the inhabitants and the orthodox, ready to make fun of such projects and in every possible way to prevent them, were enough at all times. They ridiculed both Columbus and Tsiolkovsky. But time puts everything in its place.

Now we see that it was Tsiolkovsky who was right, convinced, like other rocket designers (including SP Korolev and MI Duplishchev [47]), in the depravity of the theory of relativity, which stands as a solid barrier on the way to truth and the stars. Tsiolkovsky believed that Humanity can be truly free and self-realized only in the open space of space and countless starry worlds. If the vocation and the highest meaning of a person's life consists in fulfilling his destiny, his dream, then the highest meaning of the existence of Mankind consists in conquering the distant Cosmos, in spreading to the most distant corners of the Galaxy and the Universe. This is the only way to save Mankind. Eternally staying on Earth, people are unarmed in the face of global cataclysms, and sooner or later they will devour themselves, like bacteria in a closed volume of a nutrient medium, will become obsolete during global military conflicts, in a

crisis of overpopulation and pollution, with exhaustion of resources. And the foreshadows of this are already visible. Therefore, the path of Humanity inevitably leads to the stars! It is the BTR with cosmic rays that allows you to discover, master and travel this star path, breaking out into the vast expanses of space.

§ 5.12. Materialistic approach in science

Relativism - An idealistic philosophical doctrine that denies the possibility of objective knowledge of reality due to the alleged complete relativity of our knowledge.

Relativist - Follower, supporter of relativism.

S.I. Ozhegov, "Dictionary of the Russian language"

The definition of relativism given by Ozhegov can well be attributed to both Einstein's relativistic theory and quantum mechanics, which put the observer and the subject in the first place and thereby deny the existence of objective reality independent of the observer (§ 4.13). Indeed, within the framework of quantorelativistic theories, such concepts as space and time, mass and length, particle and wave become relative, substantially dependent on the observer, and therefore physically non-existent. Such a relativistic idea of, say, mass, this synonym for matter (its quantitative expression), of course, is not materialistic. Subjective, relative, depending on the point of view and movement of the observer and his frame of reference, can be only those characteristics that are in direct connection with his position and movement - these are coordinates, angles, speeds, accelerations, impulses, kinetic energies of objects.

They can depend on the relative position, motion of two bodies and characteristics associated with the interaction of bodies, for example, force. But they, by definition, do not depend on an external observer who does not act on bodies. That is why the lifetime and mass - intrinsic, objective characteristics of particles - cannot change depending on the frame of reference in which they are measured. And all the visible changes are just an illusion caused by the influence of motion on the relative speed and strength (§ 1.15, § 1.21). The problem of all relativistic theories, whether it be the theory of relativity or the geocentric mechanics of Aristotle, was that they put in the first place just the observer, observational devices, considering their subjective ones as primary, depending on the point of view of evaluation, and depriving the world of its own objective characteristics (§ 4.13). Quantum theory and the theory of relativity were therefore not scientific materialistic theories, because the main role was assigned to the observer, the subject. That is, the world was considered not real, but essentially dependent on an external observer, and instead of the only objective reality, they accepted an innumerable set of worlds of each observer, in spite of rigid determinism and uniqueness of phenomena.

Physics came to such an absurd relativistic vision of the world because of the development in the XX century. formal mathematical method of research, striving to learn, first of all, not the real mechanism of phenomena and the essence of what is happening, but to construct a formal description of the visible world. The choice between theories took place not according to the principle of preference for the greatest simplicity of the theory and the mechanism of

phenomena proposed to it, but according to the principle of mathematical, formal simplicity. So, Einstein stated that he also considered the possibility of building physics and electrodynamics on the basis of the ballistic principle. But he rejected this possibility, because it did not allow the creation of the wave equation [153].

However, mathematics is not a criterion for the truth of a theory. Its criterion is simplicity, naturalness, clarity of hypotheses and correspondence of theory to facts. As for the wave equation, then, as Ritz has repeatedly noted, this equation, written in partial derivatives, is not rigorous, fundamental, does not reflect the essence of natural phenomena, since it admits, like Maxwell's equation in partial derivatives, a set of physically impossible solutions [8] ... Ritz showed that the waves of light are more correct and more accurate given purely kinematically, without the help of differential equations. However, as Ritz himself showed, for such waves obeying the ballistic principle, one can come up with a differential equation: it will be either the usual wave equation (as for waves on water, in which, when passing to another frame of reference, the velocity changes), or the equation Riemann for simple waves, to the class of which kinematic waves belong [103].

Ritz saw that the BTR turns out to be more complex mathematically, since it describes all phenomena in an integral way, reducing everything to the basics, to elementary forces. After all, Ritz's theory, like the MKT or Lorentz's electronic theory, examines the microscopic picture of phenomena, and therefore turns out to be mathematically more complex than phenomenological theories, such as Maxwell's thermodynamics and electrodynamics. But it is precisely this path of addition, synthesis (integral approach) that is physically more accurate, simple and natural than the path of subtraction and division (differential approach). Thus, the differential equations of quantum mechanics and the theory of relativity that arise in modern problems turn out to be so complex that they cannot be solved even on a computer, while similar problems in Ritz's theory are easily and quickly solved on a computer by means of integration by numerical methods. Only integration over all field sources gives the only correct solution. All facts, natural phenomena in correct theories should be reduced to the foundations, the first principles, the primary sources. It was not for nothing that Democritus, Newton, Lomonosov, Mendeleev were always looking for the foundations, and therefore they achieved success. Likewise, Louis Poincaré, as a supporter of a visual, geometric approach in physics, wrote: "In no case should one consider that science is finished if it was possible to reduce it to analytical formulas. Nothing frees us from studying the phenomena in ourselves (in their essence)" [69].

The formal analytical approach very rarely leads to the establishment of objective truth. An example of such a formal approach is the geocentric system of the world of Aristotle-Ptolemy, in which the parameters of spheres and epicycles were artificially mathematically selected, which made it possible to achieve the correspondence of the apparent motion of stars and planets to the theory. Another example was the theory of relativity, which also ensured the formal correspondence of Maxwell's theory to experiments with the help of an

artificial conditional mathematical agreement. Finally, the quantum theory of the atom is the same Ptolemaic geocentric system, where, purely mathematically, the rules of quantization, the parameters of electronic spheres, orbits, and shells, were artificially introduced and matched without any mechanical and experimental grounds.

On the other hand, there were many unsuccessful mechanical models. So, Maxwell built his electrodynamics on the basis of a complex mechanical model of rollers, balls and gears of the ether. It is the complexity and artificiality of this model that was the reason that Maxwellian electrodynamics turned out to be erroneous and not consistent with experience (for example, Michelson's). Also unsuccessful was Rutherford's planetary mechanical model of the atom (which did not explain the stability and spectra of the atom). The fallacy of these, in fact, classical models led to the fact that scientists completely rejected the mechanical, classical materialistic basis of phenomena. In the course of such a formal rejection, the theory of relativity arose from Maxwell's theory, and from Rutherford's model of the atom - quantum physics and mechanics, these non-classical theories. However, the fallacy of individual mechanical models does not yet mean the fallacy of the mechanical approach and classical physics in general, but should prompt the search for other, simpler, natural and adequate mechanical models that better explain the essence of natural phenomena. Such models in electrodynamics and atomic physics were found by Ritz.

Only thanks to the materialistic approach, which recognizes the existence of an objective reality independent of the observer (whence comes naturalness, simplicity, cognizability of phenomena), such scientists as Democritus, Mendeleev, Ritz, Tsiolkovsky came to their great discoveries [162]. No wonder Democritus, as the first materialist scientist, criticized the relativistic theories of Aristotle [31, 105]. And relativistic scientists who created non-classical physics, adhering to non-materialistic, idealistic views and reducing everything to supernatural, transcendental, mystical entities, putting the subjective world of the observer in the first place, always led science into a dead end, into the darkness of biblical, medieval mysticism. Such scientists as Aristotle, Einstein, Lemaitre, Eddington, Compton, Heisenberg openly defended idealistic views [29, 156]. And it is completely incomprehensible how their non-materialistic theories could be accepted by the scientific community.

An example of such a subjective, divorced from reality, speculative nature of the construction of theories is given by many "scientific" discoveries of Aristotle, who, for the sake of his speculative system of ideas, believed, for example, that a woman has fewer teeth and ribs than a man, that a fly has not 6, but 8 legs. At the same time, Aristotle did not even bother to count the number of teeth, ribs and legs at least once, although he was twice married and was famous as a zoologist. And the worst thing is that all subsequent theoretical scientists, who considered Aristotle an indisputable authority, despite these glaring contradictions to experience, continued to count in the same way for many centuries, without trying to doubt it and check it out. With the same ferocity, they defended the Aristotelian geocentric system of the world, even when the much more accurate and natural theory of Copernicus appeared.

We meet the same attitude at the present time when considering the creations of theoretical physicists, for example, Einstein, this modern analogue of Aristotle, a lover of speculative experiments and an indisputable authority who created a scientific concept, mechanics as obviously absurd as Aristotelian. And just as fiercely, his theory of relativity and quantum photon theory are defended by armies of theorists. They simply ignore the apparent discrepancies between Einstein's theory and experiments and space observations that support Ritz's theory. Such a relativistic, disdainful attitude to reality, to observation, to experience is very accurately reflected in the remark of Einstein's wife when examining the giant 2.5-meter telescope of the Mount Wilson Observatory. Learning that he serves to study the structure of the Universe, Elsa Einstein mockingly replied that a piece of paper for theoretical calculations is enough for her husband [58, p. 159].

From the above, we can conclude that **a true physical theory should be purely materialistic, built on the basis of objective data and facts, and not on the basis of the subjective ideas of individual observers and theorists.**

As soon as speculative, unsubstantiated hypotheses that contradict all our life experience penetrate into science, we need to sound the alarm and analyze such hypotheses extremely critically. Only natural, visual, simple mechanical, materialistic models have the right of preferential use and should be admitted to consideration in the first place.

§ 5.13. Mechanical engineering approach in science

I am the purest materialist. I admit nothing but matter. In physics, chemistry and biology, I see one mechanics. The entire cosmos is just an endless and complex mechanism.

K.E. Tsiolkovsky [69]

In modern science, a formal, analytical way of describing phenomena reigns, and the essence of the phenomena is not clarified by formulas (as, say, in classical physics), but is obscured (as in the quantorelativistic theory). It must be remembered that mathematics and formulas are not an end in themselves, but only tools of science, even a kind of crutches. Mathematical formalism, the conditional acceptance of new unfounded hypotheses, such as Bohr's quantization rules or the second postulate of SRT, is an unscientific method. The essence of the scientific method is to reduce everything to mechanics, to visual movement, combination and disintegration of bodies and particles. In the world, as Democritus understood, there is nothing but matter - particles that are floating around in empty space. Only an atomistic, mechanical model of the world will be truly materialistic, scientific. The study of nature should be approached with an engineering method, considering its laws and objects as mechanical structures, arranged in the most simple, beautiful, harmonious, rational way, considering Nature to be a brilliant engineer. The idea of one engineer can only be understood by another engineer. Therefore, to analyze the creations of nature, one must think creatively, engineering, constructively, using geometry, mechanics, spatial imagination. As Lomonosov said, "Nature is simple and does not flourish with unnecessary reasons." The world is arranged

extremely simply and economically, and therefore the laws of nature are quite comprehensible - there is no supernatural in them. This is how Occam formulated his famous principle, and Copernicus was guided by the same when building a new system of the world. There is nothing beautiful about the heaps of intricate and abstract formulas, like crutches and props. They do not correspond to the real structure of the world, unlike simple mechanical models.

When science moved away from visual mechanical analogies, it reached a dead end: in antiquity and the Middle Ages, when they ridiculed the atomistic ideas of Democritus and extolled the speculative fantasies of Aristotle; in modern times, when abstract fluids flourished along with the atomism of Newton and Lomonosov - caloric, phlogiston, ether; or now, when classical particle mechanics is in disgrace, and uncertainty and relativism are extolled. Many scientists like to ridicule crude visual mechanical models, considering them too primitive, unscientific and attaching too much importance to the ideal, immaterial, mathematical, abstract description. But, as the history of science shows, it was precisely the "rough", simple mechanical models, often built by non-specialists, ordinary people, engineers, that have always promoted science most strongly and were the key to solving problems. This is how Democritus built the atomistic hypothesis, which turned out to be the greatest insight and achievement of ancient science. But idealist philosophers such as Aristotle, who believed that the world could not be so grossly mechanistic, but should be basically ideal, abstract, mathematical, criticized Democritus and in every possible way contributed to the oblivion of his concept. In the same way, Tsiolkovsky's contemporaries criticized his engineering ideas, in their application to fundamental issues of physics and cosmology. Similarly, academics now criticize Ritz's mechanistic theories.

And yet it is precisely the mechanistic, engineering approach to phenomena that turns out to be truly materialistic, since it reduces all phenomena to a few basic and known ones, to visual models, in fact, to the mechanics of the movement of material particles in emptiness. Any bodies and objects, according to this materialistic theory, are combinations, conglomerates of particles of different levels. And any energy is, ultimately, the kinetic energy of particles (§ 1.14, § 3.16, § 5.14). That is, it is the mechanical approach that corresponds to Occam's principle - not to introduce supernatural, abstract objects: fluids, strings, space curvatures - all these complex speculative hypotheses, until the possibilities of simple and classical ones have been exhausted. Walter Ritz has always insisted on this. Another famous physicist W. Thomson (Lord Kelvin) also considered mechanics to be the basis of everything and therefore said: "The true meaning of the question is: do we understand or do not understand a physical phenomenon? - boils down to the following: can we build our own mechanical model or not? "No wonder Thomson, as a follower of mechanism, was one of the active and strong defenders of classical physics, and believed that Michelson's experiment and black body radiation are classical, but no explanation yet found.

To Thomson, we owe much to the development of the molecular-kinetic theory and its application to various branches of physics, including electrodynamics and gravity (it was Thomson who revived Le Sage's corpuscular theory of gravitation, similar to Ritz's theory). This atomistic, mechanistic view of things has always propelled science forward significantly. The classical mechanical picture of the world gave science the most important laws of conservation of mass, energy, momentum, charge, etc. The rejection of mechanical models leads to oblivion of these hard-won laws. In everything, one should rely on facts and build a theory only on their basis, as the literary hero Sherlock Holmes taught, otherwise we risk surrendering to the power of empty fantasy, abstract formalism that has nothing to do with reality. So, Einstein admitted that he built his theory not on the basis of experimental facts, but purely speculative. But facts are the air of a scientist, without which science will suffocate. It is only necessary to interpret them correctly according to Holmes' recipe, to select the undoubted ones from them, freeing the inhabitants from speculation. However, a pile of facts is not science, just as a pile of bricks is not a building. In order to correctly understand, systematize, link together facts, without adjustments to build them into the building of a scientific theory, one must possess the correct method of cognition. Without it, scientific research is like a blind wandering. Perhaps that is why now, from the corruption of the mind by abstract, non-materialistic, unscientific theories and oblivion of the correct methods of cognition, discoveries that have become not the result of a systematic search, but the lot of rare scientists who accidentally stumble upon particular solutions, have been crushed.

The correct and rational method of research usually develops among engineers - their thinking by its very structure is constructive, alien to empty philosophy and meaningless abstractions. After all, the abstract-theoretical approach that has permeated modern science is by definition abstracted, distant from reality, which gives rise to non-classical theories that have no relation to it and physical meaning, while the engineering approach is as close as possible to reality. That is why at all times the most daring, innovative, interesting and correct physical ideas were put forward by people with an engineering, technical mindset, who love tinkering, constructing: Archimedes, Heron, Leonardo da Vinci, Copernicus, Galileo, Newton, Lomonosov, Kulibin, Ritz, Tesla, Tsiolkovsky, Belopolsky, Meiman, Duplishchev. So, for example, Leonardo da Vinci was the first to build the correct theory of the flight of projectiles along a ballistic trajectory, contrary to the dominant mechanics of Aristotle. Leonardo was a versatile engineer who designed many buildings and machines of the future, including the first armored personnel carrier, like modern armored personnel carriers, having a bipyramidal, biconical body and capable of firing in all directions (see the picture on the last page of the book). It is no coincidence that Leonardo, in his optical research, developed the atomistic ballistic theory of light of Democritus and Epicurus, along which bodies scatter light particles (images) in all directions, forming successive spherical fronts, thereby explaining the wave properties of light (see [Leonardo da Vinci. Selected works. M.: Ladimir, 1995](#)).

