

# Is the 5th fundamental compatible with science?

**Post by “Faunus” of December 19, 2022 at 11:12 PM**

Research estimates that there are between  $10^{78}$  and  $10^{82}$  atoms in the universe. That's a lot of atoms but it's not infinite. Am I just interpreting this wrong or did Epicurus just get it wrong?

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**Post by “Cassius” of December 20, 2022 at 12:00 AM**

Martin can give you a better answer than I can, but I can give you one that I think is compatible with classical Epicureanism:

First of all, who is "research" and what would give "research" the ability to conclude that there is a limit to the size of the universe (and therefore the number of atoms that it contains)?

I expect the answer would be that you could name some number of names of scientists who take the position that the universe as a whole is finite in size, while I expect that there are others who did or do still maintain that the size of the universe is limitless.

How does one choose between them to decide that Epicurus was "wrong"? Do you have to have the same level of scientific research background yourself in order to judge? Can you hope to attain such experience in your lifetime? Can you count the number of atoms yourself? If not, you are basically placing your confidence in some number of men whose opinions differ from others in the past and from whom - if the past is any guide - others in the future will differ too.

So you can say "I just don't know" or "I choose to believe the majority of current "experts," and that may be a fine answer for you and cause you no doubts as to a possible supernatural origin of the universe or your ability to navigate within life.

Epicurus thought it was preferable (and better reasoning) to look at this and other questions based on analogies of what we have confidence of here on earth. He therefore constructed thought experiments such as throwing the javelin out through space, and others beyond which I can cite here (including the that a finite number of atoms in an infinite space would never come together to form what we see), which led him to conclude that there was good reason to believe that the universe is boundless in size. Logically he then concluded that if the universe is boundless in size then there is no bound to the number of atoms that constitute it. He thought this was both correct reasoning and a good way to inoculate people against believe in a

supernatural dimension or a "true world" beyond this one on the order of Plato.

In the end we have another one of those questions to which we as individuals will never "know" the answer in terms of being able to count them ourselves, so we have to decide where to place our confidence. Likewise we will never "know" that there is any life after death by traveling there and finding out personally, and that ends up again being another question of how you weigh evidence and how much credit to give to speculation where direct evidence is lacking.

Call me a Luddite (or "anti-science" as the Epicureans were labeled) but the real issue as I see it is not one of counting up the number of experts on each side, but of weighing evidence that is available to us and how to assess its credibility. That's an issue of canonicity. To me, Epicurus' argument was that we should not allow conclusions based on evidence we observe through our senses here on Earth to be overturned absent equally compelling sensory evidence. And even when new evidence is gathered that does not mean we discard the old evidence - all the evidence must be reconciled.

That argument seems sound to me, and I have seen no evidence that persuades me that he was wrong in thinking that this is the best course. Whatever new evidence is confidently gathered has to be included in any model in which we have confidence, but the devil is always in the detail of "do we have all the evidence we would like to have?" That's why this is not really an anti-science argument, because the "science" in the issue we are talking about is notoriously difficult to determine due to the known limits of our evidence. There is no reason to believe in life after death, but there is every reason to think that if we throw that javelin either something will stop it or it will travel on forever.

What I personally observe in my reading of these controversies in science discussions is that the arguments that seem to say that the universe is finite in size turn on what they claim to be the "observable" universe. It appears to me that when pressed these people will also seem to acknowledge that the data from our current telescopes and data are necessarily limited in degree, providing no information about what is "beyond" their observation. And to me personally, that is where I think Epicurus' reasonings as to the "universe as a whole" continue to make good sense.

That reasoning may not convince many particle physics experts, but I don't grant to those experts the right to force me to believe a particular experiment or data that they claim to be true over what appears to me to be good reasoning that is consistent with all the raw evidence that is available to me. I would not grant to any priest the right to tell me that I should be concerned about hell because a god revealed it to him, and I would not grant to "research" the right to overturn what appears to me to be a common sense conclusion without a lot more evidence than I am persuaded that "they" have.

Similar questions arise in the issue of whether particles are infinitely divisible or not, which is pretty much the same question as to whether there is a limit in the number of "atoms." There are similar questions such as whether the universe as a whole has existed and will always exist eternally in time.

You then get to the issue of whether "in order to be an Epicurean you have to believe XXX." Luckily that's not an issue that we have a right to decide, since Epicurus is no longer here. I know that some people are going to take the position that they are convinced by modern physics arguments and are no longer concerned whether the universe is infinite in size or eternal in time. In fact I think Frances Wright appears to have taken exactly that position.

