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The Infinite Universe*:*

The Best of All Viable Cosmological Models

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Abstract:

In the present review of an article entitled: "The Universe: Finite or Infinite?**",** by Christopher J. Davison, it has been concluded that the infinite-universe model, in which space, time, and matter have been taken for granted, in advance, to be infinite, is, by far, the most logically coherent, aesthetically appealing, and the best of all recorded models of the physical universe, in the published literature.

Keywords:

Hubble's law; cosmological models; infinite universe; eternity; finite universe; relativistic cosmologies; field equation; multiverse; medieval cosmology; observable universe; universal causation; infinite past; matter; gravitation; steady state; cosmological redshift; big bang; cosmic microwave background.

Introduction:

Throughout the current discussion, the physical universe of the main *finite-universe* cosmological model is defined as the universe, in which space, time, and matter have been assumed, beforehand, to be all, quantitatively, finite. Whereas the physical universe of the main *infinite-universe* cosmological model is defined as the universe, in which space, time, and matter have been assumed, in advance, to be all, quantitatively, infinite

In theory, it might appear, at first glance, logically, conceptually, as well as ontologically possible to construct internally consistent working models of the physical universe, by, simply, replacing one or two of the three basic assumptions of the *finite-universe* model — In which the physical universe has been assumed, in advance, to be spatially, temporally, and materially finite — with one or two of the three basic assumptions of the *infinite-universe* model — In which the physical universe has been taken, beforehand, for granted, to be spatially, temporally, and materially infinite.

Upon closer examination, however, each and every one of the following groups of hybrid models of the physical universe, put together in that way, is riddled with inconsistencies, paradoxes, discrepancies, and contradictions:

1. The group of mixed cosmological models, in which the physical universe has been assumed to be spatially and materially finite, but, at the same time, to be temporally infinite; such as, for example, Aristotle's hybrid model of the physical universe ***[Ref. #4]***, in which the axiomatic finite temporality of the *finite-universe* model has been replaced with the axiomatic infinite temporality of the *infinite-universe* model; where, as a result, in all of which the physical universe is, extremely, predisposed to undergoing, eventually, premature heat death, due, mainly, to the insidious workings of the second law of thermodynamics, within closed systems, in general, and more so, within spatially closed systems, in particular.

2. The group of mixed cosmological models of the physical universe, in which the physical universe has been assumed to be spatially and temporally infinite, but materially finite; such as, for instance, the Newton-Bentley hybrid model of the physical universe ***[Ref. #9]***, in which the axiomatic infinite amount of matter of the *infinite-universe* model has been replaced with the axiomatic finite amount of matter of the *finite-universe* model; where, as a consequence, in all of which the finite amount of matter of the physical universe is, extremely, prone to being dispersed, and thinned out, into oblivion, over increasingly huge volumes of infinite space.

3. The group of mixed cosmological models of the physical universe, in which the physical universe has been assumed to be finite temporally and materially, although spatially infinite; such as, for example, the current big-bang model of the physical universe ***[Ref. #11]***, in which the axiomatic finite space of the *finite-universe* model has been replaced with the axiomatic infinite space of the *infinite-universe* model; where, inevitably, in all of which the finite matter of the physical universe is, exceedingly, liable to being dispersed, progressively, thinned out, and slipped into oblivion, over increasingly immense volumes of infinite space, in direct proportion to the given age of the physical universe.

4. The group of mixed models of the physical universe, in which the physical universe might be assumed to be finite temporally, while spatially and materially infinite, although, theoretically, permissible, there seems to have been, so far, no example, for it, in the published literature.

5. The group of mixed models of the physical universe, in which space and time might be assumed to be finite, but the amount of matter to be infinite, is a nonstarter, from a theoretical standpoint; since the assumption of infinite amounts of matter, by definition, requires, necessarily, the assumption of infinite volumes of space to go, hand in hand, with it.

6. The group of mixed models of the physical universe, in which space might be assumed to be finite, but temporally, as well as materially infinite, is, also, a nonstarter, from a theoretical standpoint, because an infinite amount of matter requires, necessarily, by its very definition, an infinite volume of space to go hand in hand with it.

And so, undoubtedly, the *infinite-universe* model of the physical universe, in which matter, space, and time have been assumed to be infinite ***[Ref. #1; Ref. #3 & Ref. 14]***, as well as the *finite-universe* model of the physical universe, in which matter, space, and time have been assumed to be finite ***[Ref. #5 & Ref. #6]***, are, by a wide margin, in the final analysis, the two most externally coherent, and internally consistent cosmological models, among all of the theoretically possible cosmological models of the physical universe.