Even more amazing are the successes of domestic engineers, self-taught, such as Kulibin, Tsiolkovsky, who, having neither education nor support, built

technology of the future at their own expense and literally discovered complex physical laws at home. Thus, the great Russian mechanic I.P. Kulibin (a probable prototype of Leskov's Lefty) was able, on the basis of his own experiments and observations, back in the 18th century to delve deeply into the laws of physics, chemistry, mechanics, and resistance to materials, having built unique machines and structures that had no analogues for a long time. Among them are not only unsurpassed microscopes, telescopes, mechanical toy watches, electric cars and micro-automatic machines, but also working models of bridges, self-propelled ships and carts. The development of optical technology was a century ahead of Kulibin's giant projectors and searchlights, his pyrotechnic devices, the creation of which required masterly mastery of the laws of optics, ballistics and chemistry. Despite this, the contribution to science and technology of Kulibin, as well as the contribution of Tsiolkovsky - figures comparable to Archimedes, Heron and Leonardo, are still underestimated. Their living innovative ideas aimed at making labor easier, at the prosperity of mankind, at the service of the people, were suppressed by the priests of academic science, for the most part - dead and practically useless.

But engineers were the first to readily accept the bold new ideas of these and other thinkers, and began to develop and apply them in practice. Here is what he writes, for example, about K.E. Tsiolkovsky A. Kosmodemyansky: "Many scientists did not understand him. He published his articles in journals that rarely attracted the attention of officially recognized scientists. For most scientists, the very subject of the basic research of Konstantin Eduardovich was irrelevant. With the "general consent" military powder rockets were buried in the 80s of the XIX century "[69, p. 175]. Note that the same is fully true in relation to ballistic theory and rhythmic electrodynamics, together with all classical science, buried at the beginning of the XX century. And although the merits of Tsiolkovsky and the prospects of the missiles were eventually proven and recognized, still nothing has changed since then. Until now, they are silent about Tsiolkovsky's works on cosmology and fundamental issues of physics. Until now, articles on the classical interpretation of "non-classical" effects are not admitted to the pages of scientific journals. And therefore, the most advanced and bold-minded are still the engineers who were the first to accept Ritz's ideas.

Speaking of Ritz and the engineers, an interesting detail should be noted: we can say that Ritz's name is invisibly present on any drawing. The fact is that the widespread designation of roughness and roughness R_z (with a $\sqrt{}$ and a corresponding numerical index) in drawings comes from the German word Ritz, which means "scratch, crack" (hence the word risk). The name of Ritz and his ideas, indeed, became an unpleasant scratch, a hitch on the seemingly so perfectly sleek monument of the theory of relativity and quantum mechanics. Ritz suggested a direct, but, for others, a thorny, uneven, perky way. Therefore, scientists tried in every possible way to erase his name and ideas from scientific literature and the memory of mankind (as they did once with the works of Democritus). The truth about Ritz was too uncomfortable. But it turned out the opposite: the scratch began to grow into a crack, which would inevitably split

the monument of non-classical physics, and then lead to its complete collapse. Then the abstract model of the world will be replaced by the working mechanical engineering model of Ritz.

Scientists-theoreticians, who cannot think creatively, constructively, visually, and therefore do not feel nature, are the complete opposite of scientists-engineers. A striking example of this is the technical and mechanical illiteracy of Aristotle, who preferred a speculative style of research, despised physical labor and experience, rough matter, and therefore created a non-materialistic theory. Aristotle hated visual, understandable models (such as the atoms of Democritus), and therefore despised geometry and reproached his teacher Plato for geometric studies that went to the detriment of abstract philosophy. Likewise, Einstein, who preferred the real - a thought experiment, was mechanically illiterate, organically incapable of sensing the laws of nature, mechanical and visual geometric modeling. This demonstrates at least an example of how Einstein theoretically calculated the optimal shape of an airplane wing profile. The result was something ugly and perverted - an airplane with an oblique, curved humped wing - and here Einstein took the path of falsehood. That is why this plane during the tests showed itself from the worst side and almost crashed [58, 73].

It is precisely this category of theoretical scientists that, apparently, constitutes the bulk of modern scientific circles. Due to the fact that science becomes too abstract, abstract, divorced from reality and from the practical needs of society, the scientific theoretical concepts themselves are also obtained far from reality. With such a passion for science for the sake of science itself, a scientist, moving away from society and its needs, inevitably loses interest in the real world and goes into the world of his abstract fantasies, the farther, the more muffled, starting to imagine himself almost like God, free to impose on Nature his invented laws. That is why Aristotle (a philosopher who despised physical labor, rough matter, who considers himself to be a master race, which slaves should maintain, and who is proud of the complete practical uselessness of his speculations and theoretical research) invented completely absurd concepts of continuous motionless ether, of a cosmos enclosed in crystal a sphere with the Earth in the center of the world, developed a ridiculous mechanics. And Einstein, Bohr and all other creators of the modern non-materialistic quantorelativistic picture of the world followed in his footsteps.

A true scientist, capable of cognizing the world, is a scientist-engineer, technician, inventor, experimenter, who is primarily engaged not in creating a super-cumbersome theoretical, speculative concept, but in searching for the real laws of nature and its beginnings. Such a scientist does not care about his private interests and the triumph of his concept at any cost, even in spite of experience, but is looking for objective knowledge and methods of using this knowledge about the structure of the world - for practical socially useful purposes. This is why neither Einstein nor Bohr is known for anything of practical significance. At the same time, discoveries, social, scientific and organizational activities of scientists-engineers and experimenters, such as Lomonosov, Kulibin, Mendeleev, Stoletov, Ritz, Tsiolkovsky, Belopolsky, J.

Thomson, Tesla, Meiman, Duplishchev, had many practically important consequences. Hence it follows that a real Scientist is not the lord of Nature and not a burden of society, but a disciple who learns wisdom from Nature, and a servant who transfers this wisdom to society. Therefore, society supports the scientist within the framework of this social symbiosis.

Thus, in order to understand and feel the laws of nature, **a scientist must be mechanically literate, must be able to work with his hands, design, must love physical labor, work in a laboratory, must be a designer, creator, artist in order to feel the beauty of Nature and the mechanisms created according to its laws, devices.**

Democritus, Leonardo da Vinci, Lomonosov, Mendeleev, Ritz, Tsiolkovsky, Tesla, Belopolsky met all these requirements, but Aristotle, Einstein and Bohr did not meet.

§ 5.14. Atomism or Energetism?

It is very well known that heat is excited by motion: from mutual friction, the hands warm up, the tree ignites with a flame; when the flint hits the flint, sparks appear, the iron heats up from forging with frequent and strong blows ... From all this it is quite obvious that a sufficient basis for heat lies in motion. And since motion cannot occur without matter, it is necessary that a sufficient basis for heat lies in the motion of some matter.

M.V. Lomonosov, "Reflections on the nature of heat and cold", 1750

This book has repeatedly shown that the BTR is a vivid example of the atomistic concept. That is why the ballistic theory is so close to the views of Democritus, Lucretius, Galileo, Lomonosov, Mendeleev, and Tsiolkovsky, who always opposed their atomistic doctrine to the mystical concepts of contemporary science. But for the same reason, the atomism of the BTR is not recognized by modern science. It would seem that the atomistic picture of the world is reliably recognized by the scientific community, while the mystical inventions of Aristotle, who rejected the atoms of Democritus, are reliably forgotten. But this only seems to be, for now in science views prevail that reject the materiality of the world and atoms. Indeed, if you look closely at today's physics, it becomes clear that it follows the program of not Democritus, but Aristotle, who rejected matter and atoms as the basis of the world.

So, in the current electrodynamics, the idea of a continuous electromagnetic field is introduced - an ideal medium that continuously fills all space, like Aristotle's ether. And according to Lucretius and Democritus, there is nothing in the world except atoms (particles of matter) and emptiness (nonexistence), which has no properties (Part 3). In SRT, mass (including the mass of atoms), this is the main property, the amount of matter, is considered relative, depending on the observer and therefore objectively non-existent (§ 1.15). Atoms, mass, matter can appear and disappear, turning into energy, again contrary to atomism (§ 1.16). In general relativity, the Universe is assumed to be finite in space and time, as well as closed in a sphere, which also runs counter to the teachings of Democritus, but agrees with Aristotle (§ 2.6). According to Einstein, space is, in addition, curved by the action of bodies, again contrary to Lucretius, who considers space to be nothingness, having no structure and properties (§ 2.2).

Finally, quantum mechanics denies matter, atoms in the last property - the certainty of their position and motion: particles are smeared in space and time, representing waves, energy excitations of a certain medium or even space itself (§ 4.10, § 4.11). The fact that the theory of relativity and quantum mechanics are, in fact, a return to the non-materialistic views of Ostwald and Mach, opposed to atomism, is no longer a secret to anyone [78, p. 410]. It is no accident that mystics, the church and religious fanatics immediately supported quantum mechanics, the theory of relativity and the cosmology of the Big Bang based on it [58, pp. 79, 159], just like the scholastic theologians of the Middle Ages - the cosmology and physics of Aristotle. After all, all these concepts, under an outwardly logical and pseudo-scientific form, concealed certain vague, transcendent, principles alien to the human mind, which fully correspond to the inventions of obscurantists and clergymen, but contradict the simple materialistic picture of the world.

Thus, in modern science, under the guise of accepting atomistic views, in reality, completely opposite non-materialistic views of Aristotle are being implemented. This trend in science, which is always opposed to atomism, is usually called energetism, energy theory. After all, it was energetism, which was clearly manifested at the end of the 19th century, that set itself the task of rejecting the doctrine of atoms and reducing everything to abstract energy, which it considered primary, while matter, its movement was considered secondary manifestations of energy. Atomism, on the contrary, reduces all types of interactions, energies to manifestations of matter, atoms and their motion, as Democritus and Lomonosov taught (§ 1.14, § 3.16). So, atomism is a synonym for materialism, which recognizes the primacy of matter. It is not for nothing that Leucippus and Democritus are considered the first consistent materialist scientists. On the other hand, energetism, which rejects the primacy of matter and largely agrees with modern science, is an anti-materialistic, idealistic concept. That is why energetism, energy theory is considered a kind of physical idealism, which considers matter to be just a form of energy manifestation, as the main defenders of energetism V. Ostwald and E. Mach, these famous idealist philosophers, argued [156]. It is no coincidence that Einstein, in constructing his theories, largely relied on the teachings of Mach [78]. Therefore, many consider the current relativistic non-classical science to be non-materialistic (§ 5.12). By the way, many quantorelativists, for example Eddington, Compton, Heisenberg, did not even hide their idealistic, energetic views and openly defended the Aristotelian doctrine, for example, that atoms are unreal, but are only energetic excitations of the environment-space.

It is surprising that today's scientists, having before their eyes so many examples of the triumph of the atomistic model of the world, continue to follow the opposite, energetic concept. So, for a long time, heat, electricity, light were associated with the movement of certain energies, fluids, respectively - caloric (phlogiston), electrophore and ether. But even Democritus proved that thermal energy is only a manifestation of the chaotic movement of atoms (§ 4.16). This concept was supported and developed by Lomonosov, who rejected caloric and proved that thermal energy is inextricably linked with the movement of matter

and has no meaning without matter, does not exist. Later it was proved that electric current is not an abstract energetic fluid, but just a stream of particles of electrons, as the ancient atomists guessed (§ 4.17). Finally, scientists recognized that the ether does not exist, but they still continue to consider light as the movement of pure energy of the electromagnetic field (§ 3.21). And even when particles of light (photons) are introduced in modern physics, they are considered by no means particles of matter, but immaterial bunches of energy that have no size, shape, or mass. And only Ritz's ballistic theory gives light a materialistic interpretation, linking it with the movement of weighty particles (rheons) with specific sizes and masses and also predicted by Democritus. Also, all other types of energy, including nuclear, the BTR reduces to mechanical energy of the motion of matter and its particles, being an exhaustive embodiment of the program of Democritus (§ 3.16). But the modern concept of energy becoming mass in nuclear processes is a complete analogue of phlogiston, caloric, converted into mass from thermal energy in chemical processes and for this reason rejected by Lomonosov (§ 3.13).

Nowadays even a schoolchild knows that not mass, but precisely energy, as a property of moving matter, is a secondary and relative concept. So, if in the ground reference system a flying bullet has a lot of energy, then for a pilot in an airplane flying at the same speed, the bullet looks stationary, its energy is zero, and therefore for the pilot the bullet is harmless, it can literally be grabbed by hands on the fly [95]. However, to this day, many scientists continue to consider energy as primary, and matter as secondary, as relative. It is these idealistic scientists who endow particles with wave properties, considering light to be only an energy wave. Such an energetic view of things allows one to create chaos in physics with impunity - to consider particles as smeared in space, and light as having the same speed in different frames of reference. After all, energy in isolation from matter is not localized in space and time. It is no accident that A. Stoletov (§ 4.3), a principled opponent of energetism, who immediately guessed in this idea an attack on materialism and classical science, came out against the idea of wave-particle dualism in the 19th century. In the same way, Stoletov ridiculed Ostwald's idea of the transfer of radiant energy in absolutely empty space, without the participation of matter. But it is precisely such an absurd energy idea that field electrodynamics and the theory of relativity are now putting forward (what now empty space, vacuum, is called a "physical field" and "physical vacuum" means only a formal replacement of idealism with physical idealism). It is not for nothing that energetism was attacked by supporting Stoletov, and such well-known defenders of the atomistic doctrine as Mendeleev and Boltzmann [23, pp. 485, 500].

Usually, energetism is associated with the names of W. Ostwald and E. Mach, who were irreconcilable enemies of the atomistic doctrine, who fiercely attacked Boltzmann, which led to the death of the latter. But, in reality, energetism has much deeper roots and goes back to the era of antiquity, when the physical idealism of Aristotle, who denied atoms, already existed. Ostwald and Mach, like the scholastics of the Middle Ages, only repeated the erroneous views of the idealists of antiquity, who considered atomistic, materialistic views

too crude and naive [78, p. 238]. And later, science always turned on the curve of mysticism precisely under the influence of energy scientists, who took physics away from the direct path of atomism (representatives of these two opposing schools are compared in the table from the appendices). One of these turns occurred with the advent of Maxwell-Faraday electrodynamics, when they left the direct path of Ampere, Weber and Gauss. After all, Maxwellian electrodynamics was a continuation of the dynamics of Aristotle, describing the motion of bodies exclusively in continuous media and fields, such as ether [105], in contrast to the atomistic approach, which studied the motion and collision of particles in a vacuum.

Indeed, Maxwellian electrodynamics began with M. Faraday, who, according to W. Ostwald, was an adherent of energetism. It was Faraday who brought Newton's dynamism to the extreme limit and, in contrast to mechanism, considered that force, energy is directly given, while "matter disappears, and its qualities are nothing more than the properties of fields and forces in empty space" [78, pp 86]. And many note that such a superficially descriptive method of Faraday's research is most reminiscent of Aristotle's blind wanderings and speculations [61]. Therefore, as soon as a physicist begins to assert that it is forces, fields, energies, waves that are a given, that they are primary, the alarm must be sounded. It is not for nothing that the scientific world met Faraday's works with great skepticism, although later physicists, under the influence of Maxwell, nevertheless succumbed to Faraday's energetics. As a result, energy Maxwellian electrodynamics, the theory of relativity, quantum mechanics, relativistic cosmology, which in spirit are equally opposed to the atomism of classical science, as physicists noted at the beginning of the 20th century, grew out of this. [72, p. 360]. And only ballistic theory restores the status quo and returns physics to the atomistic channel. After all, the basis of physics is atomistics, and everything else is mysticism. It is no coincidence that Poincaré identified classical physics with atomism, opposing them with non-classical energy physics [101].

It is worth noting that Ostwald, under the pressure of irrefutable arguments, admitted the fallacy of his energy theory in 1908, famous for many victories of classical science. By this time, indeed, the existence of atoms could no longer be disputed. However, the proponents of energetism, recognizing the reality of atoms, did not lose anything, since by that time the quantum theory and the theory of relativity had appeared, which made it possible, even recognizing atoms, to consider them as energetic entities. This is how Bohr, in his theory, represented the atom as a set of energy levels, and Bohr put forward the so-called correspondence principle, which makes it possible to shift all simple atomistic, classical explanations into a quantum way (this is how he perverted the Ritz spectral formula, obtained classically). This is how common sense and the just recognized atomistic theory were deceived.