Since no one gets to define what Epicurus would say were he here today, we each have to make the best we can of these questions. But I think it helps nobody to simply say "Epicurus has been proved wrong by modern science" until we fully and completely grapple with what he was really arguing, and evaluate his method of reaching his conclusions.

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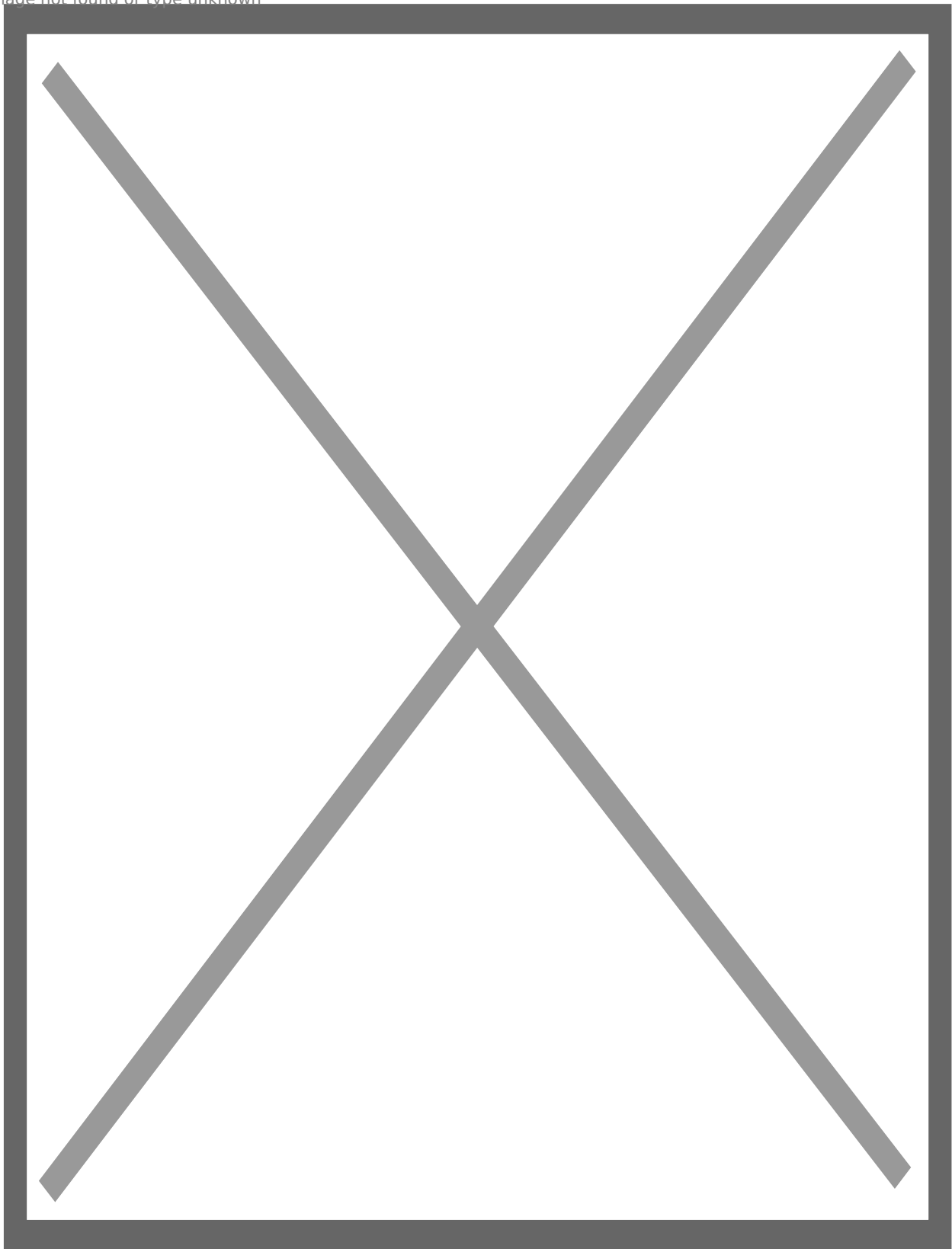
**Post by "Don" of December 20, 2022 at 7:49 AM**

It seems that number comes from here:

<https://www.thoughtco.com/number-of-atoms-in-the-universe-60379>

and there's this:

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## [How Many Atoms Are There in the Universe?](#)

It's no secret that the universe is an extremely vast place. That which we can observe (aka. "the known Universe") is estimated to span roughly 93 billion...