However, it has become common knowledge, since classical times, that the *finite-universe* cosmological model of the physical universe, within which matter, space, and time are all assumed to be finite, faces, at least, three major logical as well as ontological problems that have no real prospect of being solved or settled, even in principle, in any satisfactory manner, whatsoever, at all:

- The edge-of-the-universe problem that has been brought about by the basic assumption of finite space, and which goes as follows:

  "Now since we must admit that there is nothing outside the sum, it has no outside, and therefore is without end and limit. And it matters not in which of its regions you take your stand; so invariably, whatever position any one has taken up, he leaves the universe just as infinite as before in all directions. Again, if for the moment all existing space be held to be bounded, supposing a man runs forward to its outside borders and stands on the utmost verge and then throws a winged javelin, do you choose that when hurled with vigorous force it shall advance to the point to which it has been sent and fly to a distance, or do you decide that something can get in its way and stop it? For you must admit and adopt one of the two suppositions; either of which shuts you out from all escape and compels you to grant that the universe stretches without end" ***[Ref. #3]***.

- The absolute-beginning-of-the-universe problem that is being caused, primarily, by one of the three basic assumptions, upon which the *finite-universe* cosmological model of the physical

universe has been founded, namely, the assumption of finite time. In spite of its benign appearance, this particular problem is, hugely, daunting, and, ultimately, unsolvable, at heart. And that is because if the physical universe is assumed to have an absolute beginning, then nothing can exist prior to such an absolute beginning of the physical universe. And subsequently, the physical universe must, somehow, manage to come, into existence, out of nothing, which is, by all accounts, physically, ontologically, and logically impossible.

- The ever-present-eternity problem, which makes it, virtually, impossible, for anyone, to put forward any viable cosmological model of the physical universe, in which time is truly finite. Even medieval philosophers, working all over the world, and as determined as they were, to have a truly finite cosmos, could, from any epistemological standpoint, do nothing more beside pushing the ever-present eternity a little bit upstairs, by assigning it, arbitrarily, to their own personal deities as well as to all other sorts of hypothetical prime movers. What makes this exceptionally thorny problem, extraordinarily impossible to solve, avoid, or do away with, is that the ever-present eternity, conceptually, has, by definition, only two valid access points, the location of both of which is right smack in the middle of it. The first valid access point starts from the present time, and regresses, indefinitely, forever, into the infinite past. And likewise the second valid access point starts from the present time, as well, and then advances, indefinitely, forever, into the infinite future.

It should be noted, in this regard, however, that the published article, under discussion, takes into consideration, no other cosmological model of the finite universe, beside the current cosmological model of the finite big bang, in accordance with which the physical universe had an absolute beginning — an exact moment of time, in its finite past — prior to which no space, no time, and no matter could, possibly, have existed, in any shape or form, at all. But, nonetheless, according to the same finite big-bang cosmological model, at the precise moment of the absolute beginning, the physical universe did, anyhow, manage to have one instant of time, one point of space, and a finite amount of infinitely dense matter ***[Ref. #11 & Ref. #12]***.

Although, as might be expected all along, the proponents of the *big-bang* cosmological model of the physical universe have, always, maintained that this big-bang model of theirs is the only viable cosmological model, in modern cosmology, which is easy to extrapolate, directly, from Hubble's law, and the cosmic microwave background ***[Ref. #20 & Ref. #21]***, the theoretically proposed explanation, for both, by the means of expanding voids of pure space is, practically and logically, as a matter of fact, completely unrealistic, and far worse and much uglier than having no explanation, at hand, for either of them, to loudly speak of, or to proudly brag about, at all.

But, regardless of how popular and highly esteemed the *big-bang* cosmological model of the finite universe, nowadays, is, more likely than not, future historians and anthropologists would, actually, explain the whole edifice of it away, as nothing more than a simple projection of the nuclear age upon the entire physical universe. And they would, just, go ahead and add this particular cosmological creation of the 20th century, quite simply, to their long list of very similar mythological projections that have continued to be added, one after the other, sequentially, and nonstop, throughout human history.

1. The Universe: Finite or Infinite:

In an article entitled: **"The Universe: Finite or Infinite?" —** on pages ***126-127*** of Apeiron Vol. *7* Nr. ***1-2*** **—** Christopher John Davison wrote the following:

"A choice needs to be made between finite and infinite size and between finite and infinite lifespan. Without an understandable explanation as to what lies beyond the limits; my choice is for infinite in both cases.

The finite-size view seems to be assuming a state of "absence of everything" at the edge of an island-universe. The finite-life view requires this same "absence of everything" before and after a limited life-span and it must also require a super-power capable of both universal creation and destruction. This power is not required if the assumption is made that the Universe had no origin and will always exist. Of course, infinite size and lifespan are not understandable concepts in the same way as the size of a lake or wood. This leads to the basis of my argument—in English, finite means limited, and to say that the Universe is limited is to say that once the limit is reached all trace of everything disappears; Now this is more difficult to accept than to assume infinite lifespan and size—It is reasonable to ask those who claim limited size and lifespan to explain how space and material came into existence from nothing, how it will disappear again, and to explain the situation beyond the edge of a finite-sized Universe; Otherwise, are we not forced into the conclusion that the size and lifespan of the Universe are unlimited?

