

Cosmology - In the Real Beginning

Cosmology will contradict theology only if a given theologian asserts something that is factually not true. It is entirely possible for a religious person to have beliefs that are not in conflict with science. However, that person would have to look at Biblical myths as metaphors that are not literally true. This essay will examine some of what is scientifically known which can be compared to Biblical myths. Young earth creationism with its literal belief in a six day creation by God has no evidence other than the imagination of someone who perhaps thought that God was speaking to him. In fairness to Christians, most are quite realistic on matters of settled science as discussed here.

SECULARISM: Exclusion of religion from public affairs - Religion and religious bodies should have no part in political or civic affairs or in running public institutions. Rejection of religion or its exclusion from a philosophical or moral system.

“Ref: Encarta World English Dictionary, 1999”

It is known beyond a reasonable scientific doubt that the universe derived from a Big Bang that occurred roughly 13.7 billion years ago. NASA claims this estimate is accurate to within one percent. It was derived from several different studies of cosmic background radiation. Prior methodologies estimate the age at between 12 and 15 billion years. The oldest known stars were used to estimate the 12 billion year younger age.

The theoretical understanding of the Big Bang came in large part from Einstein’s theory of General Relativity developed in 1916. This theory replaced the prior theory of gravitation described by Isaac Newton. Space and time became interwoven together with matter in a way that has been extensively tested and confirmed to be superior to the theory of Newton.

Since there is no way to test “sacred text” pronouncements, they have to be accepted on “faith”, which is defined in Christian text as hope without evidence. (1) Science requires theoretical predictions that can be tested against observation. What is predicted by the Big Bang?

A major finding confirming the Big Bang came from Edwin Hubble (1929) with his demonstration that other galaxies are receding from us at a speed that is proportion to their distance. The light waves from these galaxies were reduced in frequency (called red shift). The reduction is exactly predicted by the specific velocities away from us. We know that the whistle of a train will sound at a higher pitch when the train is coming toward us and lower in pitch as the train goes away from us. A similar change in frequency is predicted with the light waves from receding galaxies.

If we imagine going backward in time it is obvious that the galactic movements in the universe would reverse and all the matter would eventually have to come together. The initial state of the universe would include all of space and time in a volume much smaller than a single proton. All the points of our space expanded out from that one point.

Where was this single entity? Well, it would be at the tip of your nose, at the period at the end of this sentence, in the Andromeda galaxy and at every other point in space that now exists. This is hard to understand intuitively because any small thing that we encounter or think about is now surrounded by space.

There was no space outside the Big Bang. This is nominally consistent with the story in Genesis about the void but that story does not generate the testable theories of science and would be rejected for reasons described on this web site. [Add link to Sven's Science essay]

In the first second of our universe, most matter formed into raw protons, neutrons, electrons, anti-electrons (positrons), photons and neutrinos. Some neutrons would change into additional protons and electrons or combine with protons to create deuterium, a heavier form of hydrogen. The deuterium could then combine to form helium. This process has been modeled with known physics predicting that 24 percent of standard matter would become helium, a very small amount would become lithium and the rest would be hydrogen. The observed results agree very closely with theoretical predictions.

About three hundred and eighty thousand years after the Big Bang, the matter of the universe had cooled so that electrons could stick to protons forming atomic hydrogen. Prior to this, photons were easily scattered off the free electrons from the hydrogen plasma. The removal of the free electrons meant that the photons (light and related radiation) could travel unimpeded from the last point of scattering. This created a vast "wall of light" in the distant universe that is farther away than any other radiation that can be sensed with instruments. The distribution of energy predicted for such a wall of light is called black body radiation. The distribution of the photon energy has been measured at 34 points along the curve with results exactly agreeing with the black body radiation predictions from Big Bang theory.

These initial photons are now visible as very cold cosmic background radiation at an average 2.725 degrees above absolute zero (called degrees Kelvin or K.). The frequency of radiation is related to temperature. An electric light bulb has a temperature that produces visible light. Red hot iron produces visible light at a lower wave length using a lower temperature. Less hot iron could produce infrared radiation that is not visible at all but is felt as radiant heat. The lower temperature again produces a lower frequency. This is how the wave lengths of radiation is associated with temperature. The universe has steadily cooled from the intense initial heat of the Big Bang. The wall of light that produced the cosmic background radiation was at a far higher temperature (4880 degrees F. or 2967 K.) when the light last bounced off matter. However, that wall is now retreating from us at a high percentage of the speed of light. This produces a Hubble red shift that reduces the light frequency to a temperature associated with microwave radio wavelengths, 2.725 K. With the cosmic background radiation we are seeing the hot hydrogen plasma just before it cooled to become atomic hydrogen. This exact agreement with the temperature at which hydrogen becomes plasma is another important confirmation of the Big Bang.

