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WHY IS PREINERTIA SO IMPORTANT?

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Abstract.-Preinertia is a universal property of all physical objects that was discovered and published by Galileo in 1632, yet it has remained and remains ignored by modern physics. In this article I discuss both the reasons for this ignorance and the fundamental mechanical importance of this universal attribute of all physical objects (even photons are preinertial). Indeed, preinertia is the reason why it is impossible to detect the absolute motion of an object A by means of other objects set in motion from the object A . It is also the reason why all motions are in fact absolute, however anathema absolute motion may be in contemporary physics.

Keywords: inertia, preinertia, uniform relative motion, absolute motion, detection of absolute motion, kinetic energy, linear momentum.

1. Introduction

Preinertia is a universal property of all physical objects made public by Galileo in 1632, although not with that name but referring to it as a “marvelous effect in Nature”. An idea that unfortunately he did not develop later, and that he expressed in conditional, hypothetical terms, with the following words in the mouth of Sagredo:

Sagredo.IF IT IS TRUE that the impetus with which the ship moves remains imprinted on the stone after it has separated from the mast, and IF IT IS ALSO TRUE that this motion does not hinder or slow down the straight downward motion natural to the stone, it is bound to follow a marvelous effect in Nature [2, p. 228].

As far as I know, no one in the subsequent history of physics has echoed that Galilean hypothesis (nor had anyone ever done so before).

It may seem that preinertia is obvious, as obvious as inertia; or it may even seem that they are the same thing. But until Galileo-Newton, the vast majority of thinkers defended the immobility of the Earth: “if you jump, you fall in the same place where you do it”, ergo there is no preinertia. And from Galileo-Newton to the present day, preinertia remains absent from physics, being, as it is, a universal property of all physical objects, including subatomic particles and photons. An extraordinarily relevant property that will have very significant consequences in the future of physics.

If anyone in the history of science had considered preinertia and thought about it, he would have discovered that this property of physical objects would make the detection of absolute motion impossible, if this type of motion existed. The reader can already imagine the consequences that such a conclusion would have had on the development of modern physics. Think, for example, of the Michelson-Morley experiments that attempted to detect the absolute motion of the Earth, in the words of AI Gemini 2.5:

The result of the Michelson-Morley experiment was completely unexpected: it was a null result. No difference in the speed of light was detected, regardless of the orientation of the apparatus or the time of year the experiment was performed. The speed of light is constant for all observers, regardless of their own motion. This result was a key piece that paved the way for Albert Einstein to develop his Theory of Special Relativity (1905), which is based on the idea that all motion is relative. In short: The experiment was looking for absolute motion, but its null result helped establish that all motion is relative.

No trace of preinertia, not even in the most skilled AIs of our day. For practically all physi-

cists of our day, the motion of an object is with respect to something, not through something; or around something.

The impossibility of detecting absolute motion is not the only important physical conclusion that follows formally and experimentally from preinertia: the inheritance of motion (a simplified way of expressing preinertia) implies, in turn, and for the reasons that will be given here, that there can be only a single heritable motion. And that motion can only be absolute motion through absolute space.

As if the above two reasons were not enough to affirm the importance of preinertia, there are others that confirm this importance, although these other reasons have nothing to do with preinertia or physics, but with the sociology of contemporary science, among others the following:

- 1.- The principle of academic authority: the excessive weight of certain historical and contemporary authors.
- 2.- The existence of dominant streams of thought, which are also very hostile to dissidence.
- 3.- The current system of scientific publications, very much at the service of the dominant streams of thought.

In this new article, the reasons why preinertia is a physical concept of the utmost importance are recalled. A physical concept that, sooner or later, will have to be incorporated into fundamental physics, surely incorporating it into the Principle of Inertia, as I have already proposed in other works and propose again here. All of which should serve as a lesson (of humility) for the future of physics (and all sciences).

But first, and to pave the way for the inevitable consequences of considering preinertia as a universal quality of all physical objects (including photons), I will discuss two physical issues, also important and also poorly considered by contemporary physics: the reality of the physical space through which all physical objects necessarily move, and the absolute nature of all rotational motions of all celestial bodies.

2. On the reality of physical space

The physical and metaphysical concept of space has attracted the attention of theologians, philosophers and scientists of all times. And it continues to do so, because for the contemporary scientific community the problem is not yet solved (although, as we will see here, it should be solved). Since Newton-Leibniz times, there are still two very different schools of thought on the nature of space: For some, space has a real existence, it is even made or filled with some substance (substantivalism). For others, space is not real, it is only the consequence of our (mental) way of perceiving the certain relations between physical objects (relationalism).

Indeed, for some authors, like E. Mach, the physical reality of space is an aberration which must be eliminated from mechanics [9, p. 12]). For others, as F. Wilczek, space is a form of matter [10, p. 180], not a fiction. And for others, like A. Einstein, changed their minds: from considering the physical reality of space absurd [1, p. 345] to considering its possible real existence [3, p. 134-137]). In any case, it seems clear that during the last hundred years relationalism has dominated over substantivalism.