Barely detectable distant galaxies are very near objects indeed in a limitless universe: they are as close as the next grain of sand on an infinitely large beach. Although our tiny microcosm(the detectable universe) will follow universal laws there has not been proof, observational or otherwise, of big-bang expansion.(Infinite size contradicts the big-bang theory). In a universe of infinite size, if there was a "bang" it was a local mini-bang, big only by our microscopic standards and not connected with"the origin"of a universe that had no origin. The Universe cannot expand or contract: these terms do not apply to infinite size and something of infinite age cannot be evolving with time. Matter: in one form or another always occupies infinite space and is not an "island"; otherwise the "beyond the island" question remains. Only the components of space are subject to curvature not space itself; otherwise an understandable explanation of "curved nothing"is required.

The Universe does not have an "edge" or an "age"and any component would take an impossible infinite time to "cross" the Universe.(Of course, the expression"to cross"does not apply to infinite distance) Unlimited space, time and material have probably always and will probably always produce life at various levels; However, conditions required to produce life will occur infrequently by our standards and contact is unlikely. The nearest of a endless number of examples could well be located too far away for any form of communication during the remainder of our brief microseconds on beautiful jewel planet Earth" ***[Ref. #15]***.

Without a doubt, the above arguments of his are physically, logically, and philosophically, sound and on the right track. The glaring inconsistencies of the ***'Finite Universe'***, the horrendous absurdities of the ***'Medieval Cosmos'***, and the hideous contradictions of the ***'Big Bang'*** are, simply, numerous and quite appalling.

Historically, the medieval notion of ***'Finite Cosmos'*** was all but demolished as a direct consequence of the published works of Copernicus, Bruno, Kepler, Galileo, Newton, and others.

However, almost immediately, after the publication of Einstein's paper, on his theory of general relativity, in ***1916 [Ref. #19]***, slightly modified versions of the old medieval ***'Finite Cosmos'*** started to reappear, once again, under the heading of ***'relativistic cosmologies'***; and the early arrivals of which were, of course, Einstein's so-called ***'Finite-but-Unbounded Universe'***, and Lemaître's so-called ***'Cosmic Egg' [Ref. #17 & Ref. #18]***.

Eventually, Hubble's law — the discovery of the Doppler-like displacement, towards the red end of the visible spectra of faraway galaxies,which is linearly proportional to distance from Earth — has forced most of the relativistic models of the universe to abandon the hypothesis of ***'unbounded universe'***, and to adopt the current hypothesis of ***'expanding universe'***, instead ***[Ref. #20]***.

But, regardless of whether it's being assumed to be unbounded or expanding, the hypothetical universe of the vast majority of relativistic models, in cosmology ***[Ref. #11]***, is still spatially, temporally, and materially finite and limited, at heart. And thus, no convincing arguments, on scientific, logical, epistemological, or aesthetic grounds, can, possibly, be, somehow, invented and put forward, for it, or in its favor, in any shape, form, or fashion, whatsoever, at all ***[Ref. #12]***.

And although there has been a number of daring attempts, since the start of the 21st century, in the published literature, to turn the ***'Finite-but-Expanding Universe'*** of the relativistic models, spatially, and in some cases, temporally as well, into an infinite one, in order to get rid of several paradoxes and contradictions, all in one go ***[Ref. #2 & Ref. #16]***, neither the assumption of infinite space, nor the assumption of infinite time can work, properly, as intended, in a consistent manner, side by side, and in conjunction with the assumption of finite matter, in the absence of which the field equations of Einstein's theory of general relativity, totally, break down, and, at once, fall to pieces, all together, in utter humiliation, long before they even start getting off the ground ***[Ref. #19]***.

Initially, Einstein's general theory of relativity was developed, put forward, and viewed, by him, as a reasonably satisfactory resolution of quite a few obvious inconsistencies, between the fundamental principles of classical mechanics and the basic tenets of his own special theory of relativity ***[Ref. #19]***.

However, almost immediately, soon afterward, A. Einstein, himself, and several of his colleagues began, in earnest, to resurrect various modified forms of the long-forgotten f*inite-universe* cosmological model of the medieval tiny cosmos; by making use of the following symbolic relation:

$$G_{\mu\nu} + \Lambda g_{\mu\nu} = kT_{\mu\nu}$$

where $G_{\mu\nu}$ is Einstein's tensor; $g_{\mu\nu}$ is the metric tensor; $T_{\mu\nu}$ is the stress-energy tensor; Λ is the cosmological constant; and k is Einstein's gravitational constant.

But, despite its outward algebraic appearance, the above symbolic relation is, in fact, a mere collection of symbolic templates, for constructing more and more symbolic templates, none of which is going,

even in principle, to produce numerically precise results, or to lead to mathematically meaningful predictions, without making, up front, literally, tons of ad hoc assumptions, baseless conjectures, as well as arbitrary approximations and erratic decisions, at every turn.

It's no coincidence, therefore, that all of the resurrected versions of the medieval cosmological model of the finite universe, on the basis of the aforementioned symbolic relation, have been, in the end, thrown, unceremoniously, into the dustbin; except the least extremely improbable version, and the least highly unrealistic one, in thick of them all; namely, the *big-bang* cosmological model of the finite universe.

