

Update on the State of Modern Cosmology (1, 2)

by David L. Alles, 2010-5-2

"The Catholic Church, which put Galileo under house arrest for daring to say that Earth orbits the sun, isn't known for easily accepting new scientific ideas. So it came as a surprise when Pope Pius XII declared his approval in 1951, of a brand new cosmological theory—the Big Bang. What entranced the pope was the very thing that initially made scientists wary: The theory says the universe had a beginning, and that both time and space leaped out of nothingness. It seemed to confirm the first few sentences of Genesis."(3)

As to the Universe from a philosophical view, in this case philosophical naturalism (4), there is only one tenable position. The Universe is infinite in time and space. There is no "outside of" the Universe. There is also a central tenet in philosophical naturalism that must be followed: We **can not** resort to "special creation"(5)—**ever**. It follows, then, that, if there is "something" now, rather than nothing, then there has always (in an absolute sense) been "something".

In addition to the central tenet of naturalism is the definition of "Universe" itself. The Universe *is* "all that there is"(6). This definition leaves no room for anything else. To view the Universe as finite in time, one would have to conceive of a *universal nothingness* before the existence of the Universe. Zero, zip, nada—reality would not exist. A universal nothingness is not the astrophysicists' concept of "space" where matter pops in and out of a quantum foam. There would be no space or time. A universal nothingness would have no events to mark time, no matter, no "dark matter", no "dark energy", nothing—including "nothing". So you see to go from a "universal nothingness" to a "universal somethingness" you would have to violate the central tenet of naturalism. Science is restricted to the epistemological tenets of philosophical naturalism, which are commonly referred to as "methodological naturalism"(4).

If, however, the theoretical concept of "Multiverse"(7) is correct, then our particular "universe" is not "all there is." It is only one of possibly an infinite number of "universes" throughout eternity, as in a cyclic Universe (8), or in infinite space, as in multiple universes existing at the same time (9), or both (see Note 1). This implies that the fate of our particular "universe" isn't very important in the grand scheme of things. The "Multiverse" may well be unconcerned about the fate of our "universe".

There are two very important points to be made here:

Point 1) We are back to a very old position (10), our "universe" because it has a linear history, must cycle into and out of different phases. It's cyclical (8). You see it is, after all, "turtles all the way down"(11) i.e. an infinite regression. But the Multiverse, itself, is infinite in time and space. It had no beginning and will have no end (see Notes 2 and 3).

Point 2) Copernicus strikes again (12)—it would be the greatest of hubris to think our "universe" with, and because of, its linear history, is all there is. Our Earth is not at the center of our "universe" and our "universe" probably isn't at the center of the Multiverse. After all, besides having infinite knowledge, what would it take to *prove* that our "universe" is all that there is? (see Note 4)

And finally, because of Gödel's Incompleteness Theorems (13) it may be fundamentally impossible to prove that our "universe" is all that there is. We are inside of it, and may never be able to see out.

At this point I will invoke "Ignorance" as a central epistemological principle. We simply don't know the fundamental nature of the Universe, and we probably never will. And perhaps we should learn to live with that. The problem is, of course, we don't know what we're capable of knowing. In other words—we don't know, what we can know. (see Note 5)

"The effort to understand the universe is one of the very few things that lifts human life a little above the level of farce, and gives it some of the grace of tragedy." —Steven Weinberg

Notes:

Note 1) Universe or Multiverse; universe or multiverse

At one point or another a consensus must be reached on these terms. Currently, different authors apply different meanings to them as summarized below.

A. Universe—all that there is. It had a beginning, but will have no end (14)

B. Universe—all that there is, including possibly many smaller "baby universes"(9). These baby universes can themselves give rise to other "baby universes". These "baby universes" can also be referred to as "multiverses".

C. Multiverse — a non-cyclic "all that there is", that gives rise to many smaller "baby universes." These baby universes are also non-cyclic, but can give rise to other "baby universes". Tegmark's Level III many-worlds interpretation of quantum mechanics (7)

D. Multiverse — a cyclic M-theory "all that there is". This Multiverse cycles from one "universe" to another throughout eternity (8).