But in 2015 an extraordinary scientific-technological event occurred, which has since been repeated about a hundred times: the empirical detection of gravitational waves. As is known, these waves are vibrations (of the transverse-quadrupole type) of space itself that are transmitted through that same space at the speed of $299792458 \text{ m s}^{-1}$. These vibrations interact with the interferometers that detect them by modifying the distances that separate their mirrors. Although this modification is a thousand times smaller than the diameter of a proton, it is greater than zero. Therefore the empirical interaction of space with the interferometers is real.

Thus, space has empirically detectable physical properties. Therefore, space must be a real physical object, because fictions, i.e. what do not exist, neither can vibrate, nor transmit their vibrations, nor interact physically with scientific instruments. Or to put it another way:

- 1.- That which does not exist physically cannot really vibrate, nor can its vibrations be empirically detected.
- 2.- Physical space can vibrate, and its vibrations can be empirically detected.
- 3.- Therefore, physical space is real.

This simple Modus Tollens demonstrates the physical reality of physical space. In my opinion, this signifies the final triumph of space substantivalism.

As such a physical object, physical space has its own physical properties, including those that allow it to vibrate and transmit its vibrations at the speed of light, the propagation of light at its maximum speed and, obviously, to be transparent to the motion of ordinary matter (inertia). The electrical permittivity and magnetic permeability of the vacuum could also be attributed to the physical space. To sum up:

eTheorem 1 (of the Physical Space) *Physical space is a real physical object with certain physical properties that can be tested and measured in experimental terms.*

Where an eTheorem is a statement whose veracity is supported by both experimental data, in this case the empirical detection of gravitational waves, and logical inferences.

Once the physical reality of space is established, it will have to be accepted that all physical objects move THROUGH THE SAME PHYSICAL SPACE. The problem is that, at least for the moment, we do not know how to perceive neither the substance of physical space, nor its possible discrete units (qusits, quantum space units) to which the motions of all physical objects could be referred. *But the motion of physical objects through physical space is the only motion of those objects*, and it is from the different motions of celestial objects through the same and unique real physical space that all relative motions of celestial bodies to each other result, relative motions that are the only observable and measurable motions. However, ten years after the first detection of gravitational waves, physics has yet to unequivocally confirm the existence of physical space. This demonstrates the difficulty of changing mainstream thinking.

3. On the absolute nature of rotations

On the absolute nature of the rotations of all celestial bodies, I reproduce here a text taken from [5]

In the case of the Earth, the first rotation to be considered is its rotation around an internal axis (the Earth's rotation axis). It is a real rotation because it produces observable and measurable effects: the apparent rotation of the Sun and the rest of the cosmic objects around the Earth. In each rotation of the Earth around its internal axis of rotation, each of its points describes a unique circle, with a unique center of rotation that will be a unique point on the unique Earth's rotation axis. And since in a single rotation a point cannot rotate at the same time around two different centers of rotation without being in different places at the same time, the motion of rotation of each of the points of the Earth around its corresponding center of rotation is unique and can only be referred to that unique center of rotation, which will therefore be an absolute center of absolute rotation. And this is true for every point of the planet. The rotation of the Earth around its internal axis of rotation is, therefore, a real and absolute rotation. Although, as we shall see, that absolute internal axis of absolute rotation is in turn rotating around other centers of absolute rotation external to the planet.

Instead of considering the points of the Earth, let us now consider the Earth as a whole, the Earth as a planet. The planet Earth, as a whole, now rotates in an elliptical orbit around the Sun (which occupies one of the two foci of the ellipse). That (so-called) translational motion of the Earth around the Sun also produces apparent motions in the rest of the cosmic objects. And although they are apparent, not real, appearances as such appearances are real: they are observable and measurable. And for the same reason as in the case of the points in the rotation of the Earth around its absolute internal axis of absolute rotation, the elliptical orbit of the Earth is also a unique orbit around its two unique foci (although it is not stable and in time may oscillate with respect to certain equilibrium positions). So, also in this case, the rotation of the Earth around the Sun is a real and unique motion that can only be referred to the absolute geometrical elements of its unique absolute elliptical orbit (its two foci). It is therefore another real and absolute motion.

According to everything we know about the observable universe, the vast majority of its trillions of physical objects are subject to rotational motions (from one revolution every 100 quadrillion years in the case of some galaxies, to one quadrillion revolutions per second in the case of electrons). And the above argument applies to all of them. Therefore cosmic objects do not rotate WITH RESPECT to the sphere of fixed stars, as advocated by E. Mach. [7, p. 83-84] [8, p. 45] and many contemporary physicists, but each of their rotations is a motion **AROUND** a unique and absolute axis, or center/foci, of rotation. They are, therefore, real absolute rotations, real absolute motions [4]. Thus, the vast majority of motions in the observable universe are absolute, not relative.