2. The Big-Bang Model of the Finite Cosmos:

In ***1927***, Georges Lemaître, in a paper, entitled: ***"A homogeneous universe of constant mass and increasing radius accounting for the radial velocity of extra-galactic nebulae" [Ref. #23]***, outlined, on the basis of Einstein's theory of general relativity, a tentative interpretation of Hubble's empirical law in terms of expanding space, between galaxies ***[Ref. #22]***, instead of true Doppler effect, due to actual speeding up, away from observers on Planet Earth, with radial velocities, in direct proportion to their distances from the solar system, as Edwin P. Hubble, himself, seemed to suggest ***[Ref. #20]***.

It's, widely, believed that Georges Lemaître would have never been able to base his strikingly bizarre interpretation of Hubble's empirical law, upon the framework of Einstein's theory of general relativity, if he had not, willingly, chosen, ahead of time, to throw, without hesitation, and without second thoughts, Einstein's cosmological constant Λ out of the window, and into the dustbin, for good and all.

And, clearly, most of the time, the implicit and unspoken assumption, behind such a commonly held belief, is that the relativistic cosmological models of the physical universe ought to come out, straight away, either in a natural manner, or by the overwhelming force of logical necessities, from the mathematically rigorous solutions of the field equations of Einstein's theory of general relativity.

But, in reality, there are no mathematically rigorous solutions to the field equations of Einstein's theory of general relativity. And as a matter of fact, the relativistic cosmological models can, only, be constructed, on a whim, and then externally attached, in a number of ad hoc and artificial ways, to the field equation of Einstein's theory of general relativity. And, to tell the truth, none can, really, even in principle, emerge, deductively, inductively, or naturally, in any conceivable manner, from those so-called field equations of Einstein's theory of general relativity.

And that is because, as mentioned earlier, in the present discussion, the field equation of Einstein's theory of general relativity is, merely, a collection of symbolic templates, for constructing more and more symbolic templates, none of which yields mathematically precise results, or leads to any computed sort of theoretical predictions, without making, first of all, countless assumptions, employing many approximation techniques, and taking a lot of arbitrary decisions.

Now, in theory, in general, or nine times out of ten, at least: Is it, really, possible, for the following original symbolic relation, with the symbol Λ:

$$G_{\mu\nu} + \Lambda g_{\mu\nu} = kT_{\mu\nu}$$

to let Einstein's *finite-but-unbounded* model come out, naturally, from the inside of it?

No! Since the idea of *finite-but-unbounded* space is, in itself, illogical and unmathematical, A. Einstein must have, in the first place, pictured his *finite-but-unbounded* cosmos, in his own imagination, interpreted his field equation, in a totally arbitrary way, subjectively, and then imposed, externally, his imaginary cosmological model, from the outside, quite loosely, upon the fuzzy and hazy symbols of it.

And once again, all things considered, is it, actually, possible, in principle, at least, for the following modified symbolic relation, without the Greek letter Λ:

$$G_{\mu\nu} + g_{\mu\nu} = kT_{\mu\nu}$$

to allow Lemaître's *finite-but-expanding* model to emerge fully, either by mathematical inevitabilities, or by logical necessities, from inside whatever remains of the woolly and nebulous symbols of it?

No! There is no chance, at all. Due to the fact that the notion of *finite-but-expanding* space, per se, is, intrinsically, unphysical, unmathematical, and illogical, Georges Lemaître must have had no other choice but to firstly imagine his *finite-but-expanding* cosmos, inside his head, interpret the above symbolic relation, subjectively, the way it suited him, and then to impose, externally, his fictional cosmological model, from the outside, artificially, upon the remainder of that fuzzy symbolic relation.

And one more relevant question: Is it, even remotely, possible that importing Leibniz's relational space ***[Ref. #24]***, and implanting the dogma of it, into the theoretical framework of Lemaître's *finite-but-expanding* model, could, somewhat, improve the notion of *finite-but-expanding* space, and render it, to some extent, less illogical, and not so much as unmathematical?

No! That is not, even remotely, possible. Because L'abbé Georges Lemaître postulated, within the framework of his *finite-but-expanding* cosmological model, that the change in the relational space, between galaxies, has to be caused, by the expansion of the geometrically pure ***3***-dimensional space, itself. Whilst, by contrast, in the following passage, Gottfried Wilhelm Leibniz stated, explicitly, that the change in relational space, between material objects, can only be caused, by the actual movement of one or more of the material objects, in question:

"I grant there is a difference between an absolute motion of a Body, and a mere relative change in its situation with respect to another Body. For when the immediate cause of the change is in the Body, that Body is truly in motion; and then the situation of other Bodies with respect to it, will be changed consequently, though the cause of that change be not in them" ***[Ref. #25]***.

And, finally: Is Lemaître's *big-bang* model the only cosmological model of the *finite-but-expanding* cosmos, in the entire published literature, on the topic of relativistic cosmologies?