As F. Soddy notes, such a distortion of the ideas of Democritus was practiced before. In the Newtonian era, under the guise of accepting ideas about atoms, mystical doctrines were in fact carried out, since atoms, as in modern quantum mechanics, were denied materiality, in the presence of clear sizes and shapes, in

fact, setting, according to Democritus, the properties of bodies and chemical compounds (§ 4.14) ... And the impact, contrary to Democritus, but in accordance with the theory of relativity and Maxwell's electrodynamics, was interpreted not as a result of particle impacts, mechanical shocks of atoms, but as mystical field and force influences introduced by Newton [139, p. 35]. With the filing of Newton, Dalton and Einstein, different properties of objects and the color of light rays began to be explained by the difference in masses and energies of the particles that form bodies and light, and not by the geometric shape and mutual position of these particles according to Democritus. So, revered for the founder of scientific atomism, Dalton, did not discern not only the nature of color, but also warmth (which, according to the brilliant insight of Democritus, Boyle and Lomonosov, consisted in the space-time grouping and movement of microparticles). This delayed the mechanical, atomistic understanding of light, heat and other influences for a long time, giving rise to a number of mystical, abstract, energetic substances, like caloric, phlogiston, electromagnetic field, devoid of atomic structure.

So, when studying a theory, you need to be on the lookout, because very often, under pseudo-scientific formulations, the authors of non-classical theories imperceptibly carry out irrational non-materialistic views, rejecting matter and its basic qualities.

Everyone who wants to engage in science must first clearly decide for himself whether he accepts the atomism of Democritus and the materiality of the world, or energetism, with its subjectivism, relativism and denial of matter. If the first path leads to the future, on a straight, light avenue of Ballistic theory going into infinity, then the second path turns into a dark curved street of the current non-classical science.

§ 5.15. Clarity, naturalness and simplicity are signs of a correct theory

This concept [SRT] obliges us to replace simple axioms of conservation of mass, immutability of rigid bodies, parallelogram of velocities, etc. (axioms that we must abandon only in the most extreme case) complex relations that create significant difficulties for the imagination (like the difficulties of understanding a curved three-dimensional space), with which, in principle, it is impossible to work strictly, except through analytical consideration.

Walter Ritz, "A Critique of General Electrodynamics" [8]

The main features that distinguish today's non-classical physics and cosmology are, as Ritz correctly noted, their excessive formalism, abstractionism, excessive mathematization, and the absence of visual images and models. Because of this, scientists have to work with unimaginable, physically ineffable objects that cannot be visualized visually, having found analogues for them in our world. But it is the imagination, intuition, visual-geometric style of thinking that have been at all times the main engines of science. In modern science, ideal conditions have been created for the prosperity of mediocrities, bureaucrats, routineers who do not have imagination, are indifferent to nature and are not aimed at finding the truth, who can only manipulate formulas purely automatically, pour from empty to empty, without

giving much thought to the essence of what is happening in reality. What could be simpler and more primitive than wandering blindly and aimlessly in the labyrinth of formulas until you accidentally discover a useful solution? That is why in modern physics and astrophysics, in universities and institutes, there are so many formalists, nominal workers, and so few creatively thinking people. That is why there are so few great discoveries today, as if their source had already dried up. In reality, of course, it is inexhaustible, and people simply forgot how our predecessors obtained knowledge and discoveries from it.

In the old days, scientists thought quite differently. They tried to comprehend the world, and not just get its mathematical description, they tried to discover the origins, the causes of phenomena, and not reduce them to transcendental entities. Thanks to the developed imagination, visual representations, this search was purposeful and effective. It was the desire to search for the first principles that allowed Democritus, Galileo, Newton, Lomonosov, Mendeleev, Ritz to make their epoch-making discoveries. The works and lectures of these thinkers are saturated with images, visual descriptions, which, I think, served not only as a means of illustration, a colorful depiction of phenomena, but also as the main method of analyzing and searching for fundamental principles. Only thanks to the discovery of the first principles, the phenomena appear before us in a crystal-clear form, becoming simple, understandable and natural. Classical science clarified the essence of what is happening in nature. And non-classical science, on the contrary, seems to be trying to hide, veil, muddy the meaning of phenomena, make them unknowable, transcendental.

This is exactly how the former scholars-theologians, scholastics, followers of Aristotle acted. For them, the first place was not the nature and the real essence of what was happening, but their ridiculous speculative and confusing concepts. A simple, clear and understandable theory was perceived by them as a primitive, as an unreal thing, since it is accessible to everyone. In fact, the truth should be just simple, natural and understandable to everyone. If the theory does not clarify the essence of the phenomena, but only confuses, obscures, then it is worthless. As one well-known physicist said, one must chase into three necks a scientist who is not able to explain the essence of his scientific research to an ordinary child. Nature is arranged simply and beautifully - there is nothing complicated and unknowable in it. By its very nature, it is rational and eschews unnatural, pretentious, complex decisions. Even Lomonosov noted that nature is simple and does not flourish with unnecessary reasons. And there is no mysticism or empty philosophy here. The history of the development of science proves that it was simple, understandable, natural and intuitively clear concepts at all times that triumphed in the end over complex, formal and speculative ones, better explaining the essence of phenomena.

Therefore, clarity, naturalness, simplicity are constant companions of correct theories.

Such theories usually explain a very wide range of phenomena by a few natural hypotheses, each of which has its own intuitively obvious and experimental-physical justification. Such is, for example, the atomistic theory of Democritus and the ballistic theory of Ritz. The complete opposite of such

theories is constituted by abstract non-classical doctrines, such as the theory of relativity or the quantum theory of the atom. In them, Einstein and Bohr call to accept a group of postulates taken from the ceiling, which do not follow from anywhere, are unfounded and, moreover, contradict all our life experience and intuition. And it is not important that some consequences of these postulates are "proven", and not always convincingly. The validity of the consequences in no way proves the validity of the initial premises.

Often absurd postulates are compared with the axioms of Euclidean geometry, which both Einstein and Bohr admired. At the same time, they forget that the axioms of Euclid's geometry are accepted without proof only because they are obvious, intuitively clear, and they simply cannot be verified, deduced from something else. Therefore, in physics, axioms can only be classical, intuitive, natural. If they are non-classical, contrary to common sense, then they can be accepted not earlier than they are proven by direct experiment, and even then there is always a chance of incorrect interpretation of the experiment or, in general, falsification of its results. No wonder such unnatural theories, no matter how many centuries have passed, are rejected by all sane people as something alien, repulsive, organically unacceptable.

That is why, as Ritz rightly noted, scientists must make every effort to fully explore the possibilities of visual classical science, which are far from exhausted. This is necessary not only in order to find simpler and more natural explanations for all known phenomena, but mainly in order to understand and predict something new. Our thinking is accustomed to working not with abstract, but with visual images. Creative search is inextricably linked with figurative, associative thinking, which loses support in the absence of such images, becomes blind wandering. To some extent, a mathematician, this scientist's crutch, helps him to restore balance and go a little further, but with great difficulty and very close. It is impossible to create, to know the world, purely formally, automatically operating with mathematical symbols. They are incapable of discovering new ideas, just as a computer program cannot produce more than the programmer has put into it. After all, the essence of science is not so much about solving problems, but about posing them first, asking the right questions to Nature.

A scientist, first of all, should be enthusiastic, searching, inquisitive, and only secondarily - mathematically literate and educated. The creation and construction of new physical ideas is a creative process, inseparable from physical, visual images and models. Even if these visual models do not always fully reflect the essence of what is happening, they indicate the direction of movement and give new ideas. Therefore, in order to make discoveries, one does not need to wander into the scientific mathematical jungle. It is no coincidence that Newton, although he was the author of integral and differential calculus, preferred to present his "Principles" not in analytical, but in classical geometric language, drawing on numerous illustrative examples. The same can be said about Galileo and Ritz, who were excellent mathematicians, but thought and tried to present their thoughts clearly. After all, as the centuries-old history of science shows, all discoveries and inventions lie in plain sight - in ordinary

natural phenomena, mechanisms - we just need to be able to observe, see, wonder at them, looking at them from an unexpected angle. No wonder the droplet model of the nucleus turned out to be so successful, as well as the ballistic, pyrotechnic Ritz model presented here, which explained the nature of the electron and electromagnetic phenomena. Finally, in many respects it was A. Mayer's magnetic float model that allowed Ritz and Thomson to explain the spectra and structure of atomic shells, the properties of matter. These models turn out to be a support, a compass, a guide in those areas where the human eye is unable to penetrate. The strength of such models lies in the fact that natural phenomena at all levels of the universe are described by similar laws (self-similarity § 5.16) - their number is limited, which is why many models taken in the macrocosm are applicable both in the microcosm and in the megaworld.

And the complete opposite of this visual, model interpretation is mathematical formalism, which, on the one hand, fetters the imagination, dries up science, becomes an insurmountable obstacle on the way to the discovery of something new. On the other hand, the excessive mathematization of physics, as Lenin correctly noted in his work "Materialism and Empirio-criticism", leads to a deviation of physicists from practice, reality towards idealism, transcendental constructions. This resulted in a crisis in physics at the beginning of the 20th century, which led to the emergence of non-materialistic quantorelativistic theories [29]. As a result, abstract theories are recognized as correct, which, in principle, cannot contain visual, beautiful representations and models. The phrase "I believe, because it is absurd" is again honored, and simplicity, beauty, clarity of theory, its mechanistic nature have become almost synonymous with naivety, primitivism, squalor, backwardness. Thus, Heisenberg, the father of quantum mechanics and a supporter of idealism, despised graphic classical pictures and models in physics [154]. Just like in the situation with abstract art, in which classical, understandable, harmonious paintings are contrasted with the ugly abstract non-classical paintings extolled by the trendsetters by mediocre painters who despise the harmony of colors, shapes, proportions, and simply pour out the chaos reigning in their heads onto the canvas. As has been noted more than once [111], this is a clear analogy of modern abstract nonclassical physics.

Mathematical constructions are not an end in themselves of science, but only crutches, additional supports used for more reliable justification and accuracy, for a lack of imagination. That is why modern science is in such a deplorable state. Ritz understood this better than anyone, because he himself was a virtuoso mathematician and had the least fear of mathematical difficulties. But he threw off the mathematical shackles of the imagination, which made it possible to create a visual classical model of the universe. This opened up unprecedented horizons, innumerable ways for possible discoveries and fantastic inventions, since it became possible to visualize phenomena. With the help of the BTR, the path was cleared for the free flight of thought and fantasy. Thanks to this, a sound understanding of the structure of the Universe became possible, it was possible to easily solve many mysteries of space in a unified way (including on the basis of the Ritz effect) without delving into the mathematical jungle.

Completely unexplored and intermediate aggregate states of matter (supercrystals, gas ice, cluster crystals, etc., see § 4.15, § 4.16, § 4.20) were discovered.

Ways have opened up for solving many purely applied practical problems - from high-temperature superconductivity and cold nuclear fusion to projects that seemed absolutely fantastic. The structure of elementary particles, the structure of an electron, which had not even been thought about before (§ 1.18), also immediately became clear. The sub-electronic floor of the world opened, to which there were no approaches. The way has become clear for establishing the deep nature of all known interactions and the mechanism of their interconnection, a single basis. This transition to new horizons of science and the removal of the fetters of spatial and geometric imagination is analogous to the transition from plane, two-dimensionality to three-dimensional space, from black-and-white to color, from the crawling of science and thought on the ground to their flight. But this is only the very beginning! So, the future belongs to visual, simple models, while abstract ones inevitably die out and remain in the past.

§ 5.16. Associative method, unity and interconnection of phenomena

Even in our poems constantly, as you can see, many words consist of many homogeneous letters, But both verses and words, as you will certainly admit, differ among themselves both in meaning and also in sound. You see how the letters are strong with just one change in order. As for the origins, they have even more Means for different things to arise from them.

Titus Lucretius Carus, "On the nature of things", 1st century. BC. [77]

One of the criteria for the validity of a theory, for testing its naturalness, can be considered the ease with which it explains a wide range of phenomena, how accurately and naturally it is built into the mechanism of nature, like a piece of a mosaic that has found its place. In contrast, many scientists, and especially quantorelativists, use unnatural, violent methods. They do not embed their concepts, but try to drive them by force into Nature and into the heads of people, making a rough formal adjustment (suffice it to recall Eddington). If something does not agree, such figures, with the help of a conditional agreement, accept an absurd and out of nowhere following postulate and thereby achieve agreement between the theory and the observed picture of the phenomenon. For example, when Maxwell's electrodynamics could not explain a number of experiments, an unnatural relativistic mechanics of the theory of relativity was artificially created, which made it possible to combine theory with facts. The same reconciling link was Bohr's postulates, together with quantum mechanics, which made it possible to reconcile Rutherford's unsuccessful planetary model of the atom with the fact of the stability of the atom and atomic spectra.

But any correct theory, as the history of science shows, on the contrary, immediately begins to easily and naturally explain a wide range of phenomena, integrating into the observed picture of the world, like a well-chosen puzzle. She

begins to predict and explain a lot at once (this is how it was, for example, with the atomistic theory of Democritus, in contrast to the theory of Aristotle, where for each phenomenon you had to invent your own hypothesis). Such a theory is rapidly, like a snowball, overgrown with facts and finds confirmation in various fields. Democritus and all other creators who think inductively, proceeding from the correct premises, immediately give out an avalanche of associations, a stream of images that make it possible to explain and unite a wide range of phenomena.

That is why theories should be built according to the method of induction, construction from the particular to the general. It is necessary to establish the fundamental principles of phenomena, principles, and if they are found correctly, then from them it is possible to deduce and explain the whole world. A small grain of truth contains a lot at once, from it the whole world sprouts, its integral picture. This is how Democritus, who developed the inductive method, based on the hypothesis that there are only atoms and emptiness in the world, built a surprisingly accurate picture of the world, having correctly understood many phenomena [31]. As Conan Doyle said through the mouth of Sherlock Holmes: "It is necessary to single out undoubted, indisputable facts from the mass of fabrications and conjectures of idle interpreters. Having established the initial facts, we will begin to build our theory based on them." Therefore, Democritus criticized the purely deductive method of Aristotle, who built at first a speculative, not based on a general concept, and then began to fit the facts to it [31]. However, Democritus did not deny the role of the deductive method, since it was he who made it possible to find those initial prerequisites, principles, on the basis of which the whole concept was built. That is how he created his atomistic theory, according to which only atoms and emptiness exist in the world. However, Democritus, in contrast to Aristotle and Einstein, discovered these starting points, beginning not speculatively, but on the basis of experiments and facts, as a result of generalization and systematization of a large number of observations, as can be seen from the poem "On the nature of things" [77]. In addition, it is deductive analysis that allows you to choose the correct version from several constructed theories.

Therefore, Sherlock Holmes, as a specialist in investigations and research, so highly valued the method of deduction - the movement from the general to the particular. The problem should always be looked at as a whole, globally - to check how naturally the tested theory or hypothesis describes the entire range of known phenomena, and only then work out the theory in detail, study the particulars and test its consequences. When one simple hypothesis explains a wide range of phenomena at once, it will be correct with a high degree of probability. Then, on its basis, by the method of induction, it will be possible to build a comprehensive theory. It was according to this scheme that the atomistic theory of Democritus with his fundamental idea about atoms, and the theory of Ritz, and this book, which does not give a detailed mathematical analysis of phenomena, but studies the general possibilities of the theory, were built. In the same way, from the general to the particular, the architect, artist, writer create their creations. They will never begin to figure out the details until they

understand the general idea, the diagram, until the plan, sketch is drawn. And only then, when the skeleton is ready, the skeleton, it begins to grow over with flesh, and the details are worked out. This is again an example of an engineering, planned style of thinking.

