

Infinity and the Expanding Universe

Post by “Godfrey” of July 23, 2020 at 4:50 PM

Recently there was some discussion of the expanding universe, heat death, the infinite (in time and space) universe and the ramifications of these ideas. I just came across an image from 1750 of the universe comprised of infinite galaxies, which made me think that it might be useful to start a thread on the topic. Just in case anybody would like their mind blown!



Here's the article that the image came from:

<http://blogs.getty.edu/iris/a-finite-...ok-collections/>

Post by “Cassius” of July 23, 2020 at 4:55 PM

Interesting pictures! All I know for sure is that in discussing this we're doing what Epicurus suggested at the end of the letter to Pythocles:

All these things, Pythocles, you must bear in mind; for thus you will escape in most things from superstition and will be enabled to understand what is akin to them. **And most of all give yourself up to the study of the beginnings and of infinity and of the things akin to them,** and also of the criteria of truth and of the feelings, and of the purpose for which we reason out these things. For these points when they are thoroughly studied will most easily enable you to understand the causes of the details. But those who have not thoroughly taken these things to heart could not rightly study them in themselves, nor have they made their own the reason for observing them.

<https://www.epicureanfriends.com/thread/1636-infinity-and-the-expanding-universe/>

Post by “Don” of July 23, 2020 at 8:01 PM

That picture has an MC Escher vibe to it and also reminds me of the talk of [pocket universes](#). Thanks for starting the thread!

Post by “Don” of July 24, 2020 at 7:36 AM

I wanted to go back to the original of [Cassius](#) 's underlined quote there:

Quote

μάλιστα δὲ σεαυτὸν ἀπόδος εἰς τὴν τῶν ἀρχῶν καὶ ἀπειρίας καὶ τῶν συγγενῶν τούτοις θεωρίαν

This is interesting because it includes θεωρίαν which means "contemplation, consideration." This is the same word used in the [characteristics of the sage that gets translated "take joy in public spectacles"](#) but refers to speculation, etc., in the mental sense in Epicurus. So, Epicurus is encouraging Pythokles to most importantly set out yourself on the contemplation of these things.

The word meaning infinite in this list is ἀπειρίας, literally ἀ "un, not" + πειρίας "bounded, limited". [Wikipedia had an infinity article](#) which mentions the Greek attitude to the concept. [The LSJ had a definition](#) that includes mention of Aristotle and there Stoics use of this concept, so we always have to keep in mind whether Epicurus was using the term on its own or as a reaction to another school.

My take recently was that something doesn't need to be literally infinite for us humans to consider it so. An example is the task of counting of all [the grains of sand on every beach and in every desert on Earth](#). Sure, that's a finite number but for all intents and purposes it might as well be infinite in relation to a human lifespan.

I think we need to be careful, too, about assigning modern mathematical concepts of infinity to classical Greeks. Our scientific notion may be similar but not identical to theirs.

Post by “Don” of July 24, 2020 at 8:16 AM

Oh, I forgot to mention the heat death of the universe! For me, this idea makes sense in that the universe would have the same life as everything else. Before the big bang it did not exist, then it existed, and finally it too will die and exist no more. I realize Epicurus said the universe, the All, $\tau\omicron\ \pi\alpha\nu$, always existed. And that may be true from a multiverse perspective, but also, from the perspective of a human lifespan, our own universe might as well be infinite in expanse and time.

Post by “Cassius” of July 24, 2020 at 8:34 AM

[Quote from Don](#)

My take recently was that something doesn't need to be literally infinite for us humans to consider it so. An example is the task of counting of all the grains of sand on every beach and in every desert on Earth. Sure, that's a finite number but for all intents and purposes it might as well be infinite in relation to a human lifespan.

My personal take is that Epicurus is stressing the need to think about and get comfortable with the idea that there are certain things that are very difficult to get our minds around. He's saying that instead of defaulting to some mystical attitude that "it must be god/divine/magical," we should come to terms with the limits of our capabilities and get comfortable with making decisions within that scope, with is itself a very desirable thing to be good at.

I also think personally there is an important distinction between "uncountable because we don't have the time or ability" (the grains of sand on the beach) vs. "uncountable because it in fact has no limit on the number of instances" (the number of stars or planets or whatever in the universe).

That's why personally for me when we discuss (in the podcasts for example) that it doesn't matter whether the heat death of the universe theory is correct or not, because the time span is too great to be of relevance to us, I personally don't find that a satisfactory place to stop. I don't think Epicurus would have accepted (or suggest that we should entertain) any theory as possible which would postulate that anything could go to nothing, or come from nothing, much less the universe as a whole.

I personally think that the bigger picture argument (will "everything" at some point cease to exist") requires addressing directly. Personally for myself, I am confident that the right answer is "no, the universe will never cease to exist" even though I am not and never will be an expert physicist. At some point the "logical" argument becomes so overwhelming, despite our absolute

inability to "be there and experience it for ourselves," that it deserves to be treated as if we are "certain" of it (whatever meaning we assign to "certainty").

So in the end I trace all these issues back together to thinking that Epicurus is asking us to confront the overall general question "How do we take a position when the evidence is less complete than we would like?"

In some cases it is going to be appropriate to "wait" for more evidence, and in some cases it is appropriate to consider ourselves to be "certain" even as we are. One of the major factors in deciding when it's appropriate to wait or not is whether "waiting" would conflict with prior premises that we have accepted with certainty. Of course in that case if we are rigorous we would never wait at all or hesitate to pronounce the theory as invalid.