No! Not really. Since there is, also, Hoyle's *steady-state* model ***[Ref. #26]***, which is, according to the published literature, the nearest, toughest, and most imposing competitor to Lemaître's *big-bang* model, ever devised, among all cosmological models, based on Einstein's general theory of relativity.

Basically, Hoyle's *steady-state* model takes Aristotle's mixed cosmological model ***[Ref. #4]*** , in which time has no beginning and no end, as is, and then appends *finite-but-expanding* volumes of space, and *finite-but-increasing* amounts of matter to it.

In the end, however, Lemaître's *big-bang* cosmological model has all but soundly defeated Hoyle's *steady-state* cosmological model. And that is, probably, because the assumption of the explicitly continuous *creatio ex nihilo* of matter, all the time, in Hoyle's *steady-state* cosmological model, is whole lot worse, and more aesthetically unattractive, than the assumption of the implicitly *creatio ex nihilo* of matter, just once, at the start of the universe, in Lemaître's *big-bang* cosmological model.

3. The Fundamental Deficiencies of the Big-Bang Model:

Notwithstanding its hard-won triumph over Hoyle's *steady-state* cosmological model of the *-eternal-finite-and-expanding* universe, Lemaître's *big-bang* cosmological model continues to exhibit several clusters of numerous and horrendous deficiencies, some of which have been inherited from the theory of Einstein's theory of general relativity, and some of which have been of its own making:

I. The cluster of fundamental deficiencies of materializing the purely geometrical essence of the ***3***-dimensional space, which, obviously, Lemaître's *big-bang* cosmological model has inherited, directly, from Einstein's theory of general relativity; including the primary deficiency of the presupposed elasticity of the ***3***-dimensional space; along with the supposition, in accordance with which "*matter tells space how to curve, and curved space tells matter how to move*" ***[Ref. #10]***; and, of course, the elemental deficiency of the hypothetical *never-ending* expansion of the whole void of space, throughout the physical universe, due, supposedly, to the causeless gigantic explosion of the infinitely dense and finite amounts of energy of the big-bang singularity, itself.

II. The cluster of fundamental deficiencies, generated by the fictitious unification of the essence of space and the essence of time, on the basis of the erroneous, unfounded, and completely unreasonable conjecture, according to which *"space by itself, and time by itself, are doomed to fade away into mere shadows, and only a kind of union of the two will preserve an independent reality"* ***[Ref. #11]***; and which Lemaître's big-bang cosmological model has inherited, directly from the pseudo-Euclidean geometry of Einstein's theory of special relativity, as well as from the pseudo-Riemannian geometry of Einstein's theory of general relativity, in one go, at the same time, and with no modification or alteration, significant enough to be taken note of, at all.

III. The cluster of basic deficiencies; such as the absolute beginning of time, and the implicit *creatio ex nihilo* of matter, which goes hand in hand with it, at the start of the uncaused and

ultimately inexplicable explosion of the infinitely dense but limited amount of matter of the zero-volume singularity — the supposedly one and only single mother — of the entire *finite-but-expanding* cosmos of Lemaître's *big-bang* cosmological model, itself, and everything in it.

IV. The cluster of *deferent-epicycle-like* type of deficiencies, and similar structural deficiencies; such as, for example, the deficiency of the hypothetical dark matter, and the deficiency of the equally hypothetical dark energy, which have been conjured up, in humongously large amounts, out of nowhere, in order to specifically help Lemaître's *big-bang* cosmological model:

- To explain away anomalous galactic rotation curves.
- To do away with significant discrepancies between the calculated distance–redshift relation, on the basis of Hubble's law, and the luminosity distance, for distant type Ia supernovae.
- To pull galaxies, and galaxy clusters, along with superclusters of galaxy clusters, closer together, within such an incredibly short time frame, as given by Lemaître's *big-bang* cosmological model.
- To have all sorts of celestial bodies formed, developed, and matured, within the unbelievably still pretty young cosmos of Lemaître's *big-bang* cosmological model.
- To hastily cook up several chemical elements, within the haphazardly guessed and implausibly short past of the *finite-but-expanding* cosmos of Lemaître's *big-bang* cosmological model.

It goes without saying that all of the above *deferent-epicycle-like* deficiencies have hatched out, smack-dab, from within the discordant theoretical infrastructure of Lemaître's *big-bang* cosmological model, itself; and Einstein's general relativity shouldn't be blamed for them.

V. The cluster of rudimentary deficiencies; such as the flatness deficiencies, the deficiencies of the supposedly fine-tuned initial conditions, side by side, in complete disharmony with the swept-under-the-rug deficiencies of the infinitely-hot-infinitely-disordered singularity, which have stemmed, and been spawned, primarily, from a multitude of paradoxes, contradictions and internal inconsistencies, within the theoretical framework of Lemaître's *big-bang* model, itself.