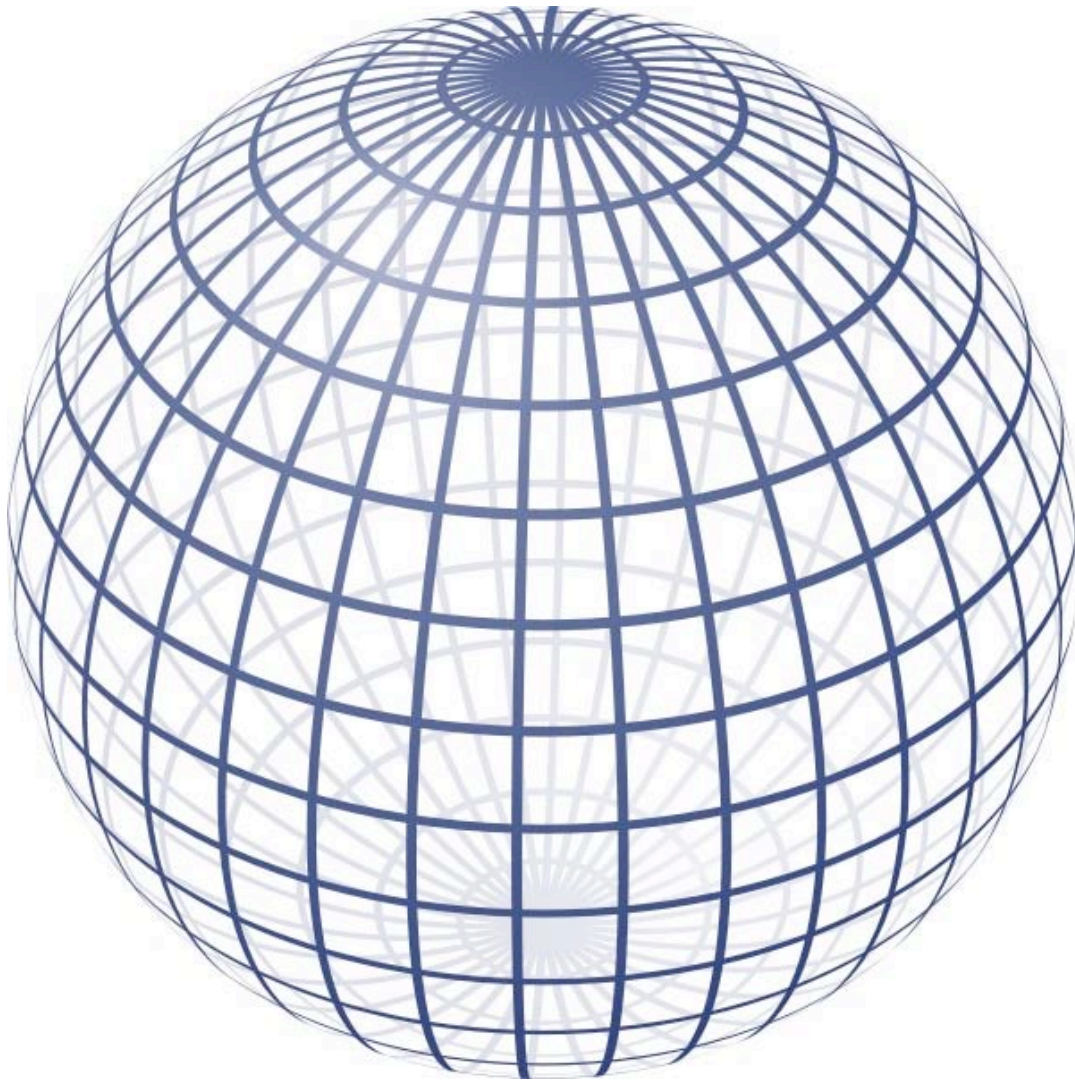
The Steinhardt-Turok Cyclic Multiverse (8)

Note that I've tried to use capital letters, as in "Universe" and "Multiverse" when these terms are used to mean the entirety of being — "all that there is." Whereas, I've used the lower case "universe" or "multiverse" to mean that these entities are a part of an all encompassing "Universe" or "Multiverse".

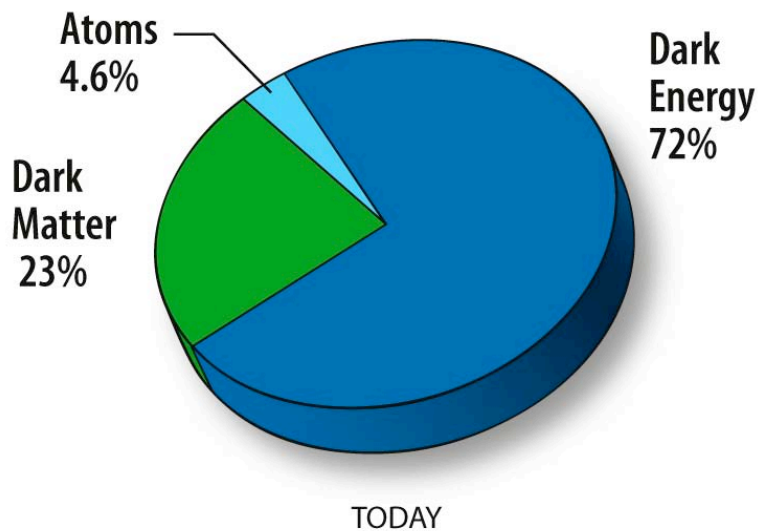
Note 2) Jainism's beliefs about the Cosmos (10)