Another factor would be whether the issue is particularly damage-causing, such as opening the possibility of the supernatural, and we also have to consider that we aren't having these discussions in a vacuum among dedicated scientists, but among normal people who will never be specialists, so we need to be concerned about the "practical" effect of theoretical speculation on them. In the end the ultimate goal is NOT "wisdom" or "truth" in the abstract sense (probably a cue there for the nearby "[Abstract Ideas](#)" thread).

To me, the issue of studying infinity and similar questions is closely related to the issue of how to think about day to day issues and so its of immediate importance for that reason.

Post by "Cassius" of July 24, 2020 at 8:37 AM

Ha, Don and I crossposted and took opposite positions on the heat death issue 😊 Well to each his own there, and I think we get a lot out of discussing the issue, because in doing so we get exercise in deciding how much consistency and confidence is appropriate. Does "nothing come from nothing or go to nothing" really mean that, or should be be open to exceptions even there? My perspective is that Epicurus is saying that the evidence before us gives us good reason to be confident that the principle we are deriving from these observations has no exceptions whatsoever. We then have to deal with the issue that we won't be around long enough to be sure what the "correct" answer is, and so the issue becomes how to apply these rules of thought in the meantime.

Post by "Cassius" of July 24, 2020 at 8:40 AM

[Quote from Don](#)

For me, this idea makes sense in that the universe would have the same life as everything else.

I think what an everyday ancient Epicurean might say in response to that is that Yes, the rule of having a set lifetime applies to BODIES (of which the Universe as a whole is a big "body" arguably) but the rule does not apply to the elemental particles themselves, which are eternal, never having been created and never being destroyed (or changing at all).

Definitely all component parts of the universe are presumed to always be moving and combining and dissipating and recombining, so that every bodily accumulation of particles has a "date" when it comes together and when it dissipates, so the universe is and always will be a moving and changing "collection" of particles, of which that collection never came from nothing nor will return to nothing.

I gather that's rule number one of Epicurean physics, and the only major "exception" (which really isn't an exception) is that if you master the art of keeping your particles together you might be able to stay that way indefinitely (the [Epicurean gods](#)).

Post by "Don" of July 24, 2020 at 9:49 AM

[Quote from Cassius](#)

Ha, Don and I crossposted and took opposite positions on the heat death issue 😊
...Does "nothing come from nothing or go to nothing" really mean that, or should be be open to exceptions even there?

Well, there's one way to get honest responses from each of us! 😊

I think I should expand my thoughts. I'm still not saying "nothing comes from/goes to nothing." As I understand it, if you take the multiverse or pocket universe theory at its word, there is a superstructure within which each universe "pops" into existence. Our universe would "simply" come into being within that larger structure... Just as we "pop" into existence out of the superstructure of atoms and void that make up our universe. There's reason to believe that that superstructure is infinite and eternal and all the universes come into existence, exist and expand, and eventually fade away due to scientific principles. The universes constituent parts would get Incorporated back into the superstructure of the multiverse, like our atoms go back

to the universe to be used again somewhere else.

That all may sound spooky and supernatural, but I don't think it is. The more I contemplated how the universe works, the more that line of thought makes sense... It feels right, if you will.

Post by "Cassius" of July 24, 2020 at 11:07 AM

That explanation seems to me a good example of how different people are going to be comfortable with different levels of speculation. I presume that if the theory is that there is a "superstructure" and that "popping" doesn't really mean "from nothing" but rather means that it is somehow generated by the superstructure and "incorporated back into the superstructure," then there's really no violation of the "nothing from nothing" rule which is sort of a logical barrier where the issue is really being fought.

My discomfort with this kind of discussion is that in fact to most common people it does in fact sound "spooky and supernatural" even if it is not intended to be so by the specialists who are theorizing it.

I don't think it is ever appropriate to suggest that there are different "truths" for different types of people on something like this, but I would say that we do need to be aware of the different levels of analysis that people are capable of doing, or maybe said another way, the different perspectives that are in play in which people interpret words at different levels of subtlety.

I'm thinking that Epicurus was perfectly happy to discuss any level of scientific detail himself, but that he also thought it appropriate to reduce things down into broader outlines that most anyone is capable of understanding. "Nothing comes or goes to nothing" is probably such a formulation, useful for most people to keep them away from being manipulated by religion or other types of manipulators, and so it's generally useful to talk in those terms, even if at times it is also appropriate, among experts, to adopt highly-technical definitions of each of the words in the formulation for purposes of scientific theorizing.

So again I think part of this discussion is the issue of context and the purpose of the entire discussion. If we are conducting a seminar of astrophysicists then one way of speaking is appropriate, while if we are talking to the remaining 99% of the people in the world another manner is appropriate. And of course in lumping everyone else into the 99% group, there are huge numbers of subdivisions of categories by language, age, etc, which would be relevant to how to explain things to them.

So maybe this is an issue that involves proper communication as much or more than it does precise scientific theory.

Post by “Don” of July 24, 2020 at 11:17 AM

I also don't think we should get caught in the trap of Epicurean Fundamentalism in requiring specifically "atoms and void" to exist as Epicurus described then. And we can't hold Epicurus to modern scientific standards of evidence and terminology.

We know modern "atoms" which make up molecules are not "un-cutttable" now. They're made up of sub-atomic particles according to the Standard Model. And those particles in turn may be made up of "strings" or fluctuations in quantum fields or... And so on.