[www.universetoday.com](http://www.universetoday.com)

It's important to look at what that second one says: "And yet, those numbers don't accurately reflect how much matter the universe may truly house. As stated already, this estimate accounts only for the observable universe which reaches 46 billion light years in any direction, and is based on where the expansion of space has taken the most distant objects observed."

Even so, I don't get my science from a 2,000+ year old text. However, Epicurus was headed in the right direction. For all intents and purposes from a human perspective, the difference between those estimates and "infinity" are academic. The word Epicurus used was ἀπειρος "without limit" often translated as "infinite."

My perspective on Epicurus's philosophy doesn't rise or fall on determining an unimaginable number of atoms. There are also other cosmos (cosmoi) to consider in the infinite All. When considering that, the number of atoms is unlimited.

PS. There's also the question of how to translate Epicurus's άτομος (atomos) into modern physics. Can we use it to refer to an "atom" as we define it? Is it a molecule? Is it a quark? Meson? Wave function? Again, Epicurus did not have access to our methods and tools, but he "got" that the cosmos is material and composed of matter and had no supernatural origin. That's the important point rather than trying to find a "Gotcha!"

Thanks, @Faunus , for the question!

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## **Post by "Cassius" of December 20, 2022 at 8:59 AM**

On topics like this I like to refer to what I think is one of the most under-rated sections of the texts, Lucretius Book 4. I see the discussion of "images" as not something to skip over as obsolete, but the place where we are going to find some of the most important insights into how to think when evidence is conflicting or illusory or not as plentiful as we would like it to be. (As to illusions, for example, how do we detect the truth? Not by jettisoning confidence in the senses, but by making more observations and then harmonizing them, and not by jumping to abandon everything about which we are already confident. We "wait" before holding an opinion to be true, when appropriate, until we can bring both old and new data all into a consistent whole.)

Here is one of the most important sections (starting around line 462) in the Brown translation):

#### Quote from Lucretius Book Four

And though reason is not able to assign a cause why an object that is really four-square when near, should appear round when seen at a distance; yet, if we cannot explain this difficulty, it is better to give any solution, even a false one, than to deliver up all certainty out of our power, to break in upon our first principle of belief, and tear up all foundations upon which our life and security depend. For not only all reason must be overthrown, but life itself must be immediately extinguished, unless you give credit to your senses. These direct you to fly from a precipice and other evils of this sort which are to be avoided, and to pursue what tends to your security. All therefore is nothing more than an empty parade of words that can be offered against the certainty of sense.

And here that same section is in greater context:

#### Quote

Many more things of this kind we observe and wonder at, which attempt to overthrow the certainty of our senses, but to no purpose - for things of this sort generally deceive us upon account of the judgment of the mind which we apply to them, and so we conclude we see things which we really do not; for nothing is more difficult than to distinguish things clear and plain from such as are doubtful, to which the mind is ready to add its assent, as it is inclined to believe everything imparted by the senses.

Lastly, if anyone thinks that he knows nothing, he cannot be sure that he knows this, when he confesses that he knows nothing at all. I shall avoid disputing with such a trifler, who perverts all things, and like a tumbler with his head prone to the earth, can go no otherwise than backwards.

And yet allow that he knows this, I would ask (since he had nothing before to lead him into such a knowledge) whence he had the notion what it was to know, or not to know; what it was that gave him an idea of Truth or Falsehood, and what taught him to distinguish between doubt and certainty?

But you will find that knowledge of truth is originally derived from the senses, nor can the senses be contradicted, for whatever is able by the evidence of an opposite truth to convince the senses of falsehood, must be something of greater certainty than they. But what can deserve greater credit than the senses require from us? Will reason, derived from erring sense, claim the privilege to contradict it? Reason - that depends wholly upon the senses, which unless you allow to be true, all reason must be false. Can

the ears correct the eyes? Or the touch the ears? Or will taste confute the touch? Or shall the nose or eyes convince the rest? This, I think, cannot be, for every sense has a separate faculty of its own, each has its distinct powers; and therefore an object, soft or hard, hot or cold, must necessarily be distinguished as soft or hard, hot or cold, by one sense separately, that is, the touch. It is the sole province of another, the sight, to perceive the colors of things, and the several properties that belong to them. The taste has a distinct office. Odors particularly affect the smell, and sound the ears. And therefore it cannot be that one sense should correct another, nor can the same sense correct itself, since an equal credit ought to be given to each; and therefore whatever the senses at any time discover to us must be certain.

