Epicurus On The Issue of The Universe Being Infinite In Space

Post by “Cassius” of January 23, 2021 at 9:14 AM

Text references:

Letter to Herodotus:

> [41] ... Moreover, the universe is boundless. For that which is bounded has an extreme point: and the extreme point is seen against something else. So that as it has no extreme point, it has no limit; and as it has no limit, it must be boundless and not bounded.
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> [42] Furthermore, the infinite is boundless both in the number of the bodies and in the extent of the void. For if on the one hand the void were boundless, and the bodies limited in number, the bodies could not stay anywhere, but would be carried about and scattered through the infinite void, not having other bodies to support them and keep them in place by means of collisions. But if, on the other hand, the void were limited, the infinite bodies would not have room wherein to take their place.
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> ...
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> [45] These brief sayings, if all these points are borne in mind, afford a sufficient outline for our understanding of the nature of existing things. Furthermore, there are infinite worlds both like and unlike this world of ours. For the atoms being infinite in number, as was proved already, are borne on far out into space. For those atoms, which are of such nature that a world could be created out of them or made by them, have not been used up either on one world or on a limited number of worlds, nor again on all the worlds which are alike, or on those which are different from these. So that there nowhere exists an obstacle to the infinite number of the worlds.

Book One:

[958] The whole universe then is bounded in no direction of its ways; for then it would be bound to have an extreme point. Now it is seen that nothing can have an extreme point, unless there be something beyond to bound it, so that there is seen to be a spot further than which the nature of our sense cannot follow it. As it is, since we must admit that there is nothing outside the whole sum, it has not an extreme point, it lacks therefore bound and limit. Nor does it matter in which quarter of it you take your stand; so true is it that, whatever place every man takes up, he leaves the whole boundless just as much on every side.

[968] Moreover, suppose now that all space were created finite, if one were to run on to the end, to its furthest coasts, and throw a flying dart, would you have it that that dart, hurled with might and main, goes on whither it is sped and flies afar, or do you think that something can check and bar its way? For one or the other you must needs admit and choose. Yet both shut off your escape and constrain you to grant that the universe spreads out free from limit. For whether there is something to check it and bring it about that it arrives not whither it was sped, nor plants itself in the goal, or whether it fares forward, it set not forth from the end. In this way I will press on, and wherever you shall set the furthest coasts, I shall ask what then becomes of the dart. It will come to pass that nowhere can a bound be set and room for flight ever prolongs the chance of flight. Lastly, before our eyes one thing is seen to bound another; air is as a wall between the hills, and mountains between tracts of air, land bounds the sea, and again sea bounds all lands; yet the universe in truth there is nothing to limit outside.

[984] Moreover, if all the space in the whole universe were shut in on all sides, and were created with borders determined, and had been bounded, then the store of matter would have flowed together with solid weight from all sides to the bottom, nor could anything be carried on beneath the canopy of the sky, nor would there be sky at all, nor the light of the sun, since in truth all matter would lie idle piled together by sinking down from limitless time. But as it is, no rest, we may be sure, has been granted to the bodies of the first-beginnings, because there is no bottom at all, whither they may, as it were, flow together, and make their resting-place. All things are for ever carried on in ceaseless movement from all sides, and bodies of matter, are even stirred up and supplied from beneath out of limitless space.

Loeb here has [998] Lastly, one thing is seen before our eyes to be the limit of another; air separates hills and mountains air, earth bounds sea and contrariwise the sea is the boundary of all lands; the universe, however, has nothing outside to be its limit.

[1002] The nature of room then and the space of the deep is such that neither could the bright thunderbolts course through it in their career, gliding on through the everlasting tract of time, nor bring it about that there remain a whit less to traverse as they travel, so far on every side spreads out huge room for things, free from limit in all directions everywhere. [

Lucretius:

Post by “Adrian” of February 3, 2023 at 1:44 PM

The idea of the universe as infinite is an interesting one. What is the nature of the universe and what are its limits? If the universe has always existed what are its boundaries? If the universe has a beginning as a big bang what does it expand into? Both are good questions. I bought a copy of the Penguin Latham translation of Lucretius in the 1970s as a science student. I recently came across this chapter by Frederik Bakker on “The End of Epicurean Infinity: Critical Reflections on the Epicurean Infinite Universe”

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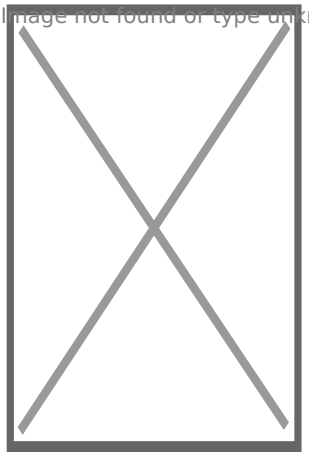

The End of Epicurean Infinity: Critical Reflections on the Epicurean Infinite Universe
In contrast to other ancient philosophers, Epicurus and his followers famously maintained the infinity of matter, and consequently of worlds. This was inferred…
link.springer.com

However the models of classical physics are different to models post Einstein. So I suppose the idea of the universe as infinite has a different meaning depending on the model used? So we have the ideas of Albert Einstein of the relation of space to time. Special Relativity has time as a dimension and so we live in four dimensions. With his General Theory of Relativity the universe does not have an edge and does not expand into anything. Space may be curved. This is discussed well by the physicist Sabine Hossenfelder in her YouTube talk: “What does the universe expand into? Do we expand with it?” With Einstein and the models of modern physics the universe does not expand into anything. It would be interesting to have an imaginary conversation between Albert Einstein, Epicurus and Lucretius in the garden. What would they say?