The ultimate importance of Epicurus's "atoms and void" is that there are fundamental physical "somethings" (atoms) and "something" within which those other "somethings" move (void) that make up the universe... That make up everything. There is no Prime Mover, no Demiurge, no Zeus, no Logos, nothing, other than those fundamental particles/laws/fields/? that comprise the universe and, by virtue of that, we can come to understand the universe without resorting to supernatural explanations, luck, or the vicissitudes of Fortune.

Post by “Cassius” of July 24, 2020 at 12:22 PM

Yes I agree, but just as we have to remain flexible toward ultimate particles we have to be at least as flexible and skeptical, or more so, about any particular theoretical model, especially if it is used to imply or advocate interpretations that would undermine the conclusion that the senses (thecanonical faculties) are what human life is all about.

"They're made up of sub-atomic particles according to the Standard Model"

Post by “Don” of July 24, 2020 at 12:39 PM

[Quote from Cassius](#)

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"They're made up of sub-atomic particles according to the Standard Model"

Oh, agreed!

My understanding is that Epicurus built his Philosophy from the ground up, but what was most important in the end was how we live our lives based on that structure with the firm foundation of Canon and Physics.

We can't be beholden to millennia-old texts and be taken seriously when it comes to scientific assertions (like some people .. cough... Say "The Universe is 6,000 years old" ... cough), but being beholden to the spirit of the assertions should not be a problem.

And I also agree that most people don't need to concern themselves with multiverses, quantum field theory, etc., to live their daily lives. For those of us who enjoy that type of contemplation, it's pleasurable. But just knowing there are physical laws in the universe and we're made up of an infinite 😊 number of atoms and molecules and building on that, that can be enough.

Post by “Cassius” of July 24, 2020 at 2:02 PM

[Quote from Don](#)

And I also agree that most people don't need to concern themselves.....

Yes setting the context is a continuing issue. Not only are we constantly dealing with background political issues that are distracting (kind of like Lucretius), it's always going to be necessary to tune the discussion to the listener so that they can understand it and appreciate it.

Most of us here I would expect are pretty far advanced into the technical and philosophical issues, but I know at least in my own case that I want to be sure to try to reach out to people who might be open to the core issues, but who aren't on the same page in terms of attitude or knowledge toward science, etc.

Ultimately I guess that entails the need to have respect for both approaches and means that any team working together on Epicurean philosophy is going to have a division of labor and a division of approach tailored to the target audience. In the end I don't think that the key issues involve major gray areas that would be a bar to that.

Post by “Don” of July 24, 2020 at 6:02 PM

[Cassius](#) had some comments above that I wanted to comment on, so I'll include them all here. Most are "Amen, ho adelphos mou (my brother)!" and others I wanted to riff on.

[Quote from Cassius](#)

My personal take is that Epicurus is stressing the need to think about and get comfortable with the idea that there are certain things that are very difficult to get our minds around. He's saying that instead of defaulting to some mystical attitude that "it must be god/divine/magical," we should come to terms with the limits of our capabilities and get comfortable with making decisions within that scope, with is itself a very desirable thing to be good at.

Fully agree. It's that "limits" concept again that has a stream running through the philosophy. I also think Epicurus stresses again and again the material nature of reality with no need to default to the supernatural or mystical forces. And agreed that getting comfortable within one's limits is a positive thing, recognizing those limits, but also expanding those limits and one's understanding. Epicurus seemed to encourage students to study the doctrines and expand from the summary/epitome phase to the comprehensive view (i.e., the 37 books of *On Nature*) while never losing sight of the summary versions and using those to keep your knowledge fresh *and* using that to be able to explain the philosophy succinctly and clearly.

[Quote from Cassius](#)

an important distinction between "uncountable because we don't have the time or ability" (the grains of sand on the beach) vs. "uncountable because it in fact has no limit on the number of instances" (the number of stars or planets or whatever in the universe).

I'm not sure I understand what you're getting at here. I would include the grains of sand, the stars in the sky, and the number of molecules in one's body in that first category. I'm not sure I know what you mean by "instances". And, in fact, all those things are "countable" at least "estimate-able" using extensions of our senses and/or extrapolating using mathematics (e.g., a grain of sand is this big...; planets tend to form around this kind of star and there are this many stars...., etc.). My version of unlimited/infinite comes down to the average humans ability to both count and comprehend these enormous numbers. Which goes back to your point, I believe, about context and what audience one is talking to.

[Quote from Cassius](#)

That's why personally for me when we discuss (in the podcasts for example) that it doesn't matter whether the heat death of the universe theory is correct or not, because the time span is too great to be of **relevance** to us, I personally don't find that a satisfactory place to stop. I don't think Epicurus would have accepted (or suggest that we should entertain) any theory as possible which would postulate that anything could go to nothing, or come from nothing, much less the universe as a whole.

That's not exactly my take - i.e., its being relevant to us - on this topic. Let me expand on my thoughts on this one: I don't think it's a place to stop investigating. And details of all the cosmological theories are still to be worked out! And as I mentioned earlier, that "heat death" is only for our own little "pocket universe". The bigger multiverse stays "here" eternal and unchanging to paraphrase Epicurus. My take on the concept's "relevance" to us humans is that the timespans are SO mind-bendingly huge that - for all intents and purposes - the universe *is* "infinite" in relation to us even though its actual lifespan is (most likely) finite. Scientists have "seen" (with extensions of their senses) space expanding and the broad consensus is that it will keep expanding until the last bit of energy is spent. But that is SO far off in the future - relative to us - that even our far-off descendants or the descendants of the sentient squids that come after us will be long gone. BUT that doesn't negate Epicurus's fundamental Canon and material-based, non-supernatural Physics relative to us with respect to our situation in the here and now.

