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BACK TO THE BEGINNING

SCIENTIFIC DISCOVERIES REVIVE THE ANCIENT BELIEF IN A BEGINNING TO THE UNIVERSE

IF WE COULD REWIND THE HISTORY OF THE UNIVERSE, WHAT WOULD WE DISCOVER ABOUT ITS ORIGIN AND DEVELOPMENT? DID IT REALLY HAVE A BEGINNING, OR WAS IT ALWAYS THERE?

The influential ancient philosopher Aristotle stated, "It is impossible that movement should ever come into being or cease to be, for it must always have existed. Nor can time come into being or cease to be."

Meanwhile, the biblical book of Genesis famously starts off, "In the beginning God created the heaven and the earth."

Which is it? Is the universe eternal—has it always been here? Or did it have a start at some point in time—did it have a birthday, so to speak? These are the two schools of thought that have enrolled followers since early times. (Actually, there was also a third school that postulated that the universe existed on the back of a giant sea turtle, but they're mostly gone now.)

The seesaw of opinion has tipped one way or the other over time. But lately the weight of evidence has all been coming down on the side of the birthday universe.

In the old days when the Christian church dominated Western society, the creation of the universe was taken for granted. But slowly the scientific viewpoint pushed aside creation as well as the Creator. Now many scientists are thinking that the idea of a creation may not have been so far off from the truth as they thought (though they are now quite certain that the moon isn't made of cheese). It's looking like the universe had a beginning at a point in time after all.

Remarkably, one of the first scientists to swing the pendulum of opinion back to the birthday-universe position was so entrenched in eternal-universe thinking that at first he refused to believe his own conclusions.

A GREAT BRAIN'S BIGGEST BLUNDER

When Albert Einstein developed his revolutionary theory of general relativity in 1916, his mathematical calculations pointed to an extraordinary conclusion—the universe was expanding. And since if you rewind the tape on any expansion, you get back to a point where it started, that meant the universe must have had a beginning too.[1]

Einstein, however, was like most scientists of his day in that he believed in an eternal universe. And not being particularly fond of the implications of his own theory, he did what any red-blooded super-genius would do: he fudged the numbers. He altered his equation in order to nullify the conclusion that the universe was expanding.

University of California astrophysicist George Smoot explains that Einstein's main problem with an expanding universe was its implication of a beginning, an ultimate barrier to scientific investigation.[2] However, once experimental data proved that the universe really was expanding, Einstein admitted his error, calling it "the biggest blunder of my life."[3]

There's a point worth considering here: if it could happen to Einstein, it could happen to anyone. Rarely is anyone completely objective when it comes to the issue of a Creator. While it is true that religious belief and philosophy became an obstacle for scientific inquiry in the days of Galileo, trends have changed. In the modern era it has at times been a prejudice against the possibility of an intelligent Designer for the universe that has kept many scientists from honest and open inquiry.

Thankfully, the truth generally comes out in the end and skeptics are convinced.

For Einstein and others, it was something called red shift that started the parade of evidence for a universe with a beginning.

RED SHIFTING THE BIG BANG THEORY INTO HIGH GEAR

In the late 1920s, the American astronomer Edwin Hubble noticed something unusual as he gazed into the heavens. It wasn't a new planet or little green men waving at him from Mars; it was something both more tedious and at the same time more thrilling.

Hubble had been spending countless nights at the Mount Wilson Observatory, studying the stars and galaxies and especially the spectrum of color in the light they sent our way. He discovered that the light from most other galaxies was shifted to the red end of the spectrum, which indicated they were moving away from us. Furthermore, the farther a galaxy was away from us, the more red shifted its light was and the faster it was moving away from us.

The only explanation for all of this was that space itself was expanding, causing all galaxies to move away from each other. In an expanding universe, from any point in space (including our own), it would appear that most stars and galaxies were racing away. And the farther away they were, the faster they would be racing.

There it was in the red shift: proof that Einstein had been right in the first place (before he fudged his formula) and that the universe really was expanding. Proof, in other words, that the universe was not eternal but had a beginning.[4]

And yet not everyone accepted the proof at first, including a scientist named Sir Fred Hoyle (former Plumian professor of astronomy at Cambridge University and founder of the Institute of Astronomy at Cambridge). Ironically, it was Hoyle who originally described the event as a "big bang," meaning to mock the idea. The name stuck. (According to physics professor Brian Greene, the term "big bang" is actually misleading since there was nothing to explode and no space in which an explosion could take place.)[5] But unlike Hoyle, many other scientists began coming over to the side of the newly named theory.

The world's leading astrophysicist, Stephen Hawking, who has held the esteemed position of Lucasian Professor of Mathematics at Cambridge, calls Hubble's discovery of an expanding universe "one of the great intellectual revolutions of the twentieth century."[6] The discovery that the universe had a beginning has led to a new science called cosmology, which attempts to understand what happened at the origin of the universe, how it works, and what will happen in its future.

Another line of evidence in the new field of cosmology comes under a name that doesn't help at all in explaining how important and comprehensive it really is.