"Jainism has been a major cultural, philosophical, social and political force since the dawn of civilization in Asia, and its ancient influence has been noted in other religions, including Buddhism and Hinduism." "Jains hold that the Universe is eternal, without beginning or end. However, the universe undergoes processes of cyclical change." "Jains do not believe in an omnipotent supreme being, creator or manager, but rather in an eternal Universe governed by natural laws."

Note 3) In trying to understand an eternal Universe, imagine instead a sphere where all of reality exists, but only on its surface. Then imagine you are on the surface of the sphere at some point—any point. Now you start walking, looking all the while for an edge—the end of reality. Your journey will be eternal, just as a cyclical universe is eternal. This is not a complicated idea. And, yet, as mortals our lives are linear with a beginning and an end. So we expect all of reality to be the same, but it isn't. (By the way, the edge of a sphere is up, not sideways. But in the case of the Universe there is no "up".)



Note 4) The history of Twentieth Century physics may be a history of the evils of hubris in science. We collectively thought we had the fundamental answers to the nature of the universe, but we didn't. "Lawrence Krauss, a cosmologist from Arizona State, said that most theories were wrong. 'We get the notions they are right because we keep talking about them,' he said. Not only are most theories wrong, he said, but most data are also wrong—at first—subject to glaring uncertainties. The recent history of physics, he said, is full of promising discoveries that disappeared because they could not be repeated."(2) Therefore, that 72% of the universe is now thought to be "dark energy" is dark indeed (15).



Note 5) "Ignorance" as a philosophical principle is underrated. We desperately need to know where our knowledge ends and our ignorance begins. Epistemology should be a fundamental component of what every would-be scientist should study. After all, we must know where the limit of our knowledge is in order to know where we should be working.

References:

(1) Overbye, D. (2008, June 3). Dark, Perhaps Forever. *The New York Times*, Science. <http://www.nytimes.com/2008/06/03/science/03dark.html>

(2) Overbye, D. (2010, Jan. 26). Physicists' Dreams and Worries in Era of the Big Collider. *The New York Times*, Science. <http://www.nytimes.com/2010/01/26/science/26essay.html?hpw>

(3) Lemonick, M. D. (2004). Before the Big Bang. *Discover* magazine, February, 36-41.
<http://discovermagazine.com/2004/feb/cover> (see print version)

(4) Definition of Philosophical Naturalism and Methodological Naturalism
http://en.wikipedia.org/wiki/Methodological_naturalism

See also: http://www.infidels.org/library/modern/barbara_forrest/naturalism.html

(5) Definition of "special creation": http://en.wikipedia.org/wiki/Special_creation

(6) Definition of Universe: <http://en.wikipedia.org/wiki/Universe>

(7) Definition of Multiverse: <http://en.wikipedia.org/wiki/Multiverse>

(8) Definition of Cyclic M-theory Universe: http://en.wikipedia.org/wiki/Cyclic_model

See also Paul J. Steinhardt: <http://www.physics.princeton.edu/~steinh/>

(9) Carroll, Sean (2010). *From Eternity to Here*. New York: Dutton, page 355.

(10) Jainism Cosmology: <http://en.wikipedia.org/wiki/Jainism>

(11) "turtles all the way down": http://en.wikipedia.org/wiki/Turtles_all_the_way_down

(12) The Copernican Principle: http://en.wikipedia.org/wiki/Copernican_principle

(13) Gödel's Incompleteness Theorems:
http://en.wikipedia.org/wiki/Gödel's_incompleteness_theorems

See also: Binder, P.-M. (2008). Philosophy of science: Theories of almost everything. *Nature* 455(16 Oct), 884-885, News and Views | doi:10.1038/455884a
http://fire.biol.wvu.edu/trent/alles/Binder_Nature_article.pdf

(14) Standard Cosmological Model: http://en.wikipedia.org/wiki/Physical_cosmology.

(15) NASA's 72% dark energy chart (see 5 year, 2008 results):
<http://map.gsfc.nasa.gov/news/events.html>