Also, I should say, I don't necessarily buy the idea of parallel universes where there are infinite numbers of "me" all living slightly different or radically different lives (a la *Rick and Morty* for those familiar with that animated series). I do find the idea of multiple universes existing side by side in the wider multiverse, all with radically different laws of physics or whatnot, intriguing. As long as there aren't multiple me's roaming around, I can *almost* wrap my head around that.

More to follow... Enjoying this thread! (Does it show? 😊)

Post by "Cassius" of July 24, 2020 at 6:29 PM

[Quote from Don](#)

Scientists have "seen" (with extensions of their senses) space expanding and the broad consensus is that it will keep expanding until the last bit of energy is spent.

THIS is the point where I have my issue. I think by definition they need to realize and admit and most of all BE CLEAR that what they have seen, as far as they can see, no matter how good the

technology gets, is not "the end" of the universe, It's only "the limit of our ability to observe." It still seems to me very clear that we would expect (based on the reasoning that matter and void must both be infinite) that there is indeed no limit to how much matter is out there. So that in fact what probably should be the presumption is that even though "our" universe appears to be expanding as far as we can see, we ought to presume (based on the logical arguments) that there is in fact no end, and outside/past our ability to see is additional infinite space with additional cosmos that may or may not be expanding or contracting or whatever in the same way that ours is.

That is why I see a major distinction between the innumerable grains of sand and the infinity of space. If in fact you had the time and inclination and perseverance to count the "grains of sand" on the beach, or on the whole earth, that would seem to be theoretically possible to count and one day come to an end.

With the number of objects in space, however, it would be theoretically impossible to even come to an end in counting, because the best argument is that the universe is infinite in size, and therefore there will always be more to be counted no matter how long one tried.

And at least for me, still shaking off the hold of my religious background, I see a difference in kind between the two situations, and not just a difference in degree. It's coming to terms with the idea that there is no counting EVER the number of elements in the universe that is hard, not coming to terms with the idea of counting the grains of sand on the beach. And it's therefore the problem of infinite space which I would see as the worse enemy in polluting men's minds with religion, rather than the problem of counting the sand on the beach. The challenge of counting the grains of sand I think could eventually be explained to most "normal" rational people, but the problem of counting something that in fact has no end is where the mind gets tempted toward the supernatural, and that's the temptation that needs to be addressed.

As you say this is an excellent discussion and I am glad we have an open forum where it can be extended in depth.

Post by "Godfrey" of July 24, 2020 at 8:02 PM

Good discussion! I may have missed it in reading your posts, but isn't a major philosophical value of infinite time and space the idea that nothing (such as a creator) can exist outside of said infinity? To me, this is the key difference between "infinite" and "innumerable."

Post by "Cassius" of July 24, 2020 at 8:11 PM

Right -- so long as the infinite has no boundary, then there's no "other side" for god to live on, and any gods that do exist must live in our own universe. Good point.

Post by “Godfrey” of July 24, 2020 at 8:34 PM

It also eliminates any supernatural since everything that exists is subject to natural laws.

Quote

From Don: "I do find the idea of multiple universes existing side by side in the wider multiverse, all with radically different laws of physics or whatnot, intriguing."

However universes with different laws of physics might provide an opening for the supernatural. I'm not at all familiar with theories of a multiverse (although I did watch that Spider-Man movie 😊). Sounds like some challenging reading to tackle!

Post by “Don” of July 24, 2020 at 8:36 PM

[Quote from Cassius](#)

Right -- so long as the infinite has no boundary, then there's no "other side" for god to live on, and any gods that do exist must live in our own universe. Good point.

Ah! But don't the [Epicurean gods](#) live in the *intermundia*... And couldn't that be the space between the universes of the multiverse? 😊 Just throwing that out there.

Post by “Godfrey” of July 24, 2020 at 9:23 PM

Hmmm. I've definitely got to read up on the multiverse. I have no idea about spaces between or different sets of laws....

Post by “Don” of July 24, 2020 at 11:23 PM

[Quote from Godfrey](#)

Hmmm. I've definitely got to read up on the multiverse. I have no idea about spaces between or different sets of laws....

I'm happy to provide some resources:

- ["Nothing" - a TV program about "nothing"](#) although the host also refers to it as the void and the vacuum. The void is an active principle out of which the universe arose. The void is not nothing.
- ["Is our universe the only universe?" - TEDed presentation by Dr. Brian Greene](#) pulling together string theory, inflationary cosmology, and the multiverse. Greene is an engaging, dynamic speaker. I highly recommend his videos and books.
- ["Do we live in a multiverse?" - A good summary from The Economist](#) and a summary of different multiverses
- ["How many universes are there?" - PBS SpaceTime](#). Just when you think you may be wrapping your brain around the theory, watch this one (and others in the PBS SpaceTime series). My brain hurts!

Just the tip of the multiverse. If you're still interested, I recommend Dr. Greene, Dr. Sean Carroll, PBS SpaceTime. Please feel free to let me know if you find these interesting.

Post by “Cassius” of July 24, 2020 at 11:37 PM

I've never really had any major issue with the idea of "multiverses" so long as the presumption is still there that everything is natural and there's no supernatural creeping in. In fact it's pretty clear in the letter the Herodotus that Epicurus was describing "worlds" as something like "star systems" and not just "planets," and that seems to me to be very compatible with what I understand to be the basic thrust of any "multiverse" theory (though I have certainly not studied them like Don has).

