Science and Religion

Workshop 2: Origin of the Universe

Origins of the Universe 101

By Michael Greshko and National Geographic Staff **(**Published January 18, 2017)

https://www.nationalgeographic.com/science/space/universe/origins-of-the-universe/

The best-supported theory of our universe's origin centres on an event known as the big bang. This theory was born of the observation that other galaxies are moving away from our own at great speed in all directions, as if they had all been propelled by an ancient explosive force.

A Belgian priest named Georges Lemaître first suggested the big bang theory in the 1920s, when he theorized that the universe began from a single primordial atom. The idea received major boosts from Edwin Hubble's observations that galaxies are speeding away from us in all directions, as well as from the 1960s discovery of cosmic microwave radiation—interpreted as echoes of the big bang—by Arno Penzias and Robert Wilson.

Further work has helped clarify the big bang's tempo. Here's the theory: In the first 10^-43 seconds of its existence, the universe was very compact, less than a million billion billionth the size of a single atom. It's thought that at such an incomprehensibly dense, energetic state, the four fundamental forces—gravity, electromagnetism, and the strong and weak nuclear forces—were forged into a single force, but our current theories haven't yet figured out how a single, unified force would work. To pull this off, we'd need to know how gravity works on the subatomic scale, but we currently don't.

It's also thought that the extremely close quarters allowed the universe's very first particles to mix, mingle, and settle into roughly the same temperature. Then, in an unimaginably small fraction of a second, all that matter and energy expanded outward more or less evenly, with tiny variations provided by fluctuations on the quantum scale. That model of breakneck expansion, called inflation, may explain why the universe has such an even temperature and distribution of matter.

After inflation, the universe continued to expand but at a much slower rate. It's still unclear what exactly powered inflation.

Aftermath of cosmic inflation

As time passed and matter cooled, more diverse kinds of particles began to form, and they eventually condensed into the stars and galaxies of our present universe.

By the time the universe was a billionth of a second old, the universe had cooled down enough for the four fundamental forces to separate from one another. The universe's fundamental particles also formed. It was still so hot, though, that these particles hadn't yet assembled into many of the subatomic particles we have today, such as the proton. As the universe kept expanding, this piping-hot primordial soup—called the quark-gluon plasma—continued to cool. Some particle colliders,

such as CERN's Large Hadron Collider, are powerful enough to re-create the quark-gluon plasma.

Radiation in the early universe was so intense that colliding photons could form pairs of particles made of matter and antimatter, which is like regular matter in every way except with the opposite electrical charge. It's thought that the early universe contained equal amounts of matter and antimatter. But as the universe cooled, photons no longer packed enough punch to make matter-antimatter pairs. So like an extreme game of musical chairs, many particles of matter and antimatter paired off and annihilated one another.

Somehow, some excess matter survived—and it's now the stuff that people, planets, and galaxies are made of. Our existence is a clear sign that the laws of nature treat matter and antimatter slightly differently. Researchers have experimentally observed this rule imbalance, called CP violation, in action. Physicists are still trying to figure out exactly how matter won out in the early universe.

Building atoms

Within the universe's first second, it was cool enough for the remaining matter to coalesce into protons and neutrons, the familiar particles that make up atoms' nuclei. And after the first three minutes, the protons and neutrons had assembled into hydrogen and helium nuclei. By mass, hydrogen was 75 percent of the early universe's matter, and helium was 25 percent. The abundance of helium is a key prediction of big bang theory, and it's been confirmed by scientific observations.

Despite having atomic nuclei, the young universe was still too hot for electrons to settle in around them to form stable atoms. The universe's matter remained an electrically charged fog that was so dense, light had a hard time bouncing its way through. It would take another 380,000 years or so for the universe to cool down enough for neutral atoms to form—a pivotal moment called recombination. The cooler universe made it transparent for the first time, which let the photons rattling around within it finally zip through unimpeded.

We still see this primordial afterglow today as cosmic microwave background radiation, which is found throughout the universe. The radiation is similar to that used to transmit TV signals via antennae. But it is the oldest radiation known and may hold many secrets about the universe's earliest moments.

From the first stars to today

There wasn't a single star in the universe until about 180 million years after the big bang. It took that long for gravity to gather clouds of hydrogen and forge them into stars. Many physicists think that vast clouds of dark matter, a still-unknown material that outweighs visible matter by more than five to one, provided a gravitational scaffold for the first galaxies and stars.

Once the universe's first stars ignited, the light they unleashed packed enough punch to once again strip electrons from neutral atoms, a key chapter of the universe called reionization. In February 2018, an Australian team announced that they may have detected signs of this “cosmic dawn.” By 400 million years after the big bang, the first

galaxies were born. In the billions of years since, stars, galaxies, and clusters of galaxies have formed and re-formed—eventually yielding our home galaxy, the Milky Way, and our cosmic home, the solar system.

Even now the universe is expanding, and to astronomers' surprise, the pace of expansion is accelerating. It's thought that this acceleration is driven by a force that repels gravity called dark energy. We still don't know what dark energy is, but it’s thought that it makes up 68 percent of the universe's total matter and energy. Dark matter makes up another 27 percent. In essence, all the matter you've ever seen—from your first love to the stars overhead—makes up less than five percent of the universe.

Q1. In your group, identify the main pieces of evidence to support this account of the creation of the universe?

Q2. In your group, identify the main areas where this theory has insufficient evidence.

Q3. As a group, examine your previous two answers, on balance how convincing is this scientific explanation of the origin of the universe?