The complete opposite of this classical method is non-classical science, which introduces out of nowhere the following postulates, sometimes completely absurd, and far-reaching conclusions are already being built from them. If something does not agree with these conclusions, then they believe that either the experiment is incorrect, or they introduce additional adjustments, correct other and long-proven theories, complicating the concept more and more in order to achieve its acceptance. This is how the theory of relativity, based on two postulates, reshaped all of classical mechanics only because it contradicted these postulates and abstract Maxwellian electrodynamics. An even greater redrawing of our views was made by the general theory of relativity. But this is the same as if someone, having almost solved the crossword puzzle, suddenly discovers that the last word he invented does not fit the letters, but despite this, he writes it down and starts rewriting, adjusting the whole crossword puzzle in accordance with it, with great stretch and sacrifices ... This method from the particular to the general is nothing more than the well-known "method of gradualness", "promotion" used by fraudsters and hucksters: a person is forced to agree step by step first with one, then with the second, ... and so on. As a result, the person turns out to be deceived, because at each "step" he proceeded from the imposed artificial situation, and not from the initial one, from which he moved away with each step. If he were alert and had an integral, holistic view of things, not focusing on particulars, it would be difficult to deceive him.

This is exactly how the theory of relativity and quantum theory were built, in complete contradiction with the harmonious existing system of classical science. And just step by step, it forcibly, by deception, moved to an unnatural result by the hucksters from science. If experience confirmed some consequence of the original postulates, it was considered confirmation of the whole concept. And yet, as is known, at least from the method of mathematical induction, such a proof is worthless if the initial basis is not proved. Indeed, the correct consequences are often obtained from the wrong premises. Therefore, the proof of individual consequences does not yet prove the whole concept and all its consequences. So, the theory of relativity and quantum mechanics are typical sophisms, like mathematical sophisms, which prove deliberately absurd things, for example, that $2 \times 2 = 5$, that all triangles are equilateral. Likewise, SRT introduces the equality of the speed of light in all reference frames.

It can be hard to find a mistake in sophism right off the bat, and the proof seems flawless. But there is always an implicit vice and it is hidden in one of the initial false positions of sophism, and the whole conclusion is based on it.

In the theory of relativity, this is the postulate of the independence of the speed of light from motion, which contradicts the first postulate about the validity of the law of inertia for light.

In quantum theory, this is the postulate of energy quantization and the principle of uncertainty, wave-particle dualism.

However plausible the conclusions of these theories may seem, they are worthless, for they are built through induction on the basis of false premises. It is no accident that Einstein bowed to logic, like Aristotle, who is called the father of this science: both of them deduced their false conclusions, following an abstract, formal-logical path, isolated from reality. As correctly noted in the symbolic and witty film "Route 60", it is this sophistry and casuistry that allows lawyers in courts, using logic and manipulating laws, to prove that white is black and vice versa. Just like in the case of quantorelativistic theories: everyone can see perfectly well that the solution is false, but formally everything looks so flawless that the mosquito will not undermine the nose. As Einstein himself remarked, such a formal-mathematical inductive method is the only perfect way to lead oneself (and others as well) by the nose.

It's also not rational to start with induction. If you work out the particulars in detail at once, you can waste a lot of time. It's the same as if the architect starts to build a building, and during the construction it turns out that it does not fit into the surrounding space. The recipe for quantorelativists in such inconsistencies is to demolish interfering buildings, although the reason for the error was only in their own shortsightedness and incompetence.

Thus, it is always necessary to first understand which way to go, determine the direction of development, build a plan, frame, scheme, and then move on, at each stage checking the compliance of the construction with real conditions. Therefore, in science, it is first necessary to analyze the problem globally, as a whole, without focusing on particulars, following first of all the naturalness of the whole concept, and not its individual aspects. So, Copernicus would never have built his theory if he had stalled on explaining some of the seeming inconsistencies of his concept, such as the absence of the parallax of the stars, the imperceptibility of the motion of the Earth, etc. Likewise, Columbus would never have discovered America if he had not been sure of the correctness of his idea, thanks to which he stubbornly pursued his goal, not paying attention to private difficulties. Both Copernicus and Columbus found the correct, most natural way, which they saw a lot of confirmation, in particular, minor inconsistencies of their theories, rightly considered temporary problems that will one day be resolved.

So, the methods of induction and deduction must work in tandem, complementing each other and working in the correct order. Then the correct theory itself, without exaggeration, begins to be associated with various phenomena of nature, society and even language. One true seed of the theory leads to far-reaching conclusions and predictions, overgrows the whole world, as if crystallizing it around itself. Often such a theory reveals analogies, parallels not only in the physical world, but also in everyday life, in the world of our sensations, in folklore, in spoken language and other cultural manifestations. If you read Lucretius's poem "On the Nature of Things", you can be amazed at the number of models, comparisons, illustrations, metaphors, allegories from life and even simple speech and writing. Thus, Lucretius compares atoms with letters of the alphabet. Just as texts, words are combinations of letters, and

bodies, molecules are combinations of atoms. The quality and sound of words depends on the type of letters and the order of their arrangement. In the same way, the properties of bodies depend on the type of atoms and the order of their adhesion. Thus, Lucretius not only outstripped the development of physical chemistry by two millennia, but also anticipated the discovery of structural chemistry by the great Russian scientist A. Butlerov. Even the number of basic atoms, of which most bodies are made up, is approximately equal to the number of letters in modern alphabets - about thirty (the rest are atoms of inert gases, rare earth metals and other rare or scattered elements, which could be matched in the ancient, more complete Slavic and Sanskrit alphabets).

It would seem like a coincidence. But in our world, nothing is accidental. Everything in nature and in life has its own meaning. The world at all levels is organized according to one scheme, according to the same optimal laws, since there is a deep interconnection of all phenomena. The world is simple, harmonious, self-similar, according to the laws of symmetry. And in this there is no metaphysics, mysticism or speculative philosophy. Isn't this a manifestation of physical laws that everything in the world is interconnected, that everything, in one way or another, even through many intermediate links, affects everything, everything is reflected, that everything is in harmony with everything? It is even believed that it is precisely this universal physical interconnection of phenomena, their harmony that should be called God, just as the mind and personality of a person is, in fact, just the totality of all connections of neurons. By virtue of such laws of universal interconnection, people are always rewarded according to their merits by this world order, by the supreme judge called God. It is in this form of universal interconnection that even dialectical materialism recognizes God. It was not in vain that the first materialist Democritus tried to deduce, and often successfully, all divine manifestations, including the soul and psyche, from the atomistic laws discovered by him, including the laws of determinism and conservation [77]. At the same time, Democritus relied on the principle of analogy between the microcosm and the macrocosm, which was widespread in antiquity [31, p. 62].

Such views on the influence of everything on everything - the phenomena of space on our world, the microcosm on space - were shared by both the great Kepler and A.L. Chizhevsky, colleague and friend of Tsiolkovsky, creator of the chandelier of the same name and ionotherapy [163]. Finally, Tsiolkovsky himself formulated this principle of the universal interconnection of phenomena, their unified nature, self-similarity (self-similarity, fractal structure) of nature at all levels of the universe in the form of the principle of monism of the Universe [159]. This unity, self-similarity of laws and natural phenomena, which forms the basis of Russian cosmism, cosmic philosophy developed by Tsiolkovsky, has been noted more than once in the book. This is the infinity of the Universe in all directions, and the work on all floors of the universe of the same laws of mechanics, fiery, sparkling ballistic and visual-geometric models. It is also a unity, a semblance of the crystalline structure of matter, atoms, nuclei, elementary particles. Even on a cosmic scale, a crystalline structure was discovered, say, near the Earth, which has special points at the vertices of an

icosahedron inscribed in it. In the same way, the Universe, as astronomers discovered, breaks up into elementary cells, has a honeycomb structure (§ 2.7): galaxies are concentrated in the walls of these cells, while their cavities do not contain luminous matter [66, 168]. It was even found that the clusters are located along the edges of octahedrons (bipyramids), ordered in space. Thus, both at the micro- and at the macro- and at the mega-level, the universe has a honeycomb, crystalline structure, as if being divided into residential blocks, apartments. The universe at every level repeats itself, only on a different scale, like a fractal, that is, it has a fractal structure.

It is due to naturalness, harmony and the law of universal connection that true theories have many unexpected parallels and analogies. There were many of them in this book. The reader could perceive many of them as an artistic device, as a metaphor, comparison, allegory, and often just as a joke. However, in every joke, as they said, only a fraction of the joke, the rest is true. That is why analogies, seemingly purely external, often have real internal hidden reasons. Even in folklore, language, especially in one of the most ancient - Russian, as Mikhail Nikolaevich Zadornov well demonstrates, there is a deep meaning - not only in every word, but even in every syllable, sound, in their order and connection. There is no language richer than Russian in meaning, form and content. This originality of the Old Russian language, its depth in combination with beauty and clarity are especially vividly reflected in the film "Games of the Gods" and in the books of V.N. Demin, one of the creators of this film, as well as the author of works in defense of ballistic theory [44].

It has long been noted that form and content are related. Therefore, as Demin confirms, people and objects do not get their names by chance, but according to a certain law of connection between form and content, as if we intuitively feel the nature of phenomena. That is why it is precisely those words, names, names that take root in the language that fall on the soul, resonate, correspond to the inner content of the called object, as Pythagoras spoke about, hearing, according to his admission, music, the harmony of natural objects. Therefore, even from the external analysis of language, folklore, one can learn a lot about the structure of our world, both due to the intuitively accurate selection of the meaning of words, and due to the fact that many now forgotten discoveries of the ancients have been preserved in the language. Because of this, a huge charge of ancient knowledge is contained in the books of V.I. Dahl: "Explanatory Dictionary of the Living Great Russian Language" and "Proverbs of the Russian People". Conversely, the form (name, title) determines program content. As the valiant captain Vrungel taught: "As you name the yacht, so it will float."

Suffice it to recall the examples when the name of a scientist, inventor surprisingly resonated with the topic of his research (§ 1.4). Let's say I.I. Polzunov built the first steam engine powered by two sliding pistons in a continuous mode. A. Bell (bell) invented the telephone. The Lumiere brothers (fr. Lumiere - light source, enlightenment) invented cinema. Biochemist M.S. Color developed chromatography. Physicist P.N. Lebedev discovered the pressure of light with the help of white and black wings. Astrophysicist Aristarchus Belopolsky built, like Aristarchus of Samos, a new picture of the

cosmos, long forgotten and alternative to Aristotle's closed space in a sphere, and the combination "White Field" means in the tradition "Heavenly World". Finally, as if by the name of Walter Ritz, the creator of the ballistic theory (BTR), the popular automatic eight-shot pistol "Walter" is named. And there are hundreds of such examples. There is no mysticism or idealism here, but there is a deep law of nature - the law of the universal interconnection of phenomena. It is not for nothing that dialectical materialism recognizes precisely this interconnection of phenomena. And such coincidences seem supernatural, as Democritus understood [31], only from ignorance of this hidden relationship and the laws of nature. This is approximately how the regular movement of the sun and stars, previously enveloped in the darkness of ignorance by the fog of mysticism, later found a natural explanation. So, consonances, parallels, symbolism, their analysis are important in science no less than in poetry, painting and fiction.

On the one hand, vivid figurative comparisons help to better perceive, assimilate and remember information, sometimes for life, if the comparison is successful: associative memory works. This is exactly how our thinking and memory are arranged: persistent connections, associations are formed. They link one thing to another, structure information, making it easier to remember and comprehend. This is the essence of mnemonic techniques. Figurative language helps to captivate the reader, ignite the idea. Therefore, such comparisons are widely used in popular science literature (§ 5.5). And in scientific books, articles, you should not neglect them. One good model, an analogy, sometimes replaces an entire page of formulas. On the other hand, the number and accuracy, the success of such parallels, analogies, associations, can serve as a measure and criterion for the truth of a theory. It is not for nothing that we accept precisely those theories in which much is in tune with us, in which we see a reflection of the world and objects familiar to us.

For other theories, for example, the theory of relativity or quantum theory, many people feel rejection and even disgust. Such meaningless concepts are organically alien to them, since they contradict the world of familiar things and views - what is usually called common sense, intuition. And only forcibly, through gradual addiction, scientists get used to these theories. The internal rejection of such ideas by people who are not constrained by dogmas, positions, the habit of thinking perversely (like some scientists) is the best criterion for the fallacy of a theory.

Finally, one last thing. The search for associations, relationships, parallels of phenomena is a very effective means of scientific research. It is this method of analogies, as the history of science shows, by the shortest path leads to a discovery. After all, the essence of science is precisely in the establishment of the relationship between phenomena and facts. Therefore, in science, figurative, associative thinking is important no less, and maybe more than in art. The scientist is different, and that is why he makes discoveries that, like other people of creative professions, he sensitively captures the relationships existing in nature, the laws of phenomena, their hidden harmony, which he conveys to people with his creativity, putting them into familiar images.

Nature, as Copernicus, Lomonosov, Newton noted, is extremely simple, economical and does not luxuriate in unnecessary reasons. It is due to interconnections, self-similarity that nature in the small contains a lot at once, "enriches one thing with many actions", which has been seen by a lot of examples in this book, where one drawing served to illustrate a lot, and the Ritz effect explained the entire cosmos. It is not for nothing that our memory works according to such an associative mechanism, which contains a lot, thanks to the establishment of connections. Similarly, a piece of a holographic plate contains information about the entire picture captured on it at once. Such an associative method of thinking, close interconnection, self-similarity of phenomena are also important because one fundamental discovery entails a whole chain, an avalanche of important discoveries, like a crystallization nucleus that causes rapid crystallization in a supersaturated solution. The same in science: one clings to another, which leads to the restructuring of all physics and cosmology. This is how Democritus and Lucretius built a whole battery of important and correct ideas, completely revising the picture of the world of Aristotle. Likewise, the discovery of Copernicus led to a chain reaction of the flourishing of mechanics, physics, astronomy in the 17th century. Similarly, the ballistic theory, discovering the common nature of all types of interactions, leads to a breakthrough into the future and the development of supertechnologies.

Let's give an EXAMPLE. Scientists have long discovered the electrical nature of light and the fact that different types of radiation (radio emission, IR rays, light, UV rays, X-rays, gamma rays) are all electromagnetic oscillations that differ only in frequency. However, the lack of understanding of the mechanical nature of light, its structure and principles of movement did not allow for a long time to discover a way to transform light into other frequency ranges. After all, it is much more convenient, instead of bulky generators for each of the bands, to have a compact laser source and a transformer of its radiation spectrum at hand, like using voltage transformers (instead of a set of different sources) or gearboxes, gearboxes in a car (instead of a set of different engines). Of course, nonlinear optics has opened up a number of ways to transform the optical spectrum. Ultrashort pulse lasers make it possible to convert light even into terahertz and X-ray radiation, but with low efficiency. You can also cause a shift in the spectrum by the Doppler effect, which changes the frequency f of the light by $f' = f/(1 + V_r/c)$, for example, in a Belopolsky gearbox with rotating mirrors. But the Doppler frequency shift is usually negligible due to the low velocity of the sources $V_r \ll c$ [74]. Only in free electron lasers with the help of powerful accelerators that accelerate electrons to $V \approx c$, it was possible to transform laser light scattered by flying electrons (reflected by an "electron mirror") into gamma and X-ray beams. But this technology is too expensive, complicated and ineffective. Fortunately, the ways of converting the frequency from the motion of the source are not limited to the Doppler effect, because there is also the Ritz effect $f' = f/(1 + La_r/c^2)$ (§ 1.10). It is he who opens a new, universal way of transforming the optical spectrum into any other range of electromagnetic waves from radio to gamma radiation, since it does not require acceleration to light speeds. Similar transformers of light radiation in non-

optical ranges have already been encountered in space by the example of pulsars, quasars, radio galaxies and bursters (§ 2.21). They are distant at astronomical distances L and therefore strongly transform the spectrum of the star even at low accelerations a_r .

However, the applicability of the Ritz effect for frequency transformation under terrestrial conditions, it would seem, is even more limited than that of the Doppler one, since in $f' = f/(1 + La_r/c^2)$ it is necessary to provide La_r/c^2 of the order of ± 1 , i.e. for $L \sim 1$ m, $a_r = c^2/L \sim 10^{17}$ m/s² are needed! This acceleration is unattainable for emitting devices, but it is easy to communicate it to atoms and electrons emitting and re-emitting light! Since the acceleration of an electron in the field E is $a = Ee/m$, where $e/m = 1.76 \cdot 10^{11}$ C/kg, then $a = 10^{17}$ m/s² already at $E \sim 10^6$ V/m (for ions $E \sim 10^9$ V/m). This and even orders of magnitude greater field levels are now easily achievable. Therefore, in terrestrial laboratories, it is possible to create universal spectrum transformers similar to space ones. For this, in a field of $E \sim 10^6$ - 10^9 V/m, it is necessary to accelerate a beam of emitting ions or light-scattering electrons, and their optical radiation, having passed the path L in an ultrapure vacuum, is converted into radio-, terahertz, IR-, UV-, X-ray or gamma-range depending on the sign and magnitude of the field E . The radiation frequency can be smoothly tuned by changing the flight distance L to the re-emitting plate (Fig. 201). And since the particles do not need to be accelerated to $V \sim c$, the conversion efficiency of optical radiation will be almost 100%.