A SECOND LAW OF FIRST IMPORTANCE

In addition to Hubble's discovery, the second law of thermodynamics also predicts a beginning to the universe. You say you don't know what the second law of thermodynamics is? I beg to differ.

Let's say you come into a room containing me and a bunch of your other pals, and you find a steaming cup of Starbucks coffee on the table. Being the thoughtful individual that you are, you ask, "Does this belong to anyone?"

To which I reply, "It's been there for the last month."

Well, you'd know immediately I was wrong or lying (probably lying). Why? Because the coffee wouldn't still be hot if it had been there for a month; it would be room temperature.

That's the second law of thermodynamics in action. This law states that everything continually moves from a state of order to disorder and that heat and energy dissipate over time. This is a law that has been verified by proof after scientific proof and has never been shown to be wrong.

Now let's apply this law to the universe, just as cosmologists have. If the universe were eternal, it would have gone cold and lifeless long ago. The stars would have burned out. Planets would have broken up into clouds of dust. And even the black

holes would have ceased vacuuming the universe of unsightly stars and planets.

When you see flaming suns and scorching meteors, in other words, you're looking at a steaming cup of coffee that over infinite time would have long since gone room temperature. Since the universe is still full of pockets of heat and energy, it cannot be eternal.

Who would have thought heat would be such a helpful clue? But wait! There is still another way that heat effects help to prove that the universe is expanding.

THE SIGNIFICANCE OF TV INTERFERENCE

In the spring of 1964, two researchers at Bell Labs observed a persistent hiss while testing their microwave radiation detector. Regardless of which direction they pointed the antenna, the static was the same. (This is the same static as TV interference. The same static that was supposed to be gone when I paid $150 to have my satellite dish installed.) Those men, Arno Penzias and Robert Wilson, had discovered what scientists say is the echo from the birth of the universe.[7]

But how could scientists know for sure that the hiss they were hearing was actually an echo from the beginning of the universe? Mathematicians calculated that heat generated at the moment the universe began would have been enormous beyond comprehension. This heat would have gradually dissipated over the life of the cosmos, leaving only a tiny residual of about 3 degrees Kelvin (–270 degrees C).

Additionally, in order for galaxies to have formed, the pattern formed by the explosion needed to have slight variations in the form of waves or ripples.

According to George Smoot, these ripples would result in very slight fluctuations in the predicted temperature and would reveal an identifiable pattern.[8] Thus, if the temperatures matched up, the birth of the universe would be scientifically verified. Merely discovering the temperature to be 3 degrees Kelvin would not prove that the universe actually had a beginning; the fluctuations also needed to match.[9]

Three decades later, that match would be made.

THE GREATEST DISCOVERY OF ALL TIME?

In 1992, a team of astrophysicists led by Smoot launched the COBE satellite in order to verify the temperatures in space. The satellite would be able to take precise measurements and determine whether fluctuations in temperature existed.

The results stunned the scientific world. Not only was the three-degree temperature confirmed, but more importantly, the profiles of the fluctuations were discovered to be a match with what had been expected.[10]

Hawking called the discovery "the scientific discovery of the century, if not all time." Smoot himself excitedly stated to newspaper reporters, "What we have found is evidence for the birth of the universe."[11] He also said, "If you're religious, it's like looking at God."[12]

THE EVIDENCE HAD BEGUN TO ADD UP, AND SOME SCIENTISTS WEREN'T LIKING THE SUM.

Astounded by the news, Ted Koppel began his ABC *Nightline* television program with an astronomer quoting the first two verses of the Bible. The other special guest, a physicist, immediately added his quote of the third Bible verse: "In the beginning God created the heavens and the earth. … And God said, 'Let there be light,' and there was light" (Genesis 1:1, 3).[13]

Evidence like that provided by the COBE satellite virtually makes other confirmations of the big bang superfluous. (Ho-hum, the universe had a beginning.) But it raises some rather intriguing questions.

THE QUESTIONS THAT FOLLOW THE EVIDENCE

Einstein's theorems based on his theory of relativity predict that the universe could not have begun without an outside force or Beginner.[14] Since Einstein's theory of relativity ranks as the most exhaustively tested and best proven principle in physics, his conclusion is deemed correct.[15]

Tests from an array of radio telescopes at the South Pole have confirmed the big bang to a still higher degree of accuracy than ever before.[16] Background radiation measurements exceed 99.9% of what had been predicted.[17] There are now more than 30 independent confirmations that the universe had a one-time origin.[18]

New telescopes such as the infrared Spitzer Space Telescope, launched in 2003, have opened up even bigger windows to our universe. They have prompted astronomer Giovanni Fazio, from the Harvard-Smithsonian Center for Astrophysics, to remark, "We are now able for the first time to lift the cosmic veil that has blocked our view."[19]

As a result of the accumulating evidence, the scientific community has long since begun asking questions about origins, such as the following:

- What was there before the big bang?
- Why did the big bang result in a universe enabling life to exist?
- How could everything originate from nothing?