But at the same time I've also sensed that there was never any reason to transmute the word "universe" from meaning "everything" as it traditionally did to something less than everything. I've always sensed that there was an "agenda" of some kind in doing that, and that part of that agenda was to suspend all rules of extrapolating that what we observe here can be of any use in predicting what would be expected to exist elsewhere in the universe. Obviously there are

great hazards in extrapolating like that, but there are also great hazards in taking an "anything goes" approach (such as opening the door to the supernatural).

There's not much to do with that concern other than to note it and move on, but I think the implications of accepting in the distant past that "maybe God lives on Mars and it's possible because we've ever been there" are pretty much the same as "maybe god lives in another part of the multiverse." There are always going to be people who use science in support of their agendas, and it's probably safer to say that every scientific theory should be presumed to have an agenda and examined for it at the beginning rather than to accept the alleged sincerity of every theory that comes down the road.

Even saying that, however, I am firmly convinced that most if not all people who really get into Epicurean philosophy are going to be keenly interested in "science" and never put aside that interest as long as they live - too much depends upon it to ever do that. I see the issue as kind of like the question of "logic" - we're always going to be "threatened" by people who use science and logic for their own agendas, and therefore a certain amount of training in it is essential for everyone for self-protection.

Post by "Don" of July 25, 2020 at 12:12 AM

Good point, [Cassius](#) , on the necessity of some scientific literacy for everyone. You seem to also be making an argument for the need for some critical thinking skills which I also agree with wholeheartedly.

One thing that struck me just now (literally, just before I saw your post and replied) was that this feeds back into my earlier query about Epicurean attitudes to multiple explanations. On our current thread's topic here, there are multiple explanations (at least 4) for different multiverse theories. All appear to have parts of real possible approaches for getting at the real nature of reality. But we **can't** know for sure at this point, and that's okay. I can accept a possible multiverse and wait for more evidence of study to hone that idea. Just like the causes of lightning or earthquakes to Epicurus or Lucretius. They **couldn't** know for sure (no instruments, no theory of plate tectonics, etc.), but they thought about it, came up with multiple plausible (to them) fully-natural explanations, and decided to live under those parameters but be open to more study or evidence of it came along.

One of the things that attracted me to Epicureanism is that, from my perspective, it can incorporate an idea like the multiverse or evolution or the possibility of alien life or other science with barely a shrug. "That's very interesting," Epicurus says, and goes on about his writing. I don't think many systems of thought can do that. Concepts like the Atonement (What

happens if there's aliens? Can they be saved too?) or evolution can tie Christian theology into knots! Epicureanism can look at those (aliens, evolution, etc.) and go, "Yep. No problem." Even classical Stoics saw the Logos at work in the universe. Epicureans didn't. They saw atoms and void and random movement. The fact that we have seen particles and anti-particles pop into and out of existence through energy changes of the quantum fields in particle accelerators doesn't affect the overall worldview of Epicurus one bit. There are fundamental physical building blocks of the universe. Whether you call them "atoms and void" or something else, the universe is built of matter without divine intervention. And even if "gods" exist, Epicurus demonstrated they have no concern over what we do nor could they have built the universe. That is incompatible with blessedness and happiness.

That's one of my reasons for finding Epicurus's philosophy compelling and worthy of study for myself.

Post by "Cassius" of July 25, 2020 at 12:39 AM

[Quote from Don](#)

it can incorporate an idea like the multiverse or evolution **or the possibility of alien life** or other science with barely a shrug

As to the alien life, of course we know that Epicurus specifically predicted that to occur, which I think is an example of how he did take the position that we could use logic based on observation to produce rules in which we can have confidence ("nature never makes only a single thing of a kind") to extrapolate what we see here to other places which we have not seen. (Pretty much the same goes with a theory of evolution, at least of a kind, and also "other worlds" if you consider "worlds" to be analogous to a universe.)

I do think it is important to consider what seem to be the rules of extrapolating. Seems to me that epicurus is saying that those rules include preference (or at least, accepting it as more substantial evidence) that if we see a thing here, then we know it CAN exist. That gives the thing a head up over pure speculation of something that has never been observed, such as the kind of speculating that says that something MAY exist somewhere else just because we haven't been there to eliminate it.

That's probably not well stated on my part, but I think that's what's going on in our current example of where we are in Book 2. Where we are now, Lucretius has been saying that there must be a limit to size of an atom because to not have a limit would be inconceivable. (Presumably because or else we would see them? Or else if there were not a limit, then a single

atom would take up the full universe?)

In other words, it seems to be a premise that Epicurus held that it is legitimate to hold that conditions that we observe here (never seeing an atom; no one thing of a single kind) are at least to some extent extrapolatable throughout the infinite universe. ("At least to some extent" meaning that if we observe them here there is a good reason to expect we will observe them elsewhere where conditions are similar.)

Now what I have just said may not be a good summary at all, but these are the issues I think they were getting at, and they deserve a lot of thought:

Are we not justified in having confidence in certain conclusions about the entire universe (that there is no supernatural god) based on extrapolation of what is observed here? And we have confidence of that even in face of the argument that "But you've never been there!" The answer to that question would have to be "yes i can be confident in some things (no supernatural god there either)" or else we'd never have confidence in much of anything. If we admit any possibility just because we've never been there, no confidence would ever be possible, it would be possible for the supernatural god from the next universe over to pop in at any moment. It seems clear to me that Epicurus did (and was justified in) ruling out that sort of argument.