Sound waves in air physically exist as small variations in air pressure. The early universe had similar waves that propagated through the intense hot plasma that then existed. Just as differences in air pressure can cause differences in temperature so can these waves in the early plasma of the universe. That difference is incredibly small. One small region of space might have cosmic background radiation at 2.7251 K and another might have 2.7249 K. Modern instruments in reading these early ripples in cosmic background radiation are quite literally listening to echoes of the Big Bang itself. This is the third category of confirmation of the Big Bang derived from the cosmic background radiation. The astonishing accuracy of current instruments gives very reliable evidence about these early conditions. It is like a photograph of what really happened.

The Hubble telescope has examined galaxies that existed in the first billion years after the Big Bang. The

light from these distant galaxies has traveled over ten billion years to reach us. What we observe belongs to a much younger age of the universe. The early galaxies are on average much different than the older galaxies in our region of space. Our galaxy is shaped as a rotating disk with spiral arms. The early galaxies are amorphous, fuzzy spheres because they have not had the time for the angular momentum in the globular cluster to form the classic spiral disks we now see.

Most galaxies have a massive black hole at the center. The greater amount of matter in a galactic core makes it easier to accumulate enough matter so that even light cannot escape. That is why they call it a black hole. A black hole will not by itself be visible at a great distance. However, the intense gravitation of a black hole can accelerate surrounding particles to nearly the speed of light and those particles will produce intense radiation.

In early galaxies, the many black holes that are doing this are called quasars. They are so bright that the light from the surrounding stars is drowned out. Supermassive black holes have been observed in many nearby galaxies. None of them are quasars. The black hole at the center of our Milky Way (26,000 light years away) is called Sagittarius A*. It almost certainly was a quasar when the universe was younger. These stark differences provide powerful visual evidence understandable to a layperson confirming the great age of the universe with specific changes over time since the Big Bang.

Theologians have often attempted to define God as that which created the universe and then presume that since there must be such a cause that there must be a God. Well, logic requires me to ask if everything must have a cause what caused God? Obviously if God can be without prior cause so could the Big Bang.

A greater problem of this desire for a first cause is the recent innovation in theory that paints a picture of no discrete boundary to the start of time. This innovation comes from Stephen Hawking and others. He asks us to consider that going back in time would be quite similar conceptually to going to the North Pole.

What happens when we reach the North Pole and continue going? Well, there is no problem we just continue. He calls this the 'no boundary condition.' If people ask what is north of the North Pole the answer is that the question is meaningless.

The no boundary condition totally removes the question of what could be before an initial time boundary at the Big Bang. It is likely to be a continuous space time surface quite different from our normal experience of time as a one directional flow.

God is often described as the mysterious, that which is not understood. The purpose of science is to explain what is not understood and thus where it succeeds it makes God unemployed. The enormous sophistication of our current understanding of space and time goes a long way toward doing this.

There could be no time if there were no space. There could also be no time if there were nothing that could be changed because time in the normal sense is a measure of change. Even without the no boundary condition the question of what came before the Big Bang has no relevance and is meaningless.

The cosmic age of our universe is confirmed in part by the known age of Earth itself at 4.5 billion years. We can date rocks by measuring the ratios of radioactive and non-radioactive atomic isotopes and comparing them to the ratio that existed when the rock was created. The greater disintegration of the radioactive isotopes will document a greater age. We have rocks samples that are four billion years old.

The relatively young geological science of plate tectonics gives us an understanding of how rocks are formed. The earth's magnetic poles have flip-flopped on a number of occasions in geological time. When molten rock made with magnetic material hardens in a magnetic field it will take on the magnetic orientation of the field around it.

Rocks on the floor of the Atlantic ocean are magnetized in bands that exactly parallel the Atlantic mid-ocean ridge. The new rock has been slowly formed over hundreds of millions of years as the molten magma comes to the surface taking on the magnetic orientation that existed at that time.

Modern cosmology presents a rich theoretical structure with evidence that has been confirmed by many mutually supporting empirical observations. The great age of the earth is confirmed in numerous ways by modern geology.

There is not the slightest need to assume God for any part of the process and there is ample evidence that would contradict any Biblical theory based on a literal understanding of the Bible.

References:

(1) KJV Heb. 11:1

Recommended Reading:

Stephen Hawking, [A Brief History of Time](#)

Michael White and John Gribbon, [Stephen Hawking: A Life in Science](#), Second Edition (2002) p-183

Web address: <http://books.nap.edu/books/0309084105/html/183.html>

NASA web site-Cosmology: The Study of the Universe

http://map.gsfc.nasa.gov/m_uni.html

Supermassive Black Holes

http://chandra.harvard.edu/xray_sources/blackholes_sm.html

USGS: Developing the Theory

<http://pubs.usgs.gov/publications/text/developing.html>

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Thus, the purpose of the organization is to recapture the territory of the secular mind (now claimed by religious extremists) for societal benefit by making the knowledge of alternatives to religion public and ubiquitous.

ASUSA invites all who share our concern with the trend away from the “separation doctrine” to join with us. We are not concerned over the private practice of religion, only with those who are moving the U.S toward theocracy.

Please join us in our effort to help steer public opinion back to support for a government run on a secular basis, one that is concerned with the public welfare of all citizens. For more info:
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