

God and the Atom by Victor Stenger: A Very Brief Review

Post by “Godfrey” of February 14, 2020 at 7:22 PM

Rather than attempt to outline the book or try to present any specific theories of physics, I'd like to attempt to relate current thinking as I understand it from this book to the Twelve Fundamentals of Nature in order to provide a platform for further discussion. Any mistakes are purely mine; I'm trying to figure this out as I go! If discussion follows, this might best be moved to the various forum threads under The Fundamentals of Nature; I'm listing them here to have them in one place for clarity.

Twelve Fundamentals of Nature:

1. Matter is uncreatable.

In the 18th century, Antoine Lavoisier determined the law of conservation of mass. Einstein showed that this must be incorporated into the First Law of Thermodynamics (Law of Conservation of Energy), which states that energy cannot be created or destroyed in an isolated system. This is because mass can be created and destroyed by energy. If I understand it correctly, $E=mc^2$ defines matter as a relationship of mass and energy. Thus matter is uncreatable.

However, cosmologically, there seems to be some disagreement as to whether the universe came from nothing, as Stenger discusses in the following.

From Chapter 6, Light and the Aether: *“...the validity of the three great conservation laws of physics is testimony to a universe that is isolated from anything on the outside and looks just like it should look if it came from nothing.”*

From Chapter 12, Atoms and the Cosmos: *“...as shown in 1970 by Stephen Hawking and Roger Penrose, Einstein's general theory of relativity implies that the universe at its first moment of existence was a singularity, that is, an infinitesimal point in space of infinite energy density. This meant that not only was matter created at that moment, but so were space and time....*

“A finite, created universe conflicts with the teachings of the atomists that the universe is eternal and boundless. In chapter 1, Epicurus was quoted as saying, “The universe is without limit.” The big bang seemed to refute atheist atomism.

“However, there was a fly in the ointment. General relativity is not a quantum theory and so does not apply to a region of space less than 1.616×10^{-35} meter in diameter, called the Planck length, named for the physicist Max Planck who... initiated the quantum revolution. Applying the Heisenberg uncertainty principle of quantum mechanics, it can be shown that it is

fundamentally impossible to define a smaller distance or to make any measurements inside a region of that size. Basically, we can have no information about what is inside a sphere with a diameter equal to the Planck length. It is a region of maximal chaos.

“The uncertainty principle also mandates that no time interval shorter than 5.391×10^{-43} second, called the Planck time, can be measured. Thus, our cosmological equations, derived from general relativity, can apply only for times greater than the Planck time and only for distances greater than the Planck length. Although their singularity proof was correct for the assumptions made, both Hawking and Penrose long ago agreed that it does not apply once quantum mechanics was taken into account, a fact most theologians... have conveniently ignored. In short, the origin of our universe was not a singularity and need not have been the beginning of time.”

I understand this as meaning that the Big Bang is actually the point where our physics ends, and any theories as to the initial moment are purely speculation.

Also from Chapter 12: *“In one scenario, which I have discussed in previous books and has been worked out mathematically, our universe appears from an earlier one by a process known as quantum tunneling. For our purposes here, suffice it to say that nothing in our current knowledge of physics and cosmology requires us to conclude that the beginning of our universe was the beginning of space, time, and everything else that is.”*

Further: *“...while the big bang was the beginning of our universe, it was not necessarily the beginning of all that is. Modern inflationary cosmology strongly suggests that other universes besides our own exist in what is called the multiverse. Because we have no observational evidence (yet) for other universes, I will not indulge in speculations about them, except to say that such speculations are based on well-established science and their ultimate empirical confirmation is not out of the realm of possibility. In any case, allow me to simply use the term multiverse to refer to all that is, even if it should turn out that our universe is all there is.”*

And: *“So the real issue is not where our particular universe came from but where the multiverse came from. This question has an easy answer. ...the multiverse is most likely eternal. Repeating myself, since it always was, it didn't have to come from anything.”* This, to me, is speculation and just kicks the problem down the road. But I must confess my ignorance.

2. Matter is indestructible.

As in Fundamental 1, this is stated by the First Law of Thermodynamics.

3. The universe consists of solid bodies and void.

This invalidates the aether, the idea that the void is a medium of some sort in which things move. The wave motion of light was thought to be evidence of this ancient idea. However light was determined to be part of the electromagnetic field, a field being “a quantity that has a value, or set of values, for each point in space.” Further, light was determined to be particulate, composed of photons: little bundles of energy which are bits of matter. Therefore light consists

of particles in a field, not waves moving in the aether.

4. Solid bodies are either compounds or simple.

Not much to say here: atoms combine to make molecules, etc.

5. The multitude of atoms is infinite.

This is a cosmological question; I'm not aware of the theory. However if the universe is infinite, this would seem to follow.

6. The void is infinite in extent.

This is a cosmological question; I'm not aware of the theory.

7. The atoms are always in motion.

Matter is comprised of energy, mass and momentum, which I think implies motion.

8. The speed of atomic motion is uniform.

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9. Motion is linear in space, vibratory in compounds.

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10. Atoms are capable of swerving slightly at any point in space or time.

The idea of atoms traveling uniformly downward is outdated. In terms of the swerve permitting free will, I think that the reducibility of the atomic model supercedes this.

11. Atoms are characterized by three qualities, weight, shape and size.

My understanding of current theory is: particles are characterized by three qualities, energy, mass and momentum.

12. The number of the different shapes is not infinite, merely innumerable.

Regarding molecules, this still applies. Atoms are numbered in the periodic table of the elements, although I assume that may be added to, particularly in other regions of an infinite universe. Atoms, for a layman such as myself, consist of smaller particles: protons, neutrons and electrons. A simplified version of the latest model consists of up and down quarks (composing protons and neutrons), electrons, and photons.

This is my very humble attempt to grapple with these issues. Any clarification from those more knowledgeable among us would be greatly appreciated!