We're dealing in complex logical issues but the only way to get confident in our conclusion is to think about what we're saying and consider the alternatives, just as he said in suggesting we think about infinity. Because infinity can either be our worst enemy ("the anything is possible argument") or our best friend (Godfrey's it eliminates supernatural gods, for one thing) in getting confident about our decisions on how to live.

I'm going to drop this here without elaboration but we also need to keep in mind in thinking about infinity the related issue we've discussed elsewhere about PD3 and the "limit of pleasure" in how Plato, Seneca, and others argued that a thing cannot be "the best" unless it has a limit, and they alleged pleasure to be something that is unlimited and therefore rejected from competition for the role of "best life." I would expect there to be a clear connection between getting comfortable with discussing limit vs infinity in the field of pleasure (ethics) and limit vs infinity in the field of physics.

Is it possible that one of the issues Epicurus saw was that we need to get comfortable with the idea of the unlimited universe being the highest there is so that we can get comfortable with allegedly unlimited pleasure as the highest goal of life?

Stated another way, maybe one way to get comfortable that there is no single goal of life that is the same for everyone is to compare that question to the size of the universe, for which there is also no single set "end" that everyone would reach if they traveled infinitely in the same direction? No single "best life" might be comparable to no single "end" of the universe in any direction. In both cases we are tempted to think that a supernatural god is the answer for both,

but in fact there is no supernatural god and the entire question is logically illegitimate (because we have never observed evidence for a supernatural god, but we have observed lots of evidence that things work naturally, and we reject the "it's possible because we haven't been there to eliminate it" argument).

Having confidence in our answer to one of these questions helps (I think) with our confidence in answering the other one.

Post by “Godfrey” of July 25, 2020 at 3:43 AM

Thanks for the links, Don! I'll take a look at those over the weekend.

I recently listened to a podcast with Alan Alda interviewing Brian Greene. You're right, he's a very good speaker and presenter of ideas; I've been thinking of reading one of his books but haven't yet. I'm also considering Victor Stenger's book *God and the Multiverse*: it looks like it has less to do with god and more to do with presenting a history of the ideas leading up to current cosmological thinking, which could be a good (if challenging) read. Stenger is an experimental as opposed to a theoretical physicist, which is something I like about him. I don't recall where Greene is on that spectrum but he seemed quite grounded.

Both Greene and Stenger, at least to some extent, consider the philosophical implications of the conclusions of physics. From what I've read or listened to, Stenger addresses the fallacy of god, while Greene addresses the implications of living in a world devoid of meaning. And they both reach ethical conclusions compatible with those of Epicurus. Greene, however, is adamant that free will doesn't exist. I personally don't buy that, and I'm not sure I'm ready to go down that rabbit hole although I would like to read his reasoning at some point.

Post by “Martin” of July 25, 2020 at 5:17 AM

Heat "death" is somewhat misleading. While we are no more after death, the universe exists without being alive and will still exist when it reaches heat death.

The way I learnt this as a student in a cosmology class, heat death means that there is only infrared radiation and matter in the form of the most stable element (iron in that lecture, nickel according to another reference), and on the way toward there, conditions will become too adverse for any lifeform to survive.

However, this class was taught before the apparent acceleration of the expansion of the universe was discovered, which should be a major game changer.

Another correction of what was mentioned in the thread: The energy will never be used up, it will just be distributed more evenly / the entropy will be much higher.

Post by “Martin” of July 25, 2020 at 5:29 AM

It is cool that theoretical physicists develop various concepts of a multiverse which are mutually exclusive and that there is considerable public interest in this.

However, those theories (or rather: so far untestable hypotheses) are highly speculative such that I still go with just one universe (of which parts might go or be outside of our horizon of observation and cause-and-effect).

Except for reading the occasional article for physicists who are not experts in this, I largely ignore the multiverse.

I still take a wait and see position on the accelerated expansion of the universe, too, but there is at least some evidence to base that one on.

Post by “Cassius” of July 25, 2020 at 7:14 AM

[Quote from Martin](#)

Heat "death" is somewhat misleading. While we are no more after death, the universe exists without being alive and will still exist when it reaches heat death. conditions will become too adverse for any lifeform to survive.

Martin, I think you mentioned this aspect briefly in the podcast, that the "death" part in "heat death" does not refer to the universe ceasing to exist, but to conditions for life (at least as we know it) not being possible.

I meant to backtrack and bring that out but I think I failed to get back to it. My concern with the subject was that we were planting the notion in less-read peoples' minds that we were entertaining a view in which the universe ceased to exist entirely. But I definitely remember

your saying that so it's in the podcast episode and can always be referred to if anyone got really confused and thought we were totally off base from Epicurus.

In general that's really my main concern with most of the terminology like Krauss' "A Universe From Nothing." ([Is Lawrence Krauss a Physicist, Or Just a Bad Philosopher?](#)) I just came across that article and have only read it once, but I think the writer pretty much has the attitude I have. I am not sure if this attitude I am describing is that of a philosopher, or a "theologian" as the article mentions, but I think that whatever the issue really boils down to, Epicurus himself would be accused by Krauss of being a philosopher rather than a physicist in taking a position on the eternity of the elemental particles, and that there is no reason from a philosophical perspective to ascribe their existence to a supernatural god.

So I get the impression Krauss and people like him would not be on the side of Epicurus, and would actually be significantly opposed to many of his conclusions, or at least his procedures for reaching his conclusions, and that makes me concerned about seeming to cite their arguments without clarification.

The modern use of words like "nothing" (and maybe I should add "heat death") appear to the untrained to be making claims about ultimate traditional logical issues that are counterintuitive from/against the traditional Epicurean perspective, and should not be accepted on that level.