According to the above argument, the following theorem can be stated:

Theorem 1 (of Absolute Rotations) *All rotational motions of all celestial bodies are real and absolute motions around unique and absolute axes, centers or foci of rotation.*

4. On the scientific importance of preinertia

The physical reality of space and the absolute nature of all rotations (simple or compound) of the vast majority of celestial bodies in the observable universe provide a suitable setting for recalling the formal results related to preinertia and formally deduced in [6]:

Theorem 2 (of Special Relativity) *Special relativity requires that all physical objects in the observable universe be preinertial.*

Theorem 3 (of the Sum of Velocities) *Relativistic sum of velocities requires that all physical objects in the observable universe be preinertial.*

Theorem 4 (of the Maximum Velocity) *The existence of a maximum velocity in the observable universe requires that all physical objects in the observable universe be preinertial.*

Theorem 5 (of the Linear Momentum) *The conservation of linear momentum requires that all physical objects in the observable universe be preinertial.*

Theorem 6 (of Preinertia) *All physical objects of the observable universe are preinertial.*

Theorem 7 (of Undetectable Absolute Motion) *Preinertia makes absolute motion, if it existed, undetectable.*

Theorem 8 (of Physical Space) *Physical space is real and absolute, the same for all ordinary physical objects contained in it and moving freely THROUGH it.*

Theorem 9 (of non-Preinertial Mechanics) *The mechanical correctness of modern physics is achieved without making use of preinertia.*

Theorem 10 (of Absolute Motion) *The motion of all physical objects through the same real and absolute physical space is also real and absolute.*

Definition 1 (of Preinertia) *Property of every physical object by virtue of which it inherits the absolute velocity vector of the physical object from which it is set in motion.*

Law 1 (Newton First Law) *Every physical object is preinertial and maintains its state of uniform motion as long as no external force acts on it.*

These simple statements are enough to understand the enormous physical importance of preinertia. It is not even necessary to comment on them. Except to say that, obviously, the history of physics would have been very different if Galilean preinertia and its consequences on the nature of motion had been taken into account at any time by any author since 1632.

5. Preinertia and the sociology of science

The case of Galileo and preinertia is very significant from the point of view of the sociology of science. Indeed, it is incredible that no one in more than 390 years has noticed this "marvelous effect in Nature" by which Galileo refers to the preinertia, the inheritance of motion. A "marvelous effect in Nature" made public in 1632 in one of Galileo's most popular and widely read books. And although not in a very detailed and explicit way, in that same book Galileo also recognizes the impossibility of detecting the motion of the object (the Earth in this case) from which the other object (the stone falling from the top of a tower on the Earth) is set in motion:

... But the part of all this motion that is common to the stone, the tower and us, is imperceptible to us and as if it did not exist, and only the part of which neither the tower nor we are participants is observable, which in the end is that with which the stone, when falling, travels the height of the tower.

Not even Newton considered this Galilean inheritance of motion: if he had, he himself, or some later physicist, would have used it to demonstrate the absolute and undetectable nature of motion. How different the history of physics would have been if that had been the case!

The author of this article first made the concept of preinertia public in 2014, in a first self-publication of his book *Digital relativity*, then rewritten and self-published as *Apparent relativity* in 2021, and especially in its second edition of 2022. Displayed on Academia.edu, ResearchGate and *The General Science Journal*, it has been downloaded / browsed / read 1025 times at the time of writing this paragraph (4/7/2025). A similar number of times, although I have not counted them, my articles related to preinertia, or in which the concept appears, have been downloaded / browsed / read. Naturally with zero effect on our beloved contemporary physics. Here, then, are the conditions to confirm the importance of preinertia also for the sociology of science.

In fact, the three points mentioned in the introduction to this article become evident:

- 1.- The principle of authority. In this case, the authority in contemporary physics of A. Einstein, an author more than admired, revered by the vast majority of physicists for more than a century. The few authors who disagree, totally or partially, with special relativity are condemned to the most severe ostracism, and in some cases even to personal insult.
- 2.- The existence of dominant currents of thought hostile to dissidence. In the present case, I must point out two of these currents: relativism in physics and infinitism in mathematics. To be outside them, as has been my case for the last 40 years, means not to exist for contemporary science.

- 3.- The current system of scientific publications. The chances of an irrelevant author, as in my case, publishing in first level scientific journals are practically nil. Some of these journals publicly warn that they do not publish papers that go against the main currents of scientific thought. I can think of nothing more anti-scientific. I hope that in the future the authors will also be anonymous to the referees, and the referees will be artificial intelligences.

Fortunately, there are publication spaces, such as The General Science Journal (where I have been publishing exclusively for the last years) and scientific networks such as ResearchGate and Academia.edu where it is possible to expose and update scientific work. I present here the most relevant data for a sociological analysis of this social exposure of my work and its practically null consequences on the scientific officialism of our days in mathematics and physics (data corresponding to 9/24/2025):

ResearchGate: Reads 28261. Research interest score higher than 83% of all ResearchGate members (more than 25 million researchers).

The General Science Journal: Reads: 17788.

Academia.edu: Public views 11102. Top 1%.

Total downloads / browsing / readings: 57151.

I appreciate the interest and apologize for my social anxiety bordering on social autism that prevents me from personal interactions.

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