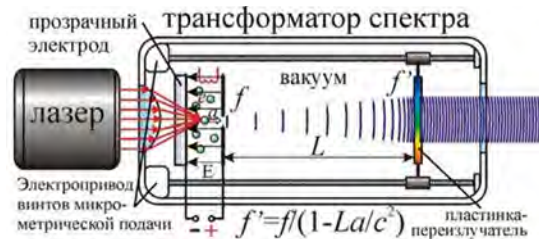


Fig. 201. Ritz transformer: laser light of frequency f is re-emitted by accelerated electrons and on the path L is converted into radiation f' of any other range.

It is interesting that something similar was proposed by S.I. Vavilov, just referring to the test of the ballistic theory. He proposed modulating the speed of the ion beam, channel beams due to fast recharge (rapid changes in the accelerating field) and observe whether the nonlinear transformations of the spectrum and phase of light oscillations predicted by Ritz would occur ([UFN, 2001, Vol. 171, No. 10](#)). But Vavilov's sudden death in 1951 did not allow him to build a setup and carry out an experiment (§ 2.9). Now the use of BTR and the increased technical capabilities will make it easy to design such efficient converters and implement Vavilov's plan. Moreover, it is possible that such radiation transformers have long been working where electrons move with huge accelerations (in lightning discharges, generators of attosecond pulses, synchrotrons), but the X-ray and gamma radiation generated in this case is interpreted as synchrotron or bremsstrahlung of electrons.

Thus, a single mechanical basis for the movements of light and particles, projectiles opens up great opportunities in terms of converting light energy.

Speaking about associations and images, it should be noted that this ballistic model of light and the unity of radiation of different frequencies from childhood is instilled in us by the mnemonic rule for memorizing the colors of the rainbow light spectrum: "Every Hunter Wants to Know Where the Pheasant Sits". Moreover, this ballistic analogy goes back many millennia: even in the ancient Indian epic "Ramayana," the rainbow was called the "seven-colored Thunder Bow", that is, Indra's hunting or combat bow, which, like the Slavic Thunderman-Perun, served for throwing lightning arrows, later included in the emblems of Roman legionaries and Russian signal troops (§ 1.9, § 5.2). Thus, the ballistic, rifle analogy connects together the past and the future, mechanics and optics, optical and radio emission. Let's hope that the unified mechanical, ballistic basis discovered by Ritz, the interconnection of all types of energy, all types of interactions and radiation, will make it possible to advance far in terms of their understanding and practical application by converting some energies into others.

According to the conviction of many scientists and philosophers, including such ancients as Pythagoras and Plato, the great law of unity and analogy operates in nature, and therefore the method of analogies is the simplest and most effective method of scientific research. It was the close interconnection and unity of natural phenomena that made it possible to make the most important discoveries of Ritz, Tesla, to know the depths of the microworld and space for such giants of Russian thought as Lomonosov, Mendeleev, Tsiolkovsky, Belopolsky. Such researchers, unlike the priests who hide knowledge behind vague formulations, do not hide, but generously scatter ideas, share discoveries with the world, sow knowledge, presenting it easily and accessible. The truth, unlike false information, cannot be traded, it can only be given. There is nothing surprising in such breadth, all-embracing, universalism, encyclopedic nature of these giants of thought. Simply, having correctly understood one thing, there is an opportunity to learn much more, just as, having found the end of a ball, you can easily unwind it. This allows different researchers to independently come to the same important and correct ideas, the unity of independent opinions of which is the best confirmation of the validity of their general idea. It was in this bold flight of fantasy, imagination, controlled by the helm of strict logic and associative thinking, that most progressive thinkers saw the main reason for their scientific success.

§ 5.17. *Harmony of nature, science and man*

Recently, however, I have been more attracted by the study of the mysteries posed to us by nature than by those superficial problems for which the imperfect structure of our society bears responsibility.

Arthur Conan Doyle, Holmes' Last Case

As it has been shown more than once in the book, the ballistic theory not only reveals the picture of the universe, establishing the interconnection of phenomena, but also does it easily, gracefully, classically, in harmony with common sense, the laws of nature and the logic of scientific development. This

is the reason for the many successes of the BTR in terms of explaining mysterious phenomena from various branches of science.

And the problematic nature of today's non-classical physics is due to the fact that it was created unnaturally, contrary to the laws of reason and the universe. Scientists, instead of trying to learn the laws of the Universe and follow them, went around them, trying to impose their own rules, generated by a perverted mind, on the world. In the theory of relativity, in quantum mechanics, quantorelativistic astrophysics and cosmology, facts were forcibly squeezed into the theoretical concept, they were adjusted, built into the system by means of many speculative artificial postulates. As a result, all such concepts look unnatural and are rejected by the mind and soul.

Such forceful, unnatural methods of obtaining knowledge and constructing theories lead to low efficiency and high cost of science. The secrets of nature are now more often not learned, but they are trying to extort from it with accelerators, colliders and other power plants. They want to forcibly wrest information from the depths of nature, and nature takes revenge for it. Having expelled Man, his mind, common sense and morality from science, it was made inanimate, soulless, formal and bureaucratic: science was dehumanized and automated, turning from creativity, art into a routine everyday technology of blindly guessing the laws of nature for their use for selfish and inhuman purposes. Fortunately, this also limits the possibilities of such a science, which is becoming excessively expensive and unable to give adequate ideas about the laws of the universe and the chances of using them for low purposes.

In the old days, scientists discovered the great secrets of nature by modest means, because they worked rationally, in harmony with nature, they obtained knowledge not by brute force, but by the power of reason. It is no coincidence that their discoveries worked for the good of mankind. Before, man considered himself a part of the universe, nature, did not separate himself from it, this was the essence of the cosmic worldview of the ancient Slavs and Indians. Their faith, unlike modern religions, did not allow for a slave-master relationship. People lived freely, not enslaving nature, but also not groveling servilely before the gods and the cosmic elements, but in full agreement with the materialistic worldview, realizing their one nature with them. The relations between man and nature, space were kindred, friendly, like those of equal members of the cosmic community, which is well reflected in Slavic fairy tales (see Demin V.N., The cherished paths of Slavic tribes. M., 2002). The man was with the world on an equal footing, which is why many world secrets were revealed to him. He lived in harmony, in union with nature, cooperated and helped her, and did not enslave, destroy or humiliate her. For this, nature generously paid him and herself revealed her secrets. This may also be the reason for the scientific successes of the technically poor Indian fakirs (§ 5.7). Such a well-known classical physicist as F. Soddy, who noted that before science was inseparable from man, society, from their spiritual world, philosophy and moral values, spoke about the same thing. Science helped a person to comprehend the perfection of the world, its harmony and beauty, it served the whole of Humanity, and not its most soulless representatives, as now, when the ultimate

dehumanization of science has occurred, which gave birth to scientists relativists with their twisted mind and complete degradation of scientific conscience and morality [139]. That is why knowledge gained and misunderstood, on the basis of false theories, does not bring humanity anything but misery and suffering, takes millions of lives and puts humanity on the brink of extinction from a global catastrophe of an ecological or military nature.

So, at the origins of the creation of a nuclear bomb were just those scientists who thought unnaturally, pervertedly, piling up absurd theories. Among such "scientists" who initiated the creation of a nuclear bomb were A. Einstein, N. Bohr, L. Szilard, A. Compton, E. Fermi, R. Oppenheimer, J. Wigner, E. Teller. Each of them made their own "worthy" contribution to the development of quantorelativistic physics and astrophysics. After the discovery of fission chain reactions, building a bomb was a purely technical, not a scientific problem. And the listed scientists served as the initiators, the driving force behind its solution. This example, in the best possible way, proves that science cannot be pursued by people who do not have the corresponding spiritual and intellectual development. Such intelligence implies not only the possession of sufficient technical and mathematical research skills, but also high spiritual, moral and social development, a high responsibility of the scientist. Science must be dealt with with mind and soul. A scientist without a soul, with a perverted mind, is like a child playing with matches near an ammunition depot, or a mentally ill terrorist with a weapon in his hands. Jules Verne also noted that in order for science to serve Good, it must not outstrip the level of moral development, it must raise it.

Each discovery must be ripe, it must come naturally, be obtained within the framework of correct theories. After all, a discovery, an invention created within the framework of a correct theory, implies sufficient mental, spiritual, ideological, and not only technical and mathematical development. Only such discoveries work for the benefit of humanity, since they are created in harmony with reason, in union with nature. And since these discoveries are obtained naturally, they are obtained with the minimum expenditure of energy, technical means, finances, time and labor of people. A sane scientist will not create dangerous inventions, because, being reasonable, he will foresee all the possible consequences of his discovery, invention. Therefore, the correct discoveries appear in due time, when humanity reaches the required level of spiritual and social development. Then they serve for the benefit of people and nature, and not to their detriment.

As for the correct information obtained with the help of adequate theories, it is not only effortlessly obtained and easily assimilated, but also works for the benefit of nature and society. Any correct knowledge implies ordering, a decrease in the measure of evil, chaos, entropy, and the newly obtained information is capable of spreading like an avalanche, unlimitedly, without entropy growth accompanying all other processes. There is nothing more structuring, constructive, ordering and anti-entropic than truth, reliable information, as shown by the physicist L. Brillouin, one of the followers of Ritz's ideas and a critic of non-classical physics. The discovery of a new

knowledge revolutionizing science noticeably reduces the measure of chaos, increasing the measure of goodness and creation, and therefore they say: "learning is light, and ignorance is darkness." And if the current dark physics is extremely chaotic, unsystematic and meaningless, then the luminiferous ballistic theory just structures and orders the knowledge accumulated by physicists, forming a crystal clear harmonious system instead of the former quantorelativistic fog.

Such a harmonious development, the interaction of nature, science, technology and man, carried out by the BTR, also contributes to the discovery of ancient knowledge, which has not yet manifested human capabilities. Because of the inadequate ideas of modern science, many are still in a dormant state, as if under the influence of intoxication, and cannot wake up, sober up in any way. We need to free ourselves from the fetters of so-called "evidence", artificial "truths." The real possibilities of a Man are endless - you just need to discover and develop them. And the greatest delusion is that only rare people endowed with talents are capable of discovery and insight. In fact, even a person of average ability can make discoveries, create great works of art, if he sets himself such a goal, gets inspired and develops his abilities.

Fantastic works have been written about the unlimited potential of any ordinary person, films have been made (for example, the film "The Phenomenon" with J. Travolta, or the story of S. Gansovsky "Awakening"). There are also numerous real cases of the sudden manifestation of unusual abilities. Moreover, as these examples show, usually a person develops harmoniously and diversified in all directions at once: in science, art, and especially in the spiritual plane. There comes a special state of the psyche (soul), equally conducive to creativity in all areas, the discovery of the gift of clairvoyance and control over the hidden forces of the body that help to work miracles (as the example of Leonardo da Vinci and Tesla shows). Perhaps any person is able to wake up, see, discover a great gift in himself, if he himself wants to. For this, only a certain impulse is lacking, a spark that ignites a person. It is not for nothing that obscurantists at all times were afraid of such enlightened people - (avatars - sowers of culture), sowing sparks, giving rise to an explosion, the flourishing of civilizations.

Such a harmonious development of mankind and man allows the BTR to be implemented, revealing secrets in harmony, in union with nature. Thus, the ballistic theory, balancing the spiritual, moral and scientific level, will straighten the lumpiness of the present civilization and open up ways to create new devices that will not enslave man, but serve him, ennoble the Earth, restore its climatic and ecological balance, and also contribute to space exploration. with an exit far beyond the solar system.

§ 5.18. About skeptics and critics

I would only like to avoid a preliminary trial of specialists who will reject jobs because they were ahead of their time; also by common human weakness: not to recognize anything original, which is so inconsistent with the thoughts that have already been perceived and petrified ...

Let us assume that experiment has rejected the hypothesis of relativity (Einstein). How many works were used by scientists to assimilate it, how many students puzzled over it - and suddenly it turned out to be nonsense. And humiliating and as if the treasure was lost. How much pride there was before others who were not familiar with the doctrine - and everything collapsed ... Old hypotheses are constantly rejected, and science is improving. And scientists always prevent this most of all, because they suffer and suffer the most from this alteration.

K.E. Tsiolkovsky [69; 159, p. 80]

It is possible that after the publication of this book there will be critical reviews coming from professional physicists and astronomers (although it is more likely to be completely ignored and hushed up). By hook or by crook, they will strive to prove that the BTR is completely erroneous, that none of the provisions of this book stand up to criticism, they will call the BTR a bluff, and those involved in it - hoaxers.

Such a reaction is natural, since in the case of the justice of the BTR, everything that these scientists believed in throughout their lives will turn out to be false, a noticeable part of their own scientific achievements and discoveries will go to dust (especially among theorists). The resurrection of Ritz's theory from oblivion for such scientists is like the Second Coming, which will inevitably be followed by the Day of Judgment - the last judgment, where they will have to answer for all their mistakes and sins in science and life. From a purely human point of view, such a fear of a court-martial of a BTR and a revolution in physics is understandable: who is pleased to be a fool in the end? But from the standpoint of science, to which a real scientist must be selflessly devoted, approaching everything objectively, impartially and impartially, putting truth above all, and not personal opinion and benefit, such a fear of the new and correct is unnatural and ridiculous. Therefore, listening to the criticism of such scientists, one should consider the following:

1) If there are errors in this book, then these may be errors of the author himself, not yet talking about the fallacy of the entire Ritz Ballistic Theory.

The fact is that everyone can have their own vision of Ballistic theory, which does not coincide with others (it is enough to compare the theories of Fox, Sekerin, Demin-Seleznev, Fritzius, Maslikov, Kuliginikh-Korneva, Sotina Boldyreva, Cheplashkin), the general is only the basis. And although the theory presented in this book is extremely close to the original concept of Ritz, much here is the essence of the original, independent developments of the author [112-132], in which the BTR acts as the basis (after all, the theory was created a century ago and many of its provisions appear today in a different light). From the works it is clear how thorny is the path traversed by the BTR for a century, how difficult it is, with errors, to get the truth. Such mistakes are inevitable in scientific research, when discovering something new. Suffice it to recall some of the delusions of Copernicus and Galileo, who considered only circular motions permissible for planets, although in general their concept was much closer to the truth than that of their predecessors. In a way, such mistakes are even useful: they learn from them, through them they learn how hard it is to get the truth. But, once again, we note that in the book these may be errors of the author, not the BTR, and someone else may well find and correct them;

2) A counterargument can be found for any argument against the BTR. Therefore, criticism of the BTR will not cost anything until the reciprocal objections of the author, against whose opinion the criticism is directed, are heard. In this sense, the example with the observations of binary stars is very instructive. De Sitter cited these observations as contradictory to BTR 4 years after Ritz's death, when, of course, he could no longer object to anything. It is not surprising, therefore, that the BTR was then considered erroneous, although in reality De Sitter's arguments, as it turned out later, were worthless and therefore for many decades the BTR was ignored practically without any reason. The theory can in no case be rejected unilaterally, on the basis of individual unverified experiments (as they have done so far with Ritz's theory), until the opposite side is heard. If a new experiment is conducted that contradicts the BTR, it must be comprehensively and in detail studied, discussed, hidden sources of errors found, and the correct interpretation of the results must be found. Most of the objections were foreseen by the author, and therefore critics can find answers to them if they carefully read the book;

