Before the "Big Bang"

By Rex Morgan

As I look up at the night sky from my home in Auckland, I am often moved to gasp with awe at the magnificence of the star-studded expanse stretched out above me. When I have the chance to view it from the remoteness of the countryside, the sight is even more awesome.

But of course the stars we can see with the naked eye only represent an infinitesimally tiny fraction of what is actually there. All we can see are some of the closest stars of our own galaxy, the Milky Way. Beyond this are literally billions of other galaxies! Immense words like "billions" trip easily off the tongues of astronomers involved in the study of the vastness of outer space. Measurements describing the sizes, temperatures, and distances between heavenly bodies, including such phenomena as comets, nebulae, quasars, and black holes, involving figures that boggle the mind.

The distances are so great that it would be ridiculous for astronomers to measure them in kilometres. Rather, they speak in terms of light years, referring to the distance light can travel in a year, around 9.5 trillion kilometres. Using this enormous unit of measurement, our Milky Way is a spiral galaxy about 100,000 light years in diameter, containing an estimated 200 billion stars and 100 billion planets. The sun takes 240 million years to make one orbit around the centre of the Milky Way. Figures of this magnitude are difficult for the average person to come to grips with, yet we are only talking about our galaxy, one amongst billions of others!

Photos taken from the Hubble Space Telescope indicate there are more than 100 billion galaxies. To give some idea of the meaning of numbers like these, if you were to count galaxies at the rate of one per second, you would take over 300 years to reach 100 billion. What a massive and magnificent universe we live in!

The origin of the universe

Have you ever wondered where all of this came from?

In the centre of the image is the immense galaxy cluster Abell S1063, located four billion light-years away, and surrounded by magnified images of galaxies much farther. Already, an infant galaxy has been found in the field, as it looked 1 billion years after the Big Bang.

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Astronomers and cosmologists have grappled with this question for centuries. Prior to the 1980s, the prevailing view was that the universe had always existed, in a stable so-called "steady state". However the equations of Albert Einstein's theory of relativity in the early 1900s implied that it wasn't constant, but was either expanding or contracting. In 1927 Georges Lemaître proposed that the universe was expanding. This was proved to be true just two years later, when Edwin Hubble discovered that the universe is continuously expanding in every direction, and that the further away a galaxy is, the faster it moves away from us.

This means the galaxies were closer together in the past—in fact they all started from the same place. This led scientists to conclude that the universe began as an explosion of space and matter, starting from an enormously dense and hot state when all the matter and energy in the universe was concentrated in a tiny space, known as a "singularity". This explosion, known as the "Big Bang", occurred about 13.8 billion years ago, according to data obtained in 2003 by the NASA satellite WMAP. The vast majority of scientists agree with the Big Bang model, and the picture is constantly being updated and fine-tuned as more research is done.

For instance, early Big Bang theorists predicted the existence of cosmic background radiation, the glow left over from the explosion. This radiation was actually discovered in 1964, providing powerful confirmation of the theory.

In 1992 the Cosmic Background Explorer (COBE) satellite made global headlines when it observed tiny ripples in the cosmic radiation, capable of giving rise to the clumps of hot matter that formed into galaxies. George Smoot, COBE project leader, referred to these fluctuations as "the fingerprints from the Maker" and stated: "What we found is evidence for the birth of the universe".[1] Renowned scientist Stephen Hawking declared this to be the "discovery of the century, if not all time".[2]

In June 1995 scientists detected primordial helium in the far reaches of the universe, consistent with an important aspect of the Big Bang theory that a mixture of hydrogen and helium was created at the beginning of the universe.

On 11 February 2016 the LIGO[3] research team for the first time ever observed gravitational waves, something predicted by Einstein in 1915. This provides further proof of Einstein's theory of general relativity, the basis of the Big Bang model.

Professor Paul Dirac, a leading physicist and Nobel laureate who is also an avowed atheist, has gone so far as to state: "It is certain that the universe began at a definite time through an act of creation."[4]

Can something come from nothing?

Supposing scientists are right, and the universe began with a huge explosion, this begs the question: "What caused the Big Bang?"

Robert Jastrow, founding director of NASA's Goddard Institute for Space Studies, says in his book *God and the Astronomers:*

> Consider the enormity of the problem. Science has proven that the universe exploded into being at a certain moment. It asks: "What cause produced this effect? Who or what put the matter and energy into the universe? Was the universe created out of nothing, or was it gathered together out of pre-existing materials?" And science cannot answer these questions…[5]

Cosmologists' observations cannot reach back to the time before the Big Bang. But the question must be asked: Where did the matter and energy released in the Big Bang come from? If there was nothing in existence before the Big Bang, how could something have come from nothing?

Imagine a world in which there is nothing—absolutely nothing at all in existence anywhere. Now ask yourself: Is it possible for anything to come out of nothing? Such an occurrence would defy the universal law of cause and effect. If things were able to appear from nothing, we would always be subject to surprises! Clearly, if there was a time when there was nothing, there would still be nothing!

Since it is impossible for something to come from nothing, there are just two alternatives: either the universe has always existed, or it was produced by a separate agent that was already in existence.