VI. The cluster of epistemic and epistemological deficiencies; including the deficiencies of lowering the logical, mathematical, and scientific standards, impacting, negatively, every step of the scientific method, and facilitating as well as accelerating the introduction of numerous pseudo-scientific creations, such as, for instance, the black holes, the white holes, and the wormholes, into the textbooks of settled science. But, the lion's share of the blame, here, falls on Einstein's theory of general relativity. In fact, Lemaître's *big-bang* cosmological model, itself, is the most horrendous deficiency, in the whole assemblage of conceptual, logical, and methodological deficiencies that has been generated by Einstein's theory of general relativity.

VII. The cluster of deficiencies of Langmuir's puffery, fanfare, and outright pathological science ***[Ref. #34]***; such as the deficiencies of excessive overhype, and the exaggerated claims of precisely having calculated everything, everywhere, in the *finite-but- expanding* cosmos of Lemaître's *big-bang* cosmological model, all the way down to the first $\boldsymbol{5.39 \times 10^{-44}}$ seconds after the big bang ***[Ref. #33]***, as well as the deficiencies of the avaricious monopolization of Hubble's law, and the claim of exclusive ownership of the important phenomenon of the cosmic microwave background; and, at the same time, the persistence in interpreting both of these two physical phenomena, in the most unrealistically and illogically horrific ways imaginable.

All in all, Lemaître's *big-bang* model of the *finite-but-expanding* cosmos is seriously flawed, in so many respects, and, undoubtedly, bound, in the long run, to hinder true scientific understating, and to impede real philosophical enlightenment, as well as to have a very negative impact, on the progress of science, in general, and on the long-term development of cosmology, and on the acquisition of genuine knowledge, about what the universe, really, is and how it, actually, works, in particular.

4. Closing Remarks:

It should be worth mentioning, at the end of this discussion, that, although, the notion of *finite cosmos* is, literally, filled to the brim with deficiencies, paradoxes, inconsistencies, and contradictions, it does seem, in its all various manifestations, sundry alterations, minor variations, and hybrid models, to resonate, with the human psyche and way of thinking, pretty well.

In fact, throughout most of recorded history, every human culture, anywhere on Planet Earth, either invented, early on, all by itself, its own version of the finite cosmos, or, simply, went ahead and just borrowed it, with or without some slight modifications, from its friends, acquaintances, or neighbors.

And that is, most likely, because, on the face of it, the finite cosmos should feel cozy, a bit comfy, and fairly easy to imagine, organize, manage, and customize, in a variety of ways, as along as the vexing and presumably daunting concepts of endless, and boundless infinities continue to remain no-go zones, or hidden away, out of sight, somewhere, in the background, either by fiat, or by free choice.

Contrastingly, the notion of *infinite cosmos* seems, more likely than not, to present itself, at first sight, as, essentially, unownable, and, practically, as nobody's personal property, under all circumstances. And subsequently, it's going to be much harder, for human beings, to call such an endless universe, or to label this kind of infinite cosmos, even metaphorically, as their own universe. And furthermore, the concept of *infinite cosmos* tends to induce, feelings of loneliness, and horror, and to give rise, at the same time, to anxiety, to a certain degree, or at least, to some feelings of unease, in the human psyche.

Take, for instance, the professedly profound trepidation of Blaise Pascal who used to say, out loud, that: *"The eternal silence of these infinite spaces fills me with dread"*; as well as: *"For, in fact, what is man in nature? A Nothing in comparison with the Infinite, an All in comparison with the Nothing, a mean between nothing and everything. Since he is infinitely removed from comprehending the extremes, the end of things and their beginning are hopelessly hidden from him in an impenetrable secret; he is equally incapable of seeing the Nothing from which he was made, and the Infinite in which he is*

swallowed up" ***[Ref. #27]***.

Needless to say, such a poetically painted thesis doesn't, really, cut the mustard. And clearly, Monsieur Pascal must have had some ulterior motive, for composing it. Since philosophically, scientifically, and logically speaking, there is, absolutely, nothing dreadful or alarming about the eternal silence of the infinite spaces. To the contrary, any faint whispering coming out of those infinite spaces would have been a heck of a lot more startling and hair-raising than a booming voice coming out of a burning bush, on the top of a mountain, in the Sinai Peninsula. In addition, there is, practically, no compelling reason, for the wise man — Homo sapiens — to whine about being infinitely small, in comparison with the infinitely large; or to brag about being infinitely large, in comparison with the infinitely small.