3) Many experiments, phenomena and effects from those that are already known or will be discovered in the future will seem to contradict Ritz's theory and will be cited as such, most likely due to their erroneous interpretation (as was the case with the same double stars § 2.10). This is natural: how can some phenomenon confirm a theory if it is interpreted from the standpoint of an opposing theory? As T. Kuhn showed, scientists consider all facts through the prism of the prevailing theory, and therefore any experience, regardless of its result, is considered a confirmation of this theory and a refutation of an alternative concept. In order to find out whether a given experiment contradicts the ballistic theory, one must first interpret everything that happens in terms of the laws introduced by the ballistic theory, in conjunction with it. Otherwise, the situation resembles the one that developed during the criticism of the Copernican system. Its opponents argued that if the Earth moved and rotated, then no objects could hold on to it. The error, as we now know, was not in Copernicus's theory, but in the erroneous mechanics of Aristotle, on which his own geocentric model was based. If we follow Copernicus and the principle of relativity introduced by him, developed in mechanics by Galileo, as well as the gravitation of the Earth assumed by Copernicus [41], it turns out that the immobility of objects on a moving Earth is quite natural. That is, the apparent inconsistency of theory with experiments does not always mean that the theory is erroneous, but may be due, as we have seen more than once, to an incorrect interpretation of phenomena, experiments and the incompleteness of our knowledge, the incompleteness of the theory. After all, it is impossible to explain, to embrace from the standpoint of a theory, all the more so revolutionary, all at once, to quickly save it from all kinds of shortcomings. This is achieved only in a long and difficult gradual process of the evolution of a scientific concept. Again, we must remember the example of Eddington and DeSitter - that is, to critically perceive the testimonies of scientists interested in SRT, who are even capable of forgery, distortion and suppression of facts;

4) There are countless phenomena and effects that speak against the theory of relativity and quantum mechanics and confirm the BTR. Most of them are either ignored, as if everything is as it should be, or they are hushed up, or, finally, complex and dubious explanations are given. Supporters of SRT specifically cite those phenomena that allegedly prove SRT, and for the BTR - those that allegedly refute it. Obviously, with such a one-sided and biased approach, one cannot come close to the truth. Therefore, the entire complex of known phenomena and experiments, all concepts as a whole, must be considered. The true theory can be revealed only in the course of a detailed comparative analysis of how naturally, fully, accurately and convincingly each of the theories explains all the phenomena and effects. Truth is learned in dispute, in comparison. Supporters of modern abstract physics focus only on criticism of alternative approaches and strive with all their might to expose the BTR in an unfavorable light, ignoring its obvious advantages and advantages over SRT and quantum mechanics;

5) The BTR can offer a new full-fledged material with an exhaustive analysis of the phenomena. Many will argue that the BTR provides mainly only a superficial, qualitative, and not quantitative explanation of the phenomena, in contrast to Maxwell's electrodynamics, quantum mechanics and the theory of relativity. Therefore, they may say that the BTR is a useless theory. However, if the book sometimes lacks an accurate quantitative analysis and description of the processes, this does not mean that it cannot be offered within the framework of the BTR. The author deliberately limited himself to describing mainly only the qualitative side of the phenomena, avoiding, if possible, complicated and lengthy mathematical calculations (which exist and can be given in the future), so as not to clutter up the book and not burden the reader with long tedious calculations, particular subtleties and insignificant details that are only interesting for specialists. It is impossible in one book to present in all details all the sections of physics, chemistry and astrophysics, especially with a new outlook on things. The purpose of the book is different: to acquaint a wide circle of readers with the BTR, to popularly present Ritz's ideas, showing that within the framework of classical physics there are no fundamental limitations for explaining the phenomena. Therefore, the book uses a relatively simple device. The BTR is far from finished - Ritz's theory has to be developed, deepened, refined, and only the most general sketches are given in the book. The mathematical apparatus of the armored personnel carrier, of course, is still imperfect, in addition, it differs greatly from the mathematics of modern electrodynamics, quantum mechanics, SRT and GRT - it has to be built from scratch (approximately in the same way, the mathematical description of the motion of planets in the heliocentric system of the world based on the laws of Kepler and Newton is not had nothing to do with the matapparatus of the epicycles and spheres of the geocentric system of Aristotle and Ptolemy). But the BTR's mathematics may well be built and, probably, will turn out to be even simpler than the mathematics of modern physics, especially if we take into account what mathematical difficulties are now faced by quantum mechanics and the theory

of gravity. Therefore, all reproaches to the BTR in superficiality and incompleteness are unfounded;

6) The BTR is a new, promising, adequate and simple theory. A more cunning category of scientists may argue that Ritz's theory, although it describes all phenomena in a more natural way, on the whole does not represent anything new and explains only the same effects as non-classical physics. And if so, is there any reason to revise all of science? After all, all accelerators, nuclear reactors, processes in semiconductors and metals are well described by existing theories, meeting the requirements of practice. So why change something then? Again, the Copernican and Ptolemy systems can be cited to this objection. Both described the movements of the planets and luminaries in the sky, and gave almost identical predictions. So, there was little reason to prefer Copernicus' theory to Ptolemy's. And yet, Copernicus's theory, firstly, is more natural and simpler, since it explained a wider range of phenomena and features of planetary motion by a smaller number of assumptions. Secondly, there were some phenomena that contradicted the theory of Aristotle-Ptolemy and naturally followed from the theory of Copernicus. And most importantly, Copernicus's theory radically changed our views on the structure of the world, space, overthrew geocentrism, making our planet one of many revolving around an ordinary star. Copernicus' theory opened new paths and horizons of knowledge, perspectives, leading to the discoveries of Galileo, Newton, etc. This is a distinctive feature of a true theory, while a false one works only at the initial stage and explains only those phenomena under which it was artificially adjusted, and therefore has no prospects. Similarly, the theory of relativity with quantum mechanics stall science, being hopeless. On the other hand, the BTR opens up supernova ways of the development of science and gives an adequate description of a wider range of phenomena;

7) The BTR is incompatible with non-classical science. Finally, the activity of the most insidious category of scientists is not excluded, who will want to make a pseudo-compromise, using the results obtained within the framework of the BTR, if possible, but completely distorting their meaning, passing off as their own and avoiding mention of Ritz's merits, as has already happened more than once. It is in this way that many "figures" of non-classical science, having perverted, disfigured beyond recognition, and passed off as their own, profited from the ideas of the classics, atomists (§ 5.14). At the same time, non-classical science will be preserved, albeit in a highly modified form, so that the authority of its leading figures will not suffer. Once, Tycho Brahe also tried to reconcile the incompatible systems of the world of Copernicus and Ptolemy, suggesting that the Earth should remain in the center of the world, the Sun would revolve around it, and the planets around it. This also happened in science later, say, when the Ritz combination principle, obtained classically, was taken by Bohr as the basis for the non-classical model of the atom; when the classical exchange fieldless model of the Ritz interaction was redrawn in QED by Feynman and Wheeler in a quantum way; when Ritz's interpretation of the displacement of the perihelion of Mercury was transformed by Einstein into a relativistic one. They will probably try to do the same now: they will want to discredit Ritz's models,

passing them off as their own, and declaring that these models are nothing new and have already been applied in science. It will be a gross lie. Ballistic theory is incompatible with non-classical science and does not allow for compromises. Any attempts to reconcile the BTR with current physics or borrow, as once, the models and results of Ritz's theory, are doomed to failure in advance.

As a result, we see that the theory of relativity with quantum mechanics, which were built completely arbitrarily, without sufficient experimental and even intuitive grounds, should be considered a bluff. According to the principle of Occam's razor, it is precisely such theories, which are not reducible to intuitive or experimental knowledge, and should be eliminated from science. Quite exactly this bluff of the founding fathers of the theory of relativity and quantum mechanics, led by Einstein, is shown in the movie "IQ". There, scientists also created a "great" discovery out of nothing, raising a grandiose hype, and so that everyone believed in it, and no one noticed the catch. The thought suggests itself, was not the theory of relativity just a grandiose joke, a hoax? Many believe this is evidenced by the widely circulated photo of Einstein with his tongue sticking out [25, 111]. Bluffing is beneficial to those who receive fame, money, grants and positions as a result, while gaining control over knowledge, science, education, etc.

Ordinary people, engineers and physicists, who are sincerely keen on science, make no sense to bluff: they do not gain anything as a result. Publishing books at their own expense, research activities for them are purely costly events that do not bring income and fame. And a true seeker of truth will not engage in hoaxes. The one who seeks the truth need not deceive himself and others: his goal is the opposite. On this occasion, K.E. Tsiolkovsky wrote: "I was interested in what gave me neither bread nor strength, but I hope that my works, maybe soon, and maybe in the distant future, will give society mountains of bread and an abyss of power" [69, p. 180]. And a little further he: "I am very saddened by the fascination of scientists with such risky hypotheses as Einstein's, which is now actually shaken (Miller, Timiryazev)" [69, p. 187]. Yes, once Tsiolkovsky was called a dreamer, a storyteller, and his theory of interplanetary flights and rockets was called a bluff. But the future has shown that even the most daring ideas of Tsiolkovsky are quite realizable, and it was those who rejected his theories who rejected his theories, defending unrighteous non-classical concepts, hiding behind the authorities and their high position, who were bluffing and mistaken.

So, the decision about the truth of one theory and the fallacy of another cannot be taken unilaterally. The other side must also be heard, as they said in antiquity. Truth is born in controversy. Therefore, we will wait with interest for new criticism both to the BTR and to the theory of relativity with quantum mechanics. Although, it should be noted that in recent years, experiments and astronomical observations have revealed more and more inconsistencies precisely in the theory of relativity, quantum mech and cosmology. And it is very likely that in the coming years these accumulating contradictions will exceed the critical mass, which will lead to an explosion and a new revolution in physics and cosmology. What will replace these theories is anyone's guess. But

it is very possible that it will be a BTR - a promising theory created a century ago and all this time has been waiting for its finest hour. It is about to come.

§ 5.19. *The role of criticism and experience in the development of BTR*

I am doubting.

Mikhailo Lomonosov [84]

So, the BTR will undoubtedly sooner or later face criticism, meticulous and well thought out. And that is great! Criticism is necessary for any new theory, not only to study its capabilities and make a decision about its fairness or fallacy, but also to develop, clarify the theory, and draw attention to it. It is not for nothing that scientists for a long time were afraid to criticize the BTR, seeing its enormous capabilities and advantages over the SRT and quantum mech. They preferred to just keep silent about Ritz and his theory, to bypass this uncomfortable question. That is why many do not even know about the BRT and are sincerely surprised to find such a simple and elegant classical theory.

The critic makes a correct theory better - he clarifies, develops, hardens with his heat and cold, with the blows of his hammer. And criticism breaks and weakens a false theory. It is no coincidence that the theory of relativity is in every possible way protected from criticism, and especially from considering its alternatives - this is fatal for it. For the same reason, quantorelativists hate being asked some simple questions. Say, what is light? Or, what happens in objective reality, in the absence of an observer? They begin to answer either in a vague mystical language, or with a set of cumbersome formulas, since they cannot clearly explain. From this, teachers feel discomfort, and students see the reason for misunderstanding in their mental disability, especially when everyone pretends that everything is clear and understandable to them.

The ancient principle from the fairy tale about the Naked King is applied, when everyone is afraid to betray their ignorance and misunderstanding, thereby maintaining a conspiracy of silence. Or the principle from V. Gubarev's fairy tale "The Kingdom of Crooked Mirrors" is used: ugliness is passed off as a standard of beauty when viewed in a distorting mirror of formulas, and those who look at the root and do not understand this "beauty" are severely punished. But the real reason for misunderstanding is always not in the student, but in the teacher. As they say, there are no bad students, there are bad teachers. In the case of false theories, it is among the clever pupils who are not indifferent to the subject, asking the right questions, that the greatest bewilderment arises. Therefore, slippery moments of quantum mechanics and the theory of relativity pass over in silence, in every possible way smoothing out the defects of the theory, giving streamlined formulations, even though they should be focused on. One gets the impression that the real meaning of modern science, like other students in the exam, is not in the desire to show the depth and thoroughness of the acquired knowledge, but, if possible, to hide the depth of their ignorance, misunderstanding of the essence of phenomena, processes, effects. If you dig deeper, you will find a terrible mess in fundamental physics. That is why it is customary to keep silent on a number of issues in science. On the contrary, Ritz

in his theory calls for a critical approach, analysis of any provisions and conclusions of scientific concepts. It was this criticism that Ritz based on his fundamental work on the BTR [8]. Constructive criticism, according to the author's conviction, is also given by this book. Criticism must be healthy, objective, creative and constructive, not spiteful - it should not be criticism for the sake of criticism. Many of those who criticize SRT and quantum mechanics limit themselves to only defaming these theories, pointing out their weaknesses, without offering anything in return. However, scientists will never abandon current dogmas if they are not offered new theories that better describe the phenomena. So the purpose of this book is not to discredit non-classical physics (its viciousness is already obvious to many), but to offer it an alternative, to understand the nature of phenomena, to construct a new, crystal-clear description of them. Therefore, criticism is also necessary for the BTR, not only for testing and clarifying this theory, but also for deepening, developing the corresponding mathematical apparatus, which has so far been very poorly developed: the range of revised natural phenomena is too wide.

Scientists are especially afraid of criticism from non-specialists who ask simple but deep questions that no one has thought about. You cannot get rid of such questions, as in replies to colleagues with vague explanations and cumbersome formulas, and you cannot put pressure on non-specialists who are not afraid to lose their "scientific reputation" and position. In this regard, scientists would prefer to avoid such situations altogether, completely fencing themselves off from those whom they call amateurs, and having achieved the exclusive right to do science in their ivory tower. Therefore, many scientists oppose the popularization of science and for its extreme mathematization, hiding from the uninitiated, following the example of the priests and monks of antiquity.

Previously, such a coding function was performed by Latin, which is inaccessible to the common people, and therefore gives scientists the right to exclusive power, a monopoly of knowledge, allocating, like mathematics today, them to the sphere of the elite, the scientific elite. And, on the contrary, along with them there are people from the environment of non-specialists who popularize science and call to bring truth and knowledge to the world, to the masses, who expound everything in an accessible, understandable language and show that there is nothing complicated in science. Perhaps that is why such heroes as Prometheus, Democritus, Lucretius, Bruno, Galileo (who wrote his Dialogues in a popular form, and not in Latin, but in Italian), were at all times persecuted, persecuted, especially when they brought them into the world seditious ideas, diverging from the officially accepted dogmas and legends, which the priests-academicians would like to regale "common people". At all times, there were scholars-researchers who discovered the truth, brought knowledge into the world, and the opposing category of scientists-priests who appropriated, obscured and distorted knowledge, hiding it from the people, applying mathematical and metaphysical cabalism, creating secret societies, sects and conspiracies. That is why, in order for knowledge to become open and

accessible, quality education, publicity and objective criticism of any existing theories are necessary.

Ritz's theory requires not only theoretical criticism, but much more - a practical test of the foundations and conclusions of the BTR using experiments and observations, especially in those cases where the predictions of the BTR strongly disagree with the conclusions of electrodynamics, the theory of relativity and quantum mechanics. The best way to test Ritz's theory is to directly test the ballistic principle in a vacuum, say with channel beams (§ 2.9), in space, for example by radar measurements, taking all precautions to take into account the effect of re-emitting media. It can also be subtle electrodynamic experiments, many of which were proposed by Ritz [8]. Finally, the most spectacular and indisputable proof of the fallacy of the theory of relativity and the correctness of Ritz will be the reliable detection of superluminal particles in accelerators and cosmic rays. However, the discrepancies between the predictions of STR and BTR about the speed of particles in accelerators can be found even at near-light speeds. These velocities can be measured directly, for example, using the classical Doppler effect on the radiation of hydrogen ions accelerated by an accelerator, if we compare this velocity with the one found by direct calculation. Only experience and criticism based on facts will make it possible to finally decide which of the theories, SRT or BTR, is fair.