The first of these alternatives is ruled out by the Big Bang model, as well as by other evidence. For instance, the second law of thermodynamics, one of the most fundamental laws of physics, states that order always gives way to disorder over time: cars wear out, buildings fall down, people grow old, and so on. There must have been a beginning or the universe would be in a state of complete disorder by now, according to Stephen Hawking.[6]

A further factor showing the universe had to have a beginning was the discovery in 1898 of the radioactive decay of certain elements. This means that these elements could not be infinitely old, or they would have already turned to lead. There must have been a time when radioactive materials came into existence.

Since the universe hasn't always existed, we are left with the second alternative, that it must have been generated by a separate agent that was already in existence.

Here is where the Christian Bible offers some telling input, with its simple and authoritative opening words: "In the beginning God created the heavens and the earth".[7] And in view of this theory that the world began with a flash of energy and light, it is fascinating that God's first recorded words are "Let there be light".[8]

A "fine-tuned" universe

In recent years scientists have been discovering that the universe bears many marks of being fine-tuned so that life as we know it can exist.

The earth is located just the right distance from the sun to enable life as we know it.

For example, it so happens that the earth is located just the right distance from the sun. If it were only fractionally, say around 2%, further away, we would all freeze. If it were as little as 2% closer, we would all burn up.[9]

It so happens also that the earth moves at just the right speed. If it moved just a little faster in its orbit around the sun, the centrifugal force would hurl us away to our destruction like a stone from a slingshot. If it travelled only slightly more slowly, the sun's massive gravity would draw our planet closer, causing the extinction of all life.

The size of the earth is just right, too. Its corresponding gravity enables a thin layer of gases, mostly nitrogen and oxygen, to form our atmosphere—just the right mixture of gases to sustain life. If our planet were only a little larger, hydrogen would be unable to escape the atmosphere, making it inhospitable to life. If the earth was a little smaller, oxygen would escape and water would evaporate.

Looking at the universe as a whole, a number of fundamental forces, or laws of nature, make it what it is. One is the force of gravity, which happens to be at just the right strength. If it were stronger, the stars would be so hot they would burn out, but if it were weaker, they wouldn't become hot enough to ignite nuclear fusion, and no planets would have been formed.

Another mark of our finely tuned universe is the strong nuclear force, which binds protons and neutrons within the nuclei of atoms. If it were any more than about 1% weaker, protons and neutrons wouldn't stick together, resulting in the existence of only one element in the universe, hydrogen, and life would be impossible. But if the strong nuclear force were slightly stronger, there would be no hydrogen, and therefore no life.

Whether we look up into the outer space of the world above us, or down into the inner space of the world around us, we are moved to marvel at what a massive and magnificent universe we live in!

There are many other such characteristics that are just right for life to be possible. One is the ratio of the gravitational force constant to the electromagnetic force constant. This cannot differ from its value by any more than one part in 10^{40} (one part in ten thousand trillion trillion trillion) without eliminating the possibility for life.[10]

Concepts like these are difficult for the average layman to follow and understand, so let's note what the expert scientists have to say about them.

Physicist Dr Robin Collins says:

> Over the past 30 years or so, scientists have discovered that just about everything about the basic structure of the universe is balanced on a razor's edge for life to exist. The coincidences are far too fantastic to attribute this to mere chance or to claim that it needs no explanation. The dials are set too precisely to have been a random accident.[11]

Commenting on the multiple forces and parameters of the universe that are "just right", Stephen Hawking observed:

> The remarkable fact is that the values of these numbers seem to have been very finely adjusted to make possible the development of life.[12]

Hawking also said:

> The odds against a universe like ours emerging out of something like the Big Bang are enormous…I think clearly there are religious implications whenever you start to discuss the origins of the universe.[13]

He quantified the odds with this astonishing statement in his bestseller *A Brief History of Time:*

> If the rate of expansion one second after the Big Bang had been smaller by even one part in a hundred thousand million million, the Universe would have re-collapsed before it ever reached its present state.[14]

Although he states that he remains firmly an atheist, Hawking is reported as conceding in March 2015 that a "God-like force" played a role in the creation of the universe.[15]

Even the renowned atheist Fred Hoyle famously stated:

> A common sense interpretation of the facts suggests that a super intellect has monkeyed with physics, as well as chemistry and biology, and that there are no blind forces worth speaking about in nature. The numbers one calculates from the facts seem to me so overwhelming as to put this conclusion almost beyond question.[16]

Celebrated British cosmologist Martin Rees, who has been Astronomer Royal since 1995, wrote that if the six numbers that underlie the fundamental physical properties of the universe were altered "even to the tiniest degree, there would be no stars, no complex elements, no life".[17]

Astrophysicist Dr Hugh Ross has catalogued 38 cosmic characteristics that must have values falling within narrowly defined ranges for life of any kind to exist.[18] Noted physicist Paul Davies remarked:

> It seems as though somebody has fine-tuned nature's numbers to make the universe… The impression of design is overwhelming.[19]

When we replace the telescope with a microscope and look into the inner world, the same breathtaking complexity again astounds us. For instance, one molecule of human DNA, far too tiny to be seen by the naked eye, comprises an intricate spiralling ladder with about 100 million twists, and about 100 billion atoms. The human eye looking into the microscope contains 40 different mechanisms, such as a lens, a pupil, and a retina, and is made up of 130 million cells. And is there anything more marvellous than the human brain, which processes more than a million messages every second?

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Did this mind-boggling display of awesome intricacy so perfectly tailored