Be that as it may, almost exactly ***223*** years later, Friedrich Nietzsche came up with what is, perhaps, the best poetically charged antithesis to the aforementioned poetically painted thesis of Blaise Pascal:

"Behold, we know what you teach: that all things recur eternally and we ourselves with them, and that we have already existed an infinite number of times before and all things with us"; as well as: *"What, if some day or night, a demon were to steal after you into your loneliest loneliness and say to you: 'This life, as you now live it and have lived it, you will have to live once more and innumerable times more; and there will be nothing new in it, but every pain and every joy and every thought and sigh… must return to you—all in the same succession and sequence—even this spider and this moonlight between the trees and even this moment and I myself. The eternal hourglass of existence is turned over again and again—and you with it, speck of dust!' Would you not throw yourself down and gnash your teeth and curse the demon who spoke thus? Or have you once experienced a tremendous moment when you would have answered him: 'You are a god, and never have I heard anything more divine!' If this thought were to gain possession of you, it would change you as you are, or perhaps crush you. The question in each and every thing, 'do you want this once more and innumerable times more?' would lie upon your actions as the greatest weight. Or how well disposed would you have to become to yourself and to life to crave nothing more fervently than this ultimate eternal confirmation and seal?"* ***[Ref. #29]***.

It goes without staying that the above antithesis indicates, quite clearly, that Nietzsche's cosmos is, virtually, indistinguishable from Aristotle's cosmos, within which time is assumed to be infinite, but space and matter are both assumed to be finite. And, naturally, of course, as a result, in this *eternal-but-finite* cosmos of Friedrich Nietzsche, only the eternal return is, logically, and physically, possible; while, at the same time, no infinite number of identical instants — infinite number of exact copies — of anything physical could, possibly, coexist, together, simultaneously, and side by side, throughout its finite space. And that is, obviously, because neither finite space, nor finite matter can accommodate an infinitely infinite number of instants of all real possibilities, running, conjointly, at the same time.

It should be noted, also, that every material thing, in the hybrid cosmos of Friedrich Nietzsche, can have no more than one single running series of the eternal return; while, by comparison, in the truly infinite cosmos, every material thing can have, in principle, an infinite number of simultaneously running series of the eternal return, at the same time, all over the infinite space, and forever.

Anyway, few decades later, Arthur Eddington whose favored cosmological model was a universe gradually evolving from Einstein's *Finite-but-unbounded-cosmos* model, and who was somewhat dismissive of Lemaître's *primeval-atom* model ***[Ref. #31]***, made the following objection to Nietzsche's hybrid cosmos, and by implication, to his arguments, for the eternal return, as well:

"The difficulty of an infinite past is appalling. It is inconceivable that we are the heirs of an infinite time of preparation; it is not less inconceivable that was once a moment with no moment preceding it. The dilemma of the beginning of time would worry us more were it not shut by another overwhelming difficulty lying between us and the infinite past" ***[Ref. #28]***.

Friedrich Nietzsche didn't seem to have published a point-by-point rebuttal to any objection of this sort. But, since Arthur Eddington, in the excerpt of his, in question, simply, picked out the thesis of Kant's first antimony, and then restated it, in his own words; Friedrich Nietzsche might, as well, choose, in response to it, the following antithesis of Kant's first antimony, and express it, in his own poetic way:

"The world has no beginning, and no limits in space; it is infinite as regards both time and space. Proof: Suppose the opposite: the world has a beginning. Now, the beginning of x is a real event preceded by a time in which x doesn't exist. So if the world began, there must have been an earlier time in which the world didn't exist, i.e. an empty time. But it isn't possible for there to be an empty time. at the end of which something comes into existence. Why? Because in an empty time there's no difference at all between any moment and any other; and that means that nothing could mark off one moment as the moment for something to come into existence. In the world many series of things can begin, but the world itself can't have a beginning, and is therefore infinite in respect of past time. As regards the second point, again assume the opposite: the world is finite in spatial extent. This implies that a limited. world exists surrounded by an unlimited empty space, which in turn implies that as well as things' being related ·to one another· in space, they will be related to space because the entire aggregate will be sitting there in—surrounded by—the empty part of space. Now, the world is an absolute whole, and there is no object of intuition outside it; so there's no correlate to which the world is related; so the ·supposed· relation of the world to empty space would be a relation of it to no object. But such a relation is nothing; so the limitation of the world by empty space is nothing; so the world can't be limited in space; i.e. it is infinite in respect of extension" ***[Ref. #28]***.

Friedrich Nietzsche could, also, choose to argue, for the plausibility of his eternal return, in the same way, as Aristotle did, by maintaining that if time had a beginning, then one could refer to a time before that beginning, because something must have preceded a beginning, and this is contradictory to the premise. And moreover, time, itself, is, by definition, a series of beginnings and ends, or moments; each moment ends the one before it. And hence, a *"first moment"* or beginning to time must have ended a moment before it, and this too is contradictory to the premise ***[Ref. #32]***.

At any rate, the aforesaid counterargument, by Arthur Eddington, in accordance with which *"the difficulty of an infinite past is appalling"*, since it is inconceivable that the present time is the heir of *"an infinite time of preparation"*, does not hold water, at all. And that is, definitely, because, in the final analysis, it is almost equivalent to, if not, entirely, on a par with, the obviously unsound assertion that, in ***Figure #1***, below, the difficulty of a negative infinity (**-∞**) is appalling, on the ground that it is inconceivable that, for example, the number zero (***0***) is the heir of an infinite series of negative numbers coming before it, and which could never be completed, under any conceivable circumstances.