Until now, nothing has contributed so much to the acceptance of Ritz's theory as a criticism from the side of illiterate relativists. Each of their attacks against the BTR invariably turned against the relativists themselves, who were beaten by their own weapons in accordance with the militant exclamation of Alexander Nevsky: "Whoever comes to us with a sword will die by the sword!" Take De Sitter, who pointed out that, according to Ritz, binary stars would show a number of anomalies, including the excessive elongation of stellar orbits in the direction of the Earth. Following him, each textbook retold this conclusion, rejecting the ballistic theory and believing that nothing of the kind is observed in binary stars. But the fact of the matter is that the orbits of spectroscopic binary stars revealed exactly such a predicted BTR and an extra elongation of orbits that is incomprehensible in the framework of SRT (Barr effect, Section 2.10). They showed double objects and a number of other predicted BTR effects (variations in brightness, spectrum, superfast and backward movements, unnecessary images), and therefore relativists, referring to the example of double stars, over and over again sign the validity of the BTR and in their ignorance of real astronomical facts. Similarly, attempts to reject Ritz's theory on the basis of radar measurements (including GPS and GLONASS) have led to the opposite result. An accurate quantitative analysis of the corrections resulting from the BTR showed their closeness to systematic radar errors, so that the calculation according to the ballistic principle eliminated these errors caused by the SRT (§ 2.1). And all the other experiments involved in criticizing the BTR (the experiment of Sagnac, Fizeau, § 1.13; experiments with the use of nuclear physics, § 3.17), turned out to be in favor of Ritz's theory and against the theory of relativity. It could not be otherwise, because the false "laws" of physics and explanations invented by relativists do not change real phenomena and laws of

nature, and therefore experiments sooner or later reveal the delusions of relativists and the validity of classical laws, if they are correctly analyzed. That is why the narrow-minded relativists do a disservice to the theory of relativity, and the more cunning ones generally avoid mentioning and criticizing Ritz's theory or confine themselves to complex theoretical criticism, without involving experiments.

That is why it is always necessary to remember that even outwardly justified criticism does not always speak of the erroneousess of the concept - recall the criticism of Copernicus's theory, or criticism of Ritz's theory based on observations of double stars and other not entirely correct experiments. As Giordano Bruno noted, it often seems that all the facts speak against a certain theory, and yet it is this theory that turns out to be true. And how many stories are known about the indictment, where, it would seem, the mosquito will not undermine the nose, but in fact all the arguments turn out to be fake. On this occasion, the hero of one film said well: "The prosecutor should create an accusation as if he were building a house. Each piece of evidence is like a brick in a building. He showed you a brick, showed that it has right angles and that it looks perfect. But when look from the other side, then all the bricks turn out to be thin, like this playing card. And the whole thing turns out to be an illusion, a trick." The building of the theory of relativity and the evidence presented by its supporters against the Ritz theory [2] seems to be just such an illusion, a house of cards. There was a flaw in each of these testimonies that nullified the entire evidence.

So, criticism, regardless of whether the BTR or modern physics is criticized, is always good. Only in a dispute, and not in a unilaterally adopted decision, the truth is comprehended. Therefore, any experience, any of its explanation, any position of any theory should be boldly subjected to criticism, doubt, not taking anything for granted. Likewise, one should not blindly believe the criticism itself: it is necessary to impartially analyze the evidence. This does not mean that everything must be categorically denied, but one must treat everything with doubt, be ready to discard this or that position, if the analysis shows its inconsistency. Each theory should be constantly tested for strength, beaten with a hammer of criticism, shells of smart and "stupid" questions, and not protected as a fragile and inviolable shrine or toy. Indeed, as Galileo noted, doubt is the father of invention.

§ 5.20. Alternative physics and cosmology

How many false discoveries were there, on the side of which were both truthful and authoritative people. And ... - how many were neglected, what later became great ... All great undertakings turned out to be untimely and although they were not forbidden, but not finding sympathy, they extinguished or penetrated little by little, with great efforts and sacrifices ... New ideas must be supported while they will not come true or until their complete inconsistency, harmfulness or inapplicability is revealed. Few have such courage, but this is a very precious property of people.

K.E. Tsiolkovsky [69]

As the reader may have noticed, Ritz's Ballistic Theory gives all phenomena a new, non-standard explanation, an alternative to what the theory of relativity and quantum mechanics have given so far. Many observations, especially cosmic ones, appear in a completely different and unusual light. And the question rightfully arises, is everything that scientists and the public believed in for a century, is it really wrong? Was this whole theory of relativity, quantum mechanics and electrodynamics, the cosmology of the Big Bang, wasted?

The answer to the first question is pretty easy. If the physical concepts of the 20th century really turn out to be erroneous, then this will not be surprising. The history of science contains many examples when, over the centuries and even millennia, scientists professed erroneous views, believed in completely absurd theories and rejected correct theories, which triumphed after millennia. So, back in the III century, BC, Aristarchus of Samos built a heliocentric model of the world, rejected in favor of the erroneous geocentric system of Aristotle-Ptolemy, which existed for two thousand years, and was defeated only by Copernicus, Kepler and Galileo. Or, the atomistic doctrine of Democritus, which was denied for millennia under the pressure of the authority of Aristotle and only a century ago triumphed. Likewise, Ritz's theory was rejected for a century under pressure from the authorities of Maxwell and Einstein, who built false electrodynamics and the theory of relativity, in which scientists believed throughout the 20th century. Such a long-term use of false theories can only be explained by the fact that no theory, as Einstein himself noted, can be absolutely rigorously proven, even if it perfectly explains a wide range of phenomena. Therefore, even the most "proven" theory is ultimately accepted simply on faith, without exhaustive experimental evidence. Therefore, one can never be sure that the accepted theory is correct, at least in part. So, absolutely nothing remained of Ptolemy's theory in modern astronomy - neither its foundation, nor epicycles, nor mathematical apparatus.

But, despite the lack of complete confidence in the validity of any theory, it is often possible to quite definitely judge the fallacy of a particular concept. Usually, a decisive experiment is sufficient for this. And often one glance at the history of the creation and recognition of a theory is enough. Already on the basis of this, albeit indirect, criterion, for many it is obvious that the theory of relativity and quantum mechanics are erroneous, since the whole frenzied epic of their creation is a history of cunning manipulations and skillful adjustments of facts to theories, laws of nature under speculative laws, this is the history of denying the laws of logic.

Take the theory of relativity, for example. Einstein himself, who gave it a modern look and formulation, argued that this theory arose in him during the analysis of Maxwellian electrodynamics, which in many respects did not agree with the laws of classical mechanics. The theory of relativity, which rebuilt all mechanics, was created for the purpose of such agreement. In fact, it combined the inconsistent - Maxwellian electrodynamics and mechanics. This is the reason for all the paradoxes of SRT and absurd, from the point of view of any sane person, statements. It was here that a violation of logic arose: from the contradiction of Maxwell's electrodynamics and classical mechanics, an

unambiguous conclusion was made about the fallacy of mechanics, while the conclusion about the falsity of Maxwell's electrodynamics was also quite admissible. Moreover, it was precisely this conclusion that was the most natural, both in view of the fact that Maxwell's theory was created relatively recently and, moreover, artificially - in a formal, hypothetical way, and because it was in Maxwell's electrodynamics that discrepancies with experiment were found (the experiments of Michelson, Trouton-Noble, Kaufmann), while the laws of mechanics were formulated strictly on the basis of experiments many centuries ago and have been verified by centuries of observation.

Indeed, the experiments that led to the creation of the theory of relativity testified precisely against Maxwell's electrodynamics. Take, for example, the experiments of Kaufmann, in which it was found that at high speeds electrons move in a completely different way from the laws of electrodynamics. However, from the experiments, an absurd conclusion was made about the change in the mass of the electron with an increase in its speed, although such deviations were never observed in ordinary mechanical experiments (§ 1.15). Also, the famous experiment of Michelson, which rejected the existence of the luminiferous ether, in fact, refuted exactly Maxwell's theory, which was based on the ether. So, both experiments were from the field of electrodynamics, not mechanics, and both refuted Maxwell's electrodynamics. It is all the more strange that, despite this, everything was turned upside down and the classical mechanics were recognized as erroneous. This was explained by the fact that scientists were too attached to Maxwell's electrodynamics, and therefore preferred to abandon classical mechanics, replacing it with relativistic ones, rather than from the so widely revered Maxwell equations, especially since there was nothing in return for them, while a replacement for mechanics was quickly found (SRT).

The story is about the same with quantum mechanics. It also arose, ultimately, from the contradiction of the planetary model of the atom with classical mechanics. The planetary model of the atom led to the instability of the atom; it could not explain the spectral laws either. Experience contradicted the planetary model of the atom. But scientists, and first of all Niels Bohr, were so attached to the planetary model of the atom that, turning a blind eye to its disagreement with experience and classical laws, they chose to sacrifice just classical mechanics, but not the planetary model. This made it possible to reach agreement with experiment, but the result was quantum mechanics, even more absurd than relativity.

So, the theory of relativity arose from the stubborn reluctance of scientists to part with Maxwell's erroneous electrodynamics, and quantum mechanics was born from the same persistent and irrational desire to preserve the erroneous planetary model of the atom, which was eventually discarded, retaining for some reason the harmonizing theory of Bohr. As a result, the laws of classical mechanics always turned out to be extreme - they were rejected and replaced by new ones - absurd and supplied with ridiculous reservations, like the fact that the old mechanics is only a particular, limiting case of more general laws of mechanics.

The only person who had the sanity and courage not to succumb to new trends, but to follow the laws of logic, was Walter Ritz. Instead of correcting the laws of mechanics, he kept them, rejecting the erroneous Maxwellian electrodynamics, replacing it with a consistently constructed Ballistic theory. And to explain the laws of radiation, he built a magnetic model that easily and naturally explained the spectral laws, without involving the erroneous planetary model of the atom. In many respects, Ritz was easier than us: he was not dominated by the established dogmas and terms of non-classical physics and the facts, allegedly proving the illegality of his approach. Just as it was not easy for Copernicus to abandon the celestial spheres of Ptolemy in his model of the world, so it is now difficult for us to avoid the terms "field", "electromagnetic waves", "quanta" - which are not quite legitimate in the BTR. But, on the other hand, at the time of Ritz, many phenomena of space and microcosm were not known, which now confirm his concept. And one had to have great courage to openly express the idea of the emission of the smallest particles of the same type during the decay of the electron, the phenomenon of temporal focusing of light, the elementary magnetic moment of the electron, the crystal structure of the atomic nucleus and the manifestations of the Ritz effect in space.

So, already **illogicality, inconsistency in the history of the creation of SRT and Quantum mechanics suggest that these theories are false.** The artificial methods used to create them speak of the same thing. The fact is that quantum mechanics and the theory of relativity are related by the following feature: when creating them, the authors (Einstein, Schrödinger, Heisenberg, Niels Bohr) did not create new models based on well-known and well-established laws. On the contrary, each of them imagined himself to be almost the Lord God and considered it possible to easily introduce new fundamental rules that contradict all our experience and the laws of Nature. Of course, if a scientist does not bind himself with any frameworks, laws, but invents them himself, then he leaves himself countless degrees of freedom, and then it will not be difficult to find such artificial theories that will explain without problems, and quite accurately, a wide range of phenomena. The truth of such a loosely created theories is unlikely, since with an infinite number of degrees of freedom one can create an infinite number of different theories that explain experience equally well. Therefore, only in the most extreme case, with complete hopelessness, it is possible to reject simple classical laws and invent new complex, unnatural laws. But before that, it is necessary to prove with complete confidence that, acting within the framework of natural classical laws, it is impossible to explain the phenomena. Unfortunately, the creators of non-classical physics did not carry out such an analysis.

It was conducted only by Walter Ritz, who proved that, while remaining within the framework of classical mechanics and common sense, all known natural phenomena can still be explained. And the presence of such a possibility automatically makes all non-classical theories constructed arbitrarily null and void. A scientist who introduces new laws of nature arbitrarily, with a light stroke of the pen, has very little chance of success. At the same time, theories, built in some rather narrow framework of existing laws, significantly limiting

the number of degrees of freedom, have a lot of chances of success if these theories explain previously misunderstood phenomena. Ritz's Ballistic Theory turned out to be just such a theory. Of course, Ritz also had to create something new - new models (of an electron, atoms, light), new electrodynamics, but these were precisely new models built within the narrow framework of the existing laws of mechanics: these were not new fundamental laws invented by chance. This is why Ritz's theory is very promising.

It is the BTR that opens up grandiose prospects and new horizons of knowledge for science. Therefore, it is likely that Ritz's theory will make it possible to make up for the time lost in the 20th century, when quantorelativistic theories ruled the show, leading science to a dead end. Only the BTR will help break out of this impasse and eliminate scientific and technical backwardness.

§ 5.21. Conclusion

We showed the drama "Bang-Bang". The hunter and the hare:
who is right and who is wrong? ...
From the cartoon "Bang-Bang, oh-oh-oh!"

So, our story about the ballistic theory and its untimely deceased creator, Walter Ritz, has come to an end. It is up to you, the reader, to decide who is right and who is wrong. Perhaps it is you who will have to prove the validity of the BTR, using theory in your work, or, on the contrary, criticize it. Only the future will show which of the theories - SRT or BTR - is closer to the truth and is more consistent with the experiment. One thing is clear: Ritz's theory was buried hastily, prematurely and without any reason. On mature and sober reflection, this theory turns out to be quite viable and promising, concealing a huge and still unrealized potential. Already now, having just begun to move, the BTR has traveled a much greater path than Ritz could initially assume. A kind of march of science and technology into the future has been completed. We tried to show this difficult historical path in all its harsh beauty, with all the difficulties, intermediate auxiliary links, twists and turns, mistakes, in order to demonstrate how difficult, it is to get the truth. But this is only the beginning of the great path of the BTR, and here a wide field for activity and discoveries opens up for enthusiasts.

On the other hand, the theory of relativity, quantum theory and modern cosmology turned out to be far from being as perfect and convincing as they usually want to be presented. The reason for the vitality of these theories lies in the fact that the dogmatists in every possible way protect them from criticism, blocking its access to the pages of scientific publications. But no matter how hard they try, if the theory is wrong, sooner or later it will become completely obvious, and the later, the worse for them. You should not guard the theory from objective criticism, because if the theory is correct, it will withstand any tests, eventually proving its validity. Criticism is also needed for ballistic theory - not only to test it, but also to draw attention to it, clarify and develop it. But scientists usually prefer to bypass the BTR in silence.

Some believe that the theory of relativity and all non-classical physics have not been viable for 40 years. And before they were. They were accepted as

temporary, trying to somehow explain the Michelson experiment, stellar aberration, photoelectric effect, spectra of atoms (everything that Ritz explained back in 1908), in the hope that over time everything will be formed. However, everything just got confused. And these theories hold only on the dictatorial regime of official science, the leadership of which, using various methods [25], seeks to create the illusion of well-being in physics. However, it cannot change reality. And so the space observations of recent years (remember the effect of the "Pioneers", § 2.1) already contradict the theory so much that many see that it is possible to cope with the urgent crisis only through a radical revolution in science. It is high time for physics to rearm. The limitations of SRT and quantum mech prevent the creation of truly revolutionary inventions. Only the revolution, the fall of the century-old dictatorship of SRT and Quantum Mech, will return physics, instead of its current ugly abstract appearance, to its former classically correct face, replace the meaningless and vulgarly abstract picture of the world with a crystal-clear classical picture. All over the world, this hidden revolution, a real people's liberation guerrilla war against the dictatorship of the dark theories of the elite, is in full swing. Like the liberation movement led by Minin and Pozharsky 400 years ago, or 500 years ago by Copernicus, this scientific revolution by Ritz will certainly be crowned with victory.

The BTR is already supported by many people in Russia and abroad - fighters of the invisible front, enthusiasts participating in the great cause of the BTR, who want to move science off the ground. You can familiarize yourself with them and their work in defense of BTR on the website www.ritz-btr.narod.ru and other sites of the author. The growing popularity of Ritz's ideas is also evidenced by numerous publications, speeches with defense or criticism of the BTR, for example, a seminar held on July 7, 2009 at UNN to commemorate the 100th anniversary of Ritz's memory, as well as a conference in Switzerland on September 18-19, 2009. Practically co-authors and adherents of the BTR ideas are not only our contemporaries, but also giants of thought who lived decades, centuries and even millennia ago, such as Canada, Democritus, Epicurus, Lucretius, Alhazen, Da Vinci, Copernicus, Bruno, Galileo, Kepler, Newton, Lomonosov, Ampere, Gauss, Mendeleev, Thomson, Tsiolkovsky, Belopolsky, Tesla. And how many more unknown and forgotten? Do we really give up the age-old wisdom of all these thinkers, from their ideas, scolded and drowned in the mire of oblivion for many centuries by dark scholastics, slipping their speculative abstract ugly theories instead of clear crystal clear ideas?

Walter Ritz was also an uncompromising fighter-revolutionary in science, who dared to speak out against the opinion of the scientific community. Despising the temptations of a serene life and the fear of death, he brought his life, along with his ideas, to the altar of science. This feat of Ritz, as well as the feat of Copernicus, Bruno, will always be an example and incentive for us to fight against obscurantism in science.