Plus, I have always been concerned, and continue to be concerned, that people like Krauss did not pick up their terminology because it was really compelled by the science, but exactly because it "tweaked" those who held to the older views, and that's an attitude I personally associate with radical skepticism and nihilism. That's just my personal viewpoint, of course, and it isn't necessarily implied or true in the case of any particular individual or theory, just something that seems to me to be worth considering in writing/talking about these issues to wider audiences.

(Sorry that this post is disjointed - i came across the article in mid-post and added it in. I need to pick up some of those points from that article in a separate post.)

Post by "Cassius" of July 25, 2020 at 7:25 AM

From [that article I just cited](#), here is the part that seems to me to be the center of the criticism against "*A Universe From Nothing: Why There Is Something Rather Than Nothing*," both the book and the terminology. I think the questions I underlined here are things we have to wrestle with in thinking about "Infinity and the Expanding Universe":

Quote

That brings me to South African physicist George Ellis. [When I interviewed Ellis last year](#), I asked him if Krauss's book answers the question posed by its subtitle. Ellis responded:

Certainly not. He is presenting untested speculative theories of how things came into existence out of a pre-existing complex of entities, including variational principles, quantum field theory, specific symmetry groups, a bubbling vacuum, all the components of the standard model of particle physics, and so on. He does not explain in what way these entities could have pre-existed the coming into being of the universe, why they should have existed at all, or why they should have had the form they did. And he gives no experimental or observational process whereby we could test these vivid speculations of the supposed universe-generation mechanism. How indeed can you test what existed before the universe existed? You can't.

Thus what he is presenting is not tested science. It's a philosophical speculation, which he apparently believes is so compelling he does not have to give any specification of evidence that would confirm it is true. Well, you can't get any evidence about what existed before space and time came into being. Above all he believes that these mathematically based speculations solve thousand year old philosophical conundrums, without seriously engaging those philosophical issues. The belief that all of reality can be fully comprehended in terms of physics and the equations of physics is a fantasy. As pointed out so well by Eddington in his Gifford lectures, they are partial and incomplete representations of physical, biological, psychological, and social reality.

And above all Krauss does not address why the laws of physics exist, why they have the form they have, or in what kind of manifestation they existed before the universe existed (which he must believe if he believes they brought the universe into existence). Who or what dreamt up symmetry principles, Lagrangians, specific symmetry groups, gauge theories, and so on? He does not begin to answer these questions. It's very ironic when he says philosophy is bunk and then himself engages in this kind of attempt at philosophy.

So as to: "The belief that all of reality can be fully comprehended in terms of physics and the equations of physics is a fantasy." I think Epicurus would say that statement is exactly correct. Our human reality cannot be fully understood as "physics." Our human reality is real to us through the canonical faculties, including not just the bodily senses, which are "more" understandable in terms of physics, but also the feeling of pleasure and pain and anticipations, which arise from physical processes but in effect constitute a separate playing field of understanding. On that playing field we are competing with supernatural religion and philosophical questions to which our nature impels us toward finding answers, and I think

Epicurus would say that the best (most pleasurable) life requires that we address these issues as best we can.

Post by “Don” of July 25, 2020 at 9:22 AM

My heavens (pun intended)! This thread has been active since I've been sleeping! Wonderful, thought-provoking comments and clarifications! I'm looking forward to digging in and responding!

One thing that hit me this morning was that I wanted to go back and see what Epicurus actually said when talking about other worlds in the Letter to Herodotus:

Quote

"Moreover, there is an infinite number of worlds [κόσμοι ἄπειροί εἰσιν], some like this world, others unlike it. For the atoms being infinite in number, as has just been proved, are borne ever further in their course. For the atoms out of which a world might arise, or by which a world might be formed, have not all been expended on one world or a finite number of worlds, whether like or unlike this one. Hence there will be nothing to hinder an infinity of worlds [τὴν ἀπειρίαν τῶν κόσμων].

I admit I assumed that he used a word like Earth or something. I was pleasantly surprised and amused that the word he uses throughout is κόσμος *kosmos* or, if you will, *cosmos*. So, "there will be nothing to hinder an infinity of worlds" could just as readily be translated as "There is nothing impeding an unlimited number of *cosmos*." The ambiguity of that word "*cosmos*" is fun to play with. Don't misunderstand! I'm not saying Epicurus was a proponent of the multiverse interpretation (necessarily) but I don't think he'd rule it out. As I understand, *cosmos* can refer to a world or a world and its associated system or the universe, the sum total of "order" (*cosmos*) that arose out of Chaos (and we know Epicurus was unsatisfied by his early teachers' attempts to explain Hesiod's Chaos).

The poetry of a phrase like "an infinity of worlds" has a certain allure and power to my ears. That whole last sentence of that paragraph would make a great Tshirt or bumper sticker 😊

Quote

οὐδὲν τὸ ἐμποδοστατήσόν ἐστι πρὸς τὴν ἀπειρίαν τῶν κόσμων.

"Ouden to empodostatēson esti pros tēn apeirian tōn kosmōn."

That *empodostatēson* carries the connotation of feet (..podo...) being put into shackles or fetters. So, there's nothing (ouden) binding the feet of reality for the existence of innumerable (apeirian) cosmos.