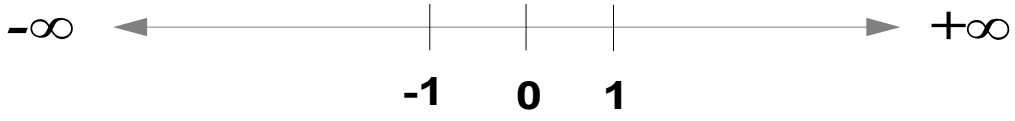

Figure #1: ***Real Number Line***

Anyhow; as far as one can tell, one of the most striking aspects of the concept of infinite past is, evidently, its unrivaled ability to do away with the absolute beginning of time and the absolute beginning of universal causation, effectively, outright, and in one fell swoop, by merely keeping both in a virtual state of suspension, forever. And moreover, the only necessary condition, in this regard, is that the act of searching, for those two absolute beginnings, must start, always, from the present time, and then regress, indefinitely, into the infinite past. And correspondingly, the interval of time between the present time and the instantaneous position of the moving point of infinite regress becomes, necessarily, longer and longer, as time goes by. But, regardless of how enormously gigantic the amount of time between the present and the moving point of infinite regress can be, it must remain, always, equal to nil, in comparison with the remaining amount of the infinite past. To put it another way, although, by its very definition, it has to keep moving farther and farther away, relative to the present time, the process of infinite regress must stay, always, at absolute rest, relative to the infinite past. In short the act of searching, for the absolute beginning of time, and the absolute beginning of universal causation, has been, for all intents and purposes, suspended, and stopped in its tracks, for good and all.

In conclusion, therefore, unlike the *finite-universe* model, which runs its head, straightaway, and on the spot, into a stone wall of paradoxes, discrepancies, inconsistencies, and contradictions, in relation to the absolute beginning of time, the absolute beginning of universal causation, and the ultimate end of space, the *infinite-universe* model rids itself of such troubles, and saves everyone the bother, by befittingly placing the nominal absolute beginnings of time, and universal causation, and the nominal ultimate end of space, in the most unreachable corners, on the other side of the infinity of the past, and on the other side of the infinity of space, respectively. And thus, as far as conceptual clarity, logical coherence and self-consistency are concerned, the *infinite-cosmos* model of the physical universe is the best of all possible cosmological models.

REFERENCES:

1. ***David J. Furley:***
   "The Greek Theory of the Infinite Universe"

2. ***M. Sedacca:***
   "The Multiverse Is an Ancient Idea"

3. ***Titus Lucretius Carus:***
   "The Nature of Things"

4. ***Stanford Encyclopedia of Philosophy:***
   "Aristotle's Natural Philosophy"

5. ***Claudius Ptolemy:***
"Almagest"

6. ***M. S. Mahoney:***
"Ptolemaic Astronomy in the Middle Ages"

7. ***René Descartes:***
"A Discourse on the Method"

8. ***Luke Mastin:***
"Cosmological Theories Through History"

9. ***William C. Saslaw:***
"The Newton-Bentley Exchange"

10. ***Stanford University:***
"Gravity Probe B"

11. ***Britannica:***
"Relativistic cosmologies"

12. ***Eric Lerner:***
"The Big Bang Never Happened"

13. ***Stanford Encyclopedia of Philosophy:***
"Giordano Bruno"

14. ***Giordano Bruno:***
"On the Infinite Universe and Worlds"

15. ***Christopher John Davison:***
"The Universe: finite or infinite?"

16. ***Gabriele Veneziano:***
"The Myth Of The Beginning Of Time"

17. ***Ethan Ruble:***
"Georges Lemaître: Father of the Cosmic Egg"

18. ***Britannica:***
"Einstein's model; closed universe"

19. ***A. Einstein:***
"The Foundation of the Generalised Theory of Relativity"

20. ***Edwin Hubble:***
"A relation between distance and radial velocity among extra-galactic nebulae"

21. ***Elizabeth Howell & Daisy Dobrijevic:***
"What is the cosmic microwave background?"

22. ***Jean-Pierre Luminet:***
"Lemaître's Big Bang"

23. ***Georges Lemaître:***
"Homogeneous Universe of Constant Mass"

24. ***R. T. W. Arthur:***
"Leibniz's Theory of Space"

25. ***Max Jammer:***
"Concepts of Space: The History of Theories of Space in Physics"

26. ***Encyclopedia - MDPI:***
"Steady State Model"

27. ***Blaise Pascal:***
"Pensées"

28. ***Arthur S. Eddington:***
" The Nature of the Physical World"

29. ***Friedrich Nietzsche:***

"Thus Spoke Zarathustra"

30. ***Immanuel Kant:***
"Critique of Pure Reason"

31. ***Helge Kragh:***
"Masters of the Universe"

32. ***Stack Exchange:***
" Aristotle's Argument from Time"

33. ***exactlywhatistime.com:***
" Time and the Big Bang"

34. ***I. Langmuir:***
" Pathological Science"

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