Smoot ponders what was there before the beginning: "Go back further still, beyond the moment of creation—what then? What was there before the big bang? What was there before time began?"[20]

The same astrophysicist notes that "until the late 1910's … those who didn't take Genesis literally had no reason to believe there had been a beginning."[21] The Genesis account of creation and the big bang theory both speak of everything coming from nothing. Suddenly the Bible and science agree (a discovery somewhat embarrassing to naturalists). Smoot admits, "There is no doubt that a parallel exists between the big bang as an event and the Christian notion of creation from nothing."[22]

The evidence had begun to add up, and some scientists weren't liking the sum.

TRYING TO AVOID THE BAD DREAM

A beginning to the universe brought scientists face to face with the question of a primary cause. That argument is a simple logical syllogism:

1. Everything that has a beginning had a cause.
2. The universe had a beginning.
3. Therefore, the universe had a cause.

But admitting a cause leads to the next logical question: who or what is the cause?

Think about it for a minute. What existed before the beginning? Well, since time, space, matter, and motion are all a part of the created universe, whatever existed before the beginning existed in a timeless, spaceless, motionless state.

So the question then becomes, what can happen spontaneously from this state of affairs? There's nothing moving, there's nothing colliding, there's … well, nothing. Not even the potential for anything to happen.

You see where this is all leading, don't you? Something outside of space and time, something very powerful and with apparent volition, must have acted to bring about the beginning. That is, there must have been an intelligent Designer of the universe. Some might go ahead and use the name God for this Creator.

Well, in certain academic circles, this line of reasoning simply won't do. And since a primary cause is beyond the limits of science, naturalists have looked for a way to prove that the universe didn't have a beginning. Smoot remarks, "Cosmologists have long struggled to avoid this bad dream by seeking explanations of the universe that avoid the necessity of a beginning."[23]

Sir Fred Hoyle (he who mockingly coined the term "big bang") was one scientist who strongly opposed the concept of a beginning for the universe. Along with Hermann Bondi and Thomas Gold, Hoyle offered the steady state theory in 1948. This was an attempt to show that the universe is eternal after all, even though the evidence had long been trending against such a view. The steady state theory collapsed from its own internal weakness.

Next came the oscillating-universe theory. According to this concept, the universe explodes, contracts, and explodes again, eternally yo-yoing. This would be another way to permit a belief in the eternal existence of the universe. But the physics for this theory didn't work. (Suddenly the universe-on-the-back-of-a-sea-turtle hypothesis was looking mighty attractive.)

More recently, some scientists, including Hawking, have begun considering the so-called multiverse theory. This theory accepts that our universe is finite, but it suggests that ours is just one of many universes. The whole mega-universe may be eternal, according to this theory, even though our particular universe is not. This theory is covered in more depth in another article in this magazine, but the key point to get about it right now is that it has no evidence whatsoever to support it.

These theories fit neatly with the philosophy of naturalism, whereas a beginning of the universe would raise the obvious question, who was there to start it? Professor Dennis Sciama, Hawking's supervisor while he was at Cambridge, admits his reasons for supporting the steady state theory: "I was a supporter of the steady state theory, not in the sense that I believed that it had to be true, but in that I found it so attractive I wanted it to be true."[24]

An origin of the universe meant naturalists were suddenly faced with the questions that threatened their world of confidence and predictability.

A ONE TIME BEGINNING

Hoyle and other scientists fervently pursued alternative explanations to a one-time origin of the universe. Eventually, however, the evidence showed clearly that the universe had a beginning, and the big bang theory was proclaimed victorious. Ironically, it was evidence from Hoyle's own research that helped confirm that the universe had a one-time beginning.

Today most cosmologists and physicists accept the big bang theory as the scientific explanation of how our universe began. In fact, scientists believe they can trace the history of the universe all the way back to

10^{-43} of a second. At that point all of the laws of nature break down and science can see no further back. The very beginning of the universe remains a mystery.

Imagine rewinding the universe back to its beginning, a time when there were no stars. No light, matter, or energy. Not even space or time. Suddenly an enormous explosion erupted from this nothingness at a temperature exceeding a million trillion trillion degrees.[25] Immediately time began. Then matter, energy, and space began taking form.

When a bomb ejects shrapnel into the air, both the bomb material and the space it blows into have already been there. However, in the beginning of the universe, neither space nor matter existed until the explosion. The space surface of the universe and the newly created matter expanded from an infinitely compressed point of nothingness.

According to the big bang theory, this explosion launched the entire universe, from the most distant galaxy, to the most colorful nebula, to quasars flashing like beacons, to our own comforting sun and nearby planets, to you and me with our questions about where we came from and what it all means. Since man alone thinks about the meaning and purpose of life, the beginning—and the cause of that beginning—must be fascinating to each one of us.

The verdict is in on the question of whether the universe is eternal or had a beginning. The idea that everything in the cosmos originated from nothing seems mythical, yet it is now mainstream science.

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