Origin Of The Universe - Theism vs. Atheism

https://www.allaboutcreation.org/origin-of-the-universe.htm

In general, theists attribute the origin of the universe to some sort of transcendent, intelligent Designer. Atheists envision a natural, undirected process by which universes spring into existence spontaneously. Prior to the 20th century most atheists believed the universe was eternal. This changed however as discoveries throughout the 20th Century rendered that view untenable. Einstein’s theory of gravity (which has been thoroughly validated by extensive experimental confirmation) and Hubble’s astronomical observations preclude an eternal universe. We now know beyond a reasonable doubt that the universe began at some point in the finite past.

Now we understand that there are only two legitimate options for the origin of the universe:

(1) Someone made the universe (Intelligent Design), or

(2) The universe made itself (Random Chance).

The third option, the universe has always been here, is no longer a feasible alternative -- it contradicts empirical science. No other scientifically plausible theories for the origin of the universe have ever been proposed.

The implications of various 20th century discoveries have put atheists in an awkward position. Logic now requires that they identify an uncontrolled mechanism by which the universe could have initiated, designed, created and developed itself without an Intelligent Director. Otherwise, intellectual honesty requires the necessity of a Creator God.

Origin of the Universe - The Big Bang Theory

So began the effort to propose an atheistic mechanism for the origin of the universe. Enter the Big Bang Theory and Darwinian Evolution. The original Big Bang Theory seeks to explain the sudden appearance of everything from nothing, while Darwinian Evolution seeks to explain the origin of complex life forms from their supposed simpler ancestors. The premise of the Big Bang is that the entire universe was compacted into a teeny tiny little ball, which, after randomly coming into existence for no apparent reason in the first place, exploded into all space, time, matter and energy in an instant. Yes, that's the theory. No Ph.D. required.

Origin of the Universe - The Inflation Universe Theories

The Big Bang Theory provided an atheistic explanation for the origin of the universe, but its obvious simplicity was subject to multiple attacks. As a result, the original theory is no longer the dominant scientific explanation for the atheistic origin of the universe. While the original Big Bang Theory is now "dead," from its ashes have emerged the various Inflationary Universe Theories (IUTs). Starting with Alan Guth in the late 1990's (The Inflationary Universe: The Quest for a New Theory of Cosmic Origins), the scientific community has now proposed roughly 50 different IUT variants. Scientists hope that one of the current IUTs will sire an accurate reconstruction of the birth of our universe, though it is universally acknowledged that all of the current IUTs have their problems. It seems the only way to get realistic calculations to match an IUT model is to make assumptions that are poorly justified.

Origin of the Universe - Post "Bang" Problems

The IUTs are essentially no better an attempt to explain the origin of the universe without God than the Big Bang. The primary differences between the IUTs and the original Big Bang Theory are really pre-bang explanations. What happened just prior to the explosion? What happened during the first millisecond of the explosion? For instance, some of the IUTs have included a concept called the 'epoch of inflation' to explain the dynamic first millisecond after the Bang. However, the basic premise of all these theory variants is the same -- the universe was compacted into a little cosmic ball that subsequently exploded with a big bang into everything that exists today. Thus, the IUTs share the same post-bang problems that plague the original Big Bang Theory. These problems include violations of established Natural Laws, such as:

(i) The Law of Causality (observed effects require a related cause),

(ii) The Law of Conservation of Angular Momentum (observed phenomena like retrograde motion in our solar system are impossible without an intervening cause), and

(iii) The Laws of Thermodynamics (Conservation of Matter/energy and Increased Entropy).

In addition, the Big Bang/iUTs are unable to explain a limitless list of other issues related to cosmological, chemical, stellar, planetary and biological causation, order and design. Where did all that matter and energy come from in the first place? What

caused its initial release? How did this explosion of everything (from nothing) order itself? How can simplicity become complexity? Where did the chemical elements come from? Where did the mathematical laws and physical properties come from? How do we explain the fine-tuning inherent in spiral galaxies, solar systems and stars? How do you explain the existence of both voids and clumps in our cosmos? Where did the first rock come from? How did life come from a rock? Where did the information code for all biologic forms come from? Where did the language convention that interprets that code come from?…

Origin of the Universe - Long Ago and Far Away...

Attempts to exclude a Creator from the "origin of the universe equation" have been long on theoretical calculations and short on common sense. The various models merely move the questions of where, why and how did everything get here to "long ago and far away." Atheists are tenacious in their efforts to ignore the necessity of a First Cause, Intelligent Designer, Creator God. But as Aldous Huxley put it so eloquently, "Facts do not cease to exist because they are ignored." And it seems that atheists must ignore a great deal in order to maintain their atheistic cosmogonic position. Is the entire universe really the result of an accidental explosion of nothing? Is the design and irreducible complexity of all living systems really the result of random chance? Where is the so-called "evolutionary mechanism"? 21st century "science" has declared that anything sounding "supernatural" is entirely off limits. Yet, by common sense definition, "science" based on the Big Bang and IUTs must suspend and/or violate established natural laws. In effect, atheistic science must use "supernatural" means to justify its atheistic presupposition.

Prior to the last 150 years, and the recent campaign to exclude God in the scientific fields, scientists as a general rule believed in God. As a matter of fact, the founders of a majority of the scientific disciplines were Theists. These men took pride in the idea that they were "thinking God's thoughts after Him." Please consider these final thoughts... If everything is an accident, there's no reason to figure anything out. If everything is futile, purpose is an imaginary concept. But if everything was created, and if everything has a purpose, shouldn't it be the underlying goal of all mankind to discover that Creator and find that purpose? And so we endeavour to discover our Creator and fulfil our purpose, while using science as merely one of our tools.

Q4. In your group, identify the main arguments put forward in this creationist article against the scientific explanations of the origin of the universe?

Q5. In your group, identify the main strengths of these creationist arguments?

Q6. In your group, identify the main weaknesses of these creationist arguments?

Q7. As a group, examine your previous answers, on balance what is your current thinking about the origins of the universe?