And though reason is not able to assign a cause why an object that is really four-square when near, should appear round when seen at a distance; yet, if we cannot explain this difficulty, it is better to give any solution, even a false one, than to deliver up all Certainty out of our power, to break in upon our first principle of belief, and tear up all foundations upon which our life and security depend. For not only all reason must be overthrown, but life itself must be immediately extinguished, unless you give credit to your senses. These direct you to fly from a precipice and other evils of this sort which are to be avoided, and to pursue what tends to your security. All therefore is nothing more than an empty parade of words that can be offered against the certainty of sense.

Lastly, as in a building, if the principle rule of the artificer be not true, if his line be not exact, or his level bear in to the least to either side, every thing must needs be wrong and crooked, the whole fabric must be ill-shaped, declining, hanging over, leaning and irregular, so that some parts will seem ready to fall and tumble down, because the whole was at first disordered by false principles. So the reason of things must of necessity be wrong and false which is founded upon a false representation of the senses.

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## Post by “Cassius” of December 20, 2022 at 10:24 AM

Another highly relevant text reference:

Quote from Letter to Pythocles

[86] We must not try to force an impossible explanation, nor employ a method of inquiry like our reasoning either about the modes of life or with respect to the solution of other physical problems: witness such propositions as that 'the universe consists of bodies and the intangible,' or that 'the elements are indivisible,' and all such statements in circumstances where there is only one explanation which harmonizes with phenomena. For this is not so with the things above us: they admit of more than one cause of coming into being and more than one account of their nature which harmonizes with our sensations.

[87] For we must not conduct scientific investigation by means of empty assumptions and arbitrary principles, but follow the lead of phenomena: for our life has not now any place for irrational belief and groundless imaginings, but we must live free from trouble.

Now all goes on without disturbance as far as regards each of those things which may be explained in several ways so as to harmonize with what we perceive, when one admits, as we are bound to do, probable theories about them. But when one accepts one theory and rejects another, which harmonizes as well with the phenomenon, it is obvious that he altogether leaves the path of scientific inquiry and has recourse to myth.

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### **Post by "Faunus" of December 20, 2022 at 12:27 PM**

So evidence shows a finite universe but that does eliminate the possibility of an infinite universe. Never thought of that.

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### **Post by "Cassius" of December 20, 2022 at 1:34 PM**

Faunus I would say it would probably be better to view that as something like:

The evidence of the senses is never 'wrong' but the opinions we draw from the evidence certainly can be. in this case there is some evidence and some argument that the universe is finite (what you are referring to) set against other evidence that the universe has no end (every

time we expand the reach of our observation we find more).

This is the constant question in lots of areas - where the evidence conflicts we have to entertain multiple possibilities or wait before attaching ourselves to a single opinion. But the one conclusion to avoid above all is that the senses are ultimately untrustworthy and that we therefore have no capacity to be confident of anything. If you fall to that level you will walk off the precipice and your life will be unsustainable.

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### **Post by “Joshua” of December 25, 2022 at 11:55 AM**

Quote

To Epicurus it meant that the idea of primeval chaos was absurd; the universe has always been a cosmos.

This is on page 124 of *Epicurus and His Philosophy* by Norman DeWitt; rather than starting a new thread I thought it might fit here.

What I am surprised to learn is that "cosmos" and "universe" are not synonymous;

Quote

Using the word cosmos implies viewing the universe as a complex and orderly system or entity. --Wikipedia

'Cosmos' in this meaning is almost a direct antonym to 'chaos', which I find interesting. [Don](#) has made reference to the use of the word  $\pi\alpha\nu$  (all, or even, "the all") as a word used by Epicurus. Is cosmos used as well?

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### **Post by “Don” of December 25, 2022 at 1:24 PM**

[Quote from Joshua](#)

Don has made reference to the use of the word  $\pi\alpha\nu$  (all, or even, "the all") as a word used by Epicurus. Is cosmos used as well?

Yes. He uses κόσμος kosmos/cosmos in the letter to Herodotus. Cosmoi/ cosmoses(?) are the world systems; The All is the whole collection of kosmoi.

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### **Post by “Don” of December 25, 2022 at 5:18 PM**

[Quote from Joshua](#)

'Cosmos' in this meaning is almost a direct antonym to 'chaos', which I find interesting

Agreed. It literally means "order" and even shows up in the etymology of " cosmetics."