Post by “Cassius” of February 3, 2023 at 3:41 PM

Thank you for posting not only the thoughtful post but because it exposes that the cites supposedly listed in the first post have somehow disappeared! I will work to fix that - thanks!

Post by “EricR” of February 4, 2023 at 5:31 AM

At the risk of seeming frivolous, (comes with age ) here's a moment with Woody Allen that may add something to this topic.

https://youtu.be/5U1-OmAlCpU

Post by “Cassius” of February 4, 2023 at 7:36 AM

Great addition to the thread EricR! I had never seen that, and it does help frame at least part of the significance of the issue!

Post by “Martin” of February 10, 2023 at 1:20 AM

> Quote
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> With Einstein and the models of modern physics the universe does not expand into anything.

This statement is misleading. As of current models and observations, both the universe and the space in which it exists are in accelerated expansion. The expansion of space seems to add so much that the distances between our galaxy and the most distant still observable galaxies seem to increase with more than the speed of light. The continued dilution of matter on the largest scale, the increase in entropy and the further development of stars will make the universe much different from now.

Post by “Adrian” of February 20, 2023 at 3:58 PM

> Quote
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> both the universe and the space in which it exists are in accelerated expansion

This is interesting. The universe has been defined as all existing matter and space considered as a whole, so is there anything outside the universe for it to expand into? If there is something outside the universe what is it?

There is a great deal of discussion on what does the universe expand into? This is discussed by the physicist Sabine Hossenfelder in her interesting YouTube video “What does the universe expand into? Do we expand with it?”, and also in her 2022 book “Existential Physics: A Scientist’s Guide to Life’s Biggest Questions.”

Are you possibly referring to the no-boundary proposal which avoids the Big Bang singularity by replacing time with space outside the early universe? Hossenfelder says outside because it makes little sense to use before if there was no time. In the no-boundary proposal, the universe is embedded into space. I find the concept of a space outside the universe for the universe to expand into difficulty to conceive since all space is surely within the universe? Cosmology is very interesting.

Post by “Cassius” of February 20, 2023 at 4:46 PM

> Quote from Adrian
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> I find the concept of a space outside the universe for the universe to expand into difficulty to conceive since all space is surely within the universe?

And to me this is an issue of word-play as much as it is of anything else. If we are defining the "all" as everything, then it seems to me the only way you end up with these seemingly-conflicting positions is by ignoring the definition issue. If, like Lucretius and his javelin, the universe is "expanding" - then whatever it is expanding into would seem to be by definition part of the universe.

I can't help but being suspicious that there is something more behind these formulations than good-faith science. Every time I have tried to dig deeper into these questions it seems to me I have found that the issue is that those who are postulating some kind of weirdness are fudging that they are considering the universe as a whole to be "what is observable as of now" which is

NOT the definition of "the all" traditionally meant as the definition of "the universe."

Post by “Peter Konstans” of October 2, 2023 at 5:43 PM

Epicurus may well have theorized correctly. I'm a follower of those scientists like Pavel Kroupa and Eric J. Lerner who argue that the traditional cosmological paradigm of a Big Bang, dark energy and an expanding universe is false and present the thesis that the actual empirical data supports a Milgromian universe (MOND) which is always evolving but not expanding and with no beginning in time.

Post by “Cassius” of October 2, 2023 at 6:25 PM

> Quote from Peter Konstans
>
> I'm a follower of those scientists like Pavel Kroupa and Eric J. Lerner who argue that the traditional cosmological paradigm of a Big Bang, dark energy and an expanding universe is false and present the thesis that the actual empirical data supports a Milgromian universe (MOND) which is always evolving but not expanding and with no beginning in time.

Peter if you can point to particular articles that you have found valuable on this subject I would definitely like to see them linked in this section of the forum.

Post by “Martin” of October 3, 2023 at 6:52 AM

Whereas I am not aware of an outright refutation of MOND, that theory can describe well only the observations for single galaxies. MOND has significant difficulties both with galaxy clusters and over cosmological distances. It is a purely empirical modification of Einstein's theory without an explanatory foundation.

My quick reference for this is in German:

https://pro-physik.de/zeitschriften/download/12825

My impression is that MOND is an almost useless ad-hoc model because it is not good enough to explain anything to similar depth as Einstein's theories of relativity do.

Post by “Peter Konstans” of October 4, 2023 at 4:29 AM

> Quote from Cassius
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> > Quote from Peter Konstans
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>
> Peter if you can point to particular articles that you have found valuable on this subject I would definitely like to see them linked in this section of the forum.

There is plenty of content with Pavel Kroupa on youtube and some with Eric Lerner. For us here who are (I presume) laymen as far as cosmology is concerned it's always more pleasing to hear specialists inform us than read papers meant for experts.

Post by “Peter Konstans” of October 4, 2023 at 4:41 AM

Good place to start

https://darkmattercrisis.files.wordpress.com/2022/04/mond_for_dummies-27.04.2022.pdf

Pavel Kroupa: The Dark Matter Crisis