Ah! That concept - and the way Epicurus expresses it - just sings for me in the original language! 😊

Post by “Cassius” of July 25, 2020 at 10:50 AM

Yes Don - I hate to be so dependent on the commentators, but this is one of those areas that has sunk into my mind I think from a variety of sources - and not just DeWitt - that the "cosmos/world" reference in Herodotus is intended not just to refer to the Earth, but (I presume) pretty much everything we see in the sky as well. And yes that would certainly lend itself to interpretation that Epicurus was distinguishing "our visible universes" from "all other infinitely numbered other universes that are out there beyond those that we can see ourselves. "

However all along the way I drag my feet about using the word "universe" in this phrasing, since I grew up on the definition that "universe" means "everything" and "everything" in fact means "every thing" ! 😊

But times change and if people want to use "universe" to mean some segment of the whole then that is OK with me, just like I acknowledge that there are all sorts of languages other than English, and in the end the terms are matters of convention. 😊

Post by “Cassius” of July 25, 2020 at 11:01 AM

Don your comment on feet is interesting too, since it has always struck me how odd Lucretius' formulation is in the discussion of those who deny the existence of any kind of knowledge, which also contains a "foot" analogy -

nam nil aegrius est quam res secernere apertas
ab dubiis, animus quas ab se protinus addit.

Denique nil sciri siquis putat, id quoque nescit
470 an sciri possit, quoniam nil scire fatetur.
hunc igitur contra mittam contendere causam,
qui capite ipse sua in statuit vestigia sese.
et tamen hoc quoque uti concedam scire, at id ipsum
quaeram, cum in rebus veri nil viderit ante,
475 unde sciat quid sit scire et nescire vicissim,

469 Moreover, if anyone thinks that nothing is known, he does not
even know whether that can be known, since he declares that he
knows nothing.^b I will therefore spare to plead cause against a man
who has placed his head in his own footsteps.^c And yet even if I
grant that he knows that, still I will ask just this: since material
things had no truth for his vision to begin with, how he knows what
it is to know or not to know as the case may be, what

I see Munro uses "where his feet should be" to pursue the analogy, but I was expecting to see some variation of "pedes" here and see "vestigia" instead so I am not sure how firmly the foot analogy holds. (However since I think Munro tried very much to be literal, I bet it does.)

Again if a man believe that nothing is known, he knows not whether this even can be known, since he admits he knows nothing. I will therefore decline to argue the case against him who places himself with head where his feet should be. And yet granting that he knows this, I would still put this question, since he has never yet seen any truth in things, whence he knows what knowing and not knowing severally are, and what it is that has produced the knowledge of the true and the false and what has proved the doubtful to differ from the certain. You

Post by "Don" of July 25, 2020 at 11:08 AM

Interesting. It looks like *vestigia* carries the idea of footprints ("vestigial" marks left over from someone walking):

- *vestigium* n (genitive *vestigii* or *vestigii*); second declension
- footprint, track
- trace, vestige, mark
- sole of the foot
- horseshoe
- (figuratively, of time) moment, instant

Post by "Godfrey" of July 25, 2020 at 11:17 AM

Quote

So as to: "*The belief that all of reality can be fully comprehended in terms of physics and the equations of physics is a fantasy.*" I think Epicurus would say that statement is exactly correct. Our human reality cannot be fully understood as "physics." Our human reality is real to us through the canonical faculties, including not just the bodily senses, which are "more" understandable in terms of physics, but also the feeling of pleasure and pain and anticipations, which arise from physical processes but in effect constitute a separate playing field of understanding

Maybe I'm stating the obvious, but this is my intuitive answer to the idea that there is no free will.

Post by "Cassius" of July 25, 2020 at 11:26 AM

Yes, Godfrey I agree. I can understand the technical issues being discussed by those who challenge "free will" - at least I think I can - but I also observe that those who really get into arguing against "free will" seem to have an agenda with implications that go far more deep than just a desire to be technically correct. Some version of "free will" is something that seems to be just as real to us as pleasure and pain, and from a practical point of view that pretty much ends the discussion of whether it is "real" or not.

Post by "Don" of July 25, 2020 at 2:50 PM

Quote

[Godfrey](#): I recently listened to a podcast with Alan Alda interviewing Brian Greene.

It wasn't the [Clear and Vivid episode](#) by any chance, was it? I'm a regular listener of that podcast.

Post by "Godfrey" of July 25, 2020 at 4:07 PM

Yes, that's the one!

Post by “Don” of July 25, 2020 at 6:24 PM

[Quote from Cassius](#)

Yes, Godfrey I agree. I can understand the technical issues being discussed by those who challenge "free will" - at least I think I can - but I also observe that those who really get into arguing against "free will" seem to have an agenda with implications that go far more deep than just a desire to be technically correct. Some version of "free will" is something that seems to be just as real to us as pleasure and pain, and from a practical point of view that pretty much ends the discussion of whether it is "real" or not.

I agree, [Cassius](#) . I can follow their arguments but I find them unpersuasive most of the time. And I agree that, from a practical perspective, free will is "real."

Post by “Godfrey” of July 25, 2020 at 7:13 PM

[Don](#) I've just watched the Economist video and the Brian Greene video and find them quite thought provoking. However what I'm finding is that, for me, physics videos are basically appetizers: just enough to get some idea of the issues but not a full understanding. For me, doing some reading will provide the chance to follow the arguments more carefully as well as to reflect on the implications. But if this subject was simple, we wouldn't be discussing it!

More specifically, the string theory as presented by Greene seems profoundly unsatisfying: too many machinations for too few results. Of course there is the factor of my admitted ignorance.... 🙄 But I tend to prefer the Ockham's razor approach; the approach in the video seems way too convoluted to suit my simplistic taste.

Thanks for the links though!