The ballistic theory is sometimes blamed for its battle, "combat" character, attacking the style of battle with non-classical physics. Not being a supporter of conflicts, especially military ones, I would like to point out in justification that such a "military" terminology has developed by itself a long time ago. The term

"ballistic theory" arose during Ritz's lifetime, in 1908. And the BTR (Ballistic Theory of Ritz) turned out to be not only a convenient and memorable figurative abbreviation, but also a spectacular model of the ballistic principle and a symbol of the scientific revolution. So here we just have a positive example of the use of military equipment and symbols for peaceful scientific purposes, for armor protection of the classical picture of the world. As for the uncompromising and fierce battle of the BTR with non-classical physics, it must be said that this war was unleashed precisely by quantorelativists, who trampled the truth and used dishonest methods (at least in terms of prohibiting criticism of the SRT). Only then will the supporters of the BTR cover the guns when justice is restored.

Below are the appendices and a list of references in which the reader can find additional materials on the biography of Ritz, on Ballistic theory and SRT, and the pros and cons of each of the theories. For the most part, this is publicly available popular science literature, which allows even a non-specialist to understand the essence of the problem and is not burdened with a complex mathematical apparatus. Most of these sources can be found on the website WWW.RITZ-BTR.NAROD.RU, founded in 2005 for the centenary of the SRT. Please send your wishes, comments, criticism regarding the BTR and the book presented to the author at the e-mail address: sergey-semikov@yandex.ru.

In conditions when books on Ritz's Ballistic Theory are practically not published, its true meaning and significance is hidden, this publication may seem to the reader a revelation. And yet, we recall that the BTR was not completed by Ritz and it cannot be considered the ultimate truth, no matter how beautiful and comfortable it may seem. In this book, only a partial reconstruction and restoration of the BTR was carried out, a single classical picture of the universe was drawn, which still has to be carefully prescribed, worked out experimentally and mathematically. Ritz's theory is still awaiting its final restoration, development and elaboration. And perhaps it is you, the reader, who will have to complete one or several parts of this difficult, but very important, interesting and grandiose task.

Сергей Семиков

April 12, 2009

SOURCES AND APPLICATIONS

Progress motors and brakes table

THE WAY OF SCIENCE IN TRUTH Progressive material scientists and their discoveries	THE WAY OF SCIENCE ON CURVE Backward Scientists, Idealists and Their False Theories
Democritus, J. Bruno, K. Tsiolkovsky, F. Hoyle - eternal life and youth of the stationary universe - direct Euclidean infinite space - an infinite number of star-worlds	Aristotle, J. Lemaitre, A. Einstein, A. Friedman - Big Bang, Expansion and Heat Death of the Universe - curved space, closed in a sphere - denial of the infinity of the world
Democritus, L. Boltzmann - there are atoms, energy is their movement - classic particle mechanics - a single mechanical nature of all types of energies and processes - no heat death of the Universe	E. Mach, W. Ostwald - there are no atoms, there is only energy - relativistic mechanics - non-mechanical, energetic, external interpretation of processes - energy degeneration of the Universe
A. Belopolsky - redshift from light aging effect - theory of Cepheids as double and multiple stars - measurement of parameters of hundreds of stars - dim satellite stars of Cepheids and cosmic dispersion of light - time focusing of light, incl. by Doppler	A. Eddington - redshift from the expansion of the Universe - theory of Cepheids as pulsating stars - false size of dwarfs, giants - quantorelativistic theory of black holes and white dwarfs - focusing light with gravitational lenses
Aristarchus, N. Copernicus, G. Galileo - heliocentric system of the world	Aristotle, R. Descartes, A. Einstein - geocentric model of the world
Democritus, Epicurus, P. Gassendi - atomistic theory (there are particles and emptiness) - light - a stream of particles flying by waves of fronts - light, electrical, magnetic, gravitational effects caused by the impact of particles emitted by bodies	- substance continuity and fear of emptiness - light - waves, disturbances of motionless ether - all influences are of a field nature, being properties of the space itself, its singular points, vortices or curvature
J. Bruno, G. Galilei, I. Newton - classical mechanics and Galileo's principle of relativity	- relativistic mechanics and Einstein's principle of relativity
E. Freundlich, A. Michelson, J. Bradley, M. Duplischew - observations that confirmed the ballistic principle	R. Oppenheimer, P. Ehrenfest - black holes, neutron stars - rejection of the proton-electron model of nuclei
I. Newton, A. Ampere, W. Weber - central forces along a straight line connecting interacting points	R. Descartes, M. Faraday, K. Maxwell - along the curved lines of force surrounding the points
P. Gassendi, I. Newton - light corpuscle outflow theory	A. Einstein, I. Tamm - the discovery of phonons - quanta of sound
A. Stoletov - classical laws of the photoelectric effect	- quantum laws of the photoelectric effect
J. Thomson - the discovery of electron-particles - geometric shells of the atom - ballistic electrodynamics	W. Heisenberg - blur of electrons-waves - quantum shells of an atom - quantum electrodynamics
J. Thomson, F. Lenard, G. Lewis, I. Langmuir - classical structural and dynamical model of the atom - electro-mechanical theory of chemical bonding	N. Bohr, A. Sommerfeld - quantum structureless model of the atom - quantum theory of chemical bonding
- cells of electronic layers are low capacity - geometric theory electron levels - atomic, nuclear frameworks of unaccounted mass - particles have a spatial structure	W. Pauli - Pauli exclusion principle - quantum theory of electronicatomic levels - weightless neutrino in beta decay - symmetry of decays of structureless particles

A. Mayer, G Lewis, I. Langmuir - structural-geometric theory of molecules and chemical bonds	W. Heitler, F. London, M. Born - quantum theory of molecules and chemical bonding from overlapping orbitals
A. Butlerov, A. Mayer, Lucretius - structural chemistry, the existence of different configurations of atoms, as the cause of isomerism	K. Weizsacker - nuclear isomers as energetically excited metastable states of the nucleus
A. Mayer - geometric shell magnetic model of atoms with stable numbers of electrons	M. Goeppert-Mayer - quantum shell model nuclei and values of the magic numbers of nucleons
D. Mendeleev - periodic table of elements	M. Gell-Mann, J. Zweig - quark system element particles
- equilibrium temperature of the space gas - kinetic theory of heat, reactions	G. Gamow - relict heat of the Big Bang - quantum theory of nuclear reactions
V. Hess, S. Shnoll - cosmic rays and their variations intensity	E. Fermi, V. Ginzburg - acceleration of cosmic rays by magnetic clouds
S. Maslikov - radio galaxies and quasars - optical sources with an EDR-converted spectrum - independent of the properties of the environment light dispersion	V. Ginzburg - magnetic bremsstrahlung and synchrotron mechanism of radio emission galaxies and quasars - acceleration and deceleration of cosmic rays in space
K. Jansky, G. Reber - discovery of galactic radio emission with a thermal nature	V. Ginzburg - synchrotron mechanism of galactic radio emission
M. La Rosa, V. Sekerin, R. Fritzius - double stars prove the BTR - denial of the applicability of SRT and GRT in space - stationary model of the Universe	W. De Sitter - double stars contradict the BTR - development of the theory of relativity in astrophysics - the theory of the expansion of the universe
J. LeSage, I. Zellner - the force of gravity is caused by the impacts of particles flying at the speed of light, and therefore changes in depending on the speed of bodies	R. Descartes, A. Einstein - field theory of gravity caused by spatial vortices or spatial curvature
P. Dirac	
- positron - the antiparticle of the negative-mass electron - positrons are in the nucleus and protons - particle symmetry: positrons and equal number of electrons in the world	- positron - positive hole in the Dirac sea - positrons are in antiworlds - symmetry of fields: Dirac magnetic monopoles - analogue of charges
Unknown Scientist - classic picture of the Compton effect [74]	A. Compton - quantum interpretation of the Compton effect
P. Drude - classical theory of conductivity - metal optics and polarization of light metals	A. Sommerfeld - quantum theory of conduction - quantorelativistic theory of metals and atoms
I. Zellner, V. Petrov - the unity of electrical, magnetic and gravitational forces	S. Glashow, S. Weinberg - quantum. electroweak theory interactions
W. Voigt, I. Stark - classical theory of the Stark effect	K. Schwarzschild, P. Epstein, E. Schrödinger - quantum theory of the Stark effect
I. van der Waals - classical theory of the real gas, taking into account interactions and particle sizes	V. Nernst - reducing the heat capacity of gases for rotational quantization molecular movement
G. Kamerling Onnes - discovery of superconductivity	J. Bardeen, L. Cooper, J. Schrieffer - quantum superconductivity
P. Kapitsa, Atkins - superfluidity of helium and theory of "snowballs"	L. Landau, V. Ginzburg - two-fluid theory of superfluidity of helium
P. Curie, P. Weiss	- quantum theory of second-order phase transitions,

- theory of crystallization, transitions paramagnetferromagnet, the role of symmetry	superconductivity and ferromagnetism
V. Fabrikant, T. Meiman - invention and creation of a laser	C. Towns - quantum laser theory
J. Fox - connection of masses, lifetimes and types of decays of elementary particles with their structure according to the BTR	A. Eddington - fabricated ratios masses of elementary particles and constants in terms of the numbers π and e
H. Lorentz, J. Fox, V. Okolotin - corpuscular electrodynamics	M. Faraday, K. Maxwell - electrodynamics of continuous media - theory of the electromagnetic field, ether and waves
W. Ritz - exchange interaction model charges from the exchange of rheons - emission electrodynamics - description of the spectra of the magnetic model of the atom (combination principle) - quantization of electron positions - standard magnetic moment particles (Ritz and Weiss magneton) - magnetic theory of the Zeeman effect - theory of elastic vibrations of plates - spectrum of vibration frequencies of molecules - asymmetry and electron axis - fixed position of electrons in an atom - BTR and ballistic principle - electrical theory of gravity - different nature of inert and gravitational mass - single electrical nature magnetic and gravitational forces - multiplying the number of images stars on BTR - light - stream of rheons - light emission during vibration electrons in an atom and stability coefficients, probabilities their provisions, corresponding spectrum line intensities - classic space-time interpretation of the Doppler and Ritz effects	R. Feynman, W. Heisenberg, W. Pauli - electrical forces from exchange virtual photons - quantum electrodynamics
	N. Bohr - a description of the spectra of the planetary atomic model - quantization of electron orbits - quantization of the magnetic moment atom (Bohr magneton)
	A. Sommerfeld, P. Debye - quantum theory of the Zeeman effect - quantum theory of solids - energy spectrum of crystals
	S. Goudsmit, J. Uhlenbeck - quantum spin of an electron
	W. Heisenberg - the uncertainty principle for electron
	A. Einstein - SRT and constancy of the speed of light - curved theory of gravity (GRT) - equivalence of inert and gravitational mass - quantorelativistic geometrodynamics unified field theory - multiplication of the number of images in gravitational lenses - light - flux of photons - instant emission of photons at abrupt change atomic energies and coefficients Einstein radiation corresponding to the probabilities of jumps - quantorelativistic interpretation frequency shift from speed and source acceleration
	- the law of transformation of mass and energy $E = mc^2$ - quantum theory of heat capacity - energy atoms and structureless bonds between them
	- energy atoms and structureless bonds between them - quantum theory of the photoelectric effect - photons and wave-particle dualism in the laws of radiation (with De Broglie)
M. Lomonosov - the law of conservation of mass and energy - molecular kinetic theory of heat - pyramidal atoms and the geometry of their bonds, carried out particle impacts	- inability to exceed the speed of light N. Bohr and O. Bohr - quantum theory of nuclear decays
M. Planck - classical theory of the photoelectric effect - the relationship between the energy E and the frequency f of rotation of electrons in the atom $E = hf$, blackbody radiation law	
N. Tesla - superluminal signals, incl. those of cosmic rays - the decay of nuclei induced by cosmic rays	

B. Brauner, W. Prandtl, A. Grimm - classic version of the table of Mendeleeev - the relationship of nuclear and chemical properties	N. Bohr and O. Bohr - interpretation of the periodic table according to the quantum theory of the atom - independence of nuclear and chemical technical properties
V. Manturov - nucleons - electron-positron crystals - crystal model of the core - the electrical nature of nuclear forces	- amorphous nucleons like liquids - quantum-droplet model of the nucleus - quantum theory of nuclear forces

Table of experiments on checking BTR, STR and GTR

Experiments and Effects Confirming BTR, but rejecting Maxwell's electrodynamics, SRT, GTR and Big Bang theory	Experiments and effects consistent with an BTR, but falsely cited as its violations and confirmations SRT or GRT
Starlight aberration Annihilation Busters, their variability and spectrum "Ejections" and "cocoons" of stars Additional images of space objects Quasars The redshift of galaxies, its paradoxes and the Hubble constant Irregular variable stars New - double stars and repetitive new Enrichment of the spectrum of the synchrotron Radiation Object SS 433 Michelson's experience Cantor's experience Duplishchev's experience Absence of Dirac monopoles Paired Astro Objects of Arp Semi-regular variable stars Venus radar Radio galaxies and their emissions X-ray and radio pulsars Supernovae and their spectra Superluminal particles in space beams and accelerators Flattened stars, Achernar, etc. Cepheids and variations in the brightness of their lines Electrodynamic experiments-paradoxes Barr effect Blazhko effect Pioneers effect	Galaxy light aberration De Sitter's analysis of binary stars "Gravitational Lenses" Mass defect in decays Slowing down light near the sun Bending rays near the sun Red shift of the spectrum of the Sun and stars GPS and GLONASS navigation Boehmmel's experience Bonch-Bruevich's experience Kaufmann's experience and the "relativistic" weight gain The experience of Mazmanishvili and Filippov The Pound and Rebke experience Experiment with annihilation radiation Sagnac experience and laser gyroscope Experience with radiation of nuclei and particles Fizeau experience and entrainment coefficient Airy's Experience Experiments with changing the course of atomic hours Experiments with changing the frequency of gamma radiation on a rotating disk Lack of stellar "ghosts" Transverse Doppler effect Particle lifetime stretching Relict radiation X-ray stars and Brecher's analysis Perihelion offset of Mercury "Black holes" and their X-ray radiation

Table of experiments on testing BTR and quantum mech

Experiments and Effects Confirming the classical theory of the structure of atoms, substances that reject quantum	Experiments Explained by Classical theory, but falsely considered its violation and confirmation of the quantum
Decay asymmetry The proximity of the radii of the electron and the nucleus Lasers Magic numbers of nuclei Magnetism of atoms and particles Nonlinear photoeffect Inverse "Compton effect" Experiments on the diffraction of one photon Experiments on the "diffraction" of one electron Shnoll's Experiments Superconductivity Superfluidity of helium Properties of lanthanides and actinides Conductivity properties of metals Selective photo effect Fatigue photo effect Mossbauer effect Nuclear isomers	Freezing degrees of freedom "Diffraction" of atoms "Diffraction" of neutrons Electron "diffraction" Heat capacity curve of solids Masers Multiphoton processes Planck's law of thermal radiation Franck-Hertz experience Vavilov's experience in registering photons Registration of gamma quanta Spectral series of atoms Tunnel effect Photo effect Cold issue Zeeman effect Compton effect Stark effect

Abbreviations used

AK - Kalashnikov assault rifle
AMS - Automatic Interplanetary Station
APS - Stechkin Automatic Pistol
NPP - Nuclear Power Plant
APC - Ritz Ballistic Theory
Navy - Navy
HF - High Frequencies (3-30 MHz)
GLONASS - Global Navigation Satellite System
DOT - Long Term Fire Point
UTP - Unified Field Theory
QCD - Quantum ChromoDynamics
QED - Quantum ElectroDynamics
LASER, eng. LASER - Light Amplification by Stimulated Emission of Radiation (light amplification by stimulated radiation)

MASER, eng. MASER - Microwave Amplification by Stimulated Emission of Radiation
(amplification of microwave waves using stimulated radiation)
MCT - Molecular Kinetic Theory
NTR - Scientific and Technical Revolution
General Relativity - General Theory of Relativity
Microwave - Ultra High Frequencies (3-30 GHz)
SRT - Special Theory of Relativity
TP - Theory of Ripples (stars)
Computer - Electronic Computing Machine
EDR - Doppler-Ritz effect
EMF - Electromotive Force
HAARP, eng. HAARP - High frequency Active Auroral Research Program
(high-frequency active auroral research program)
HYAS - Cold Nuclear Fusion
GPS - eng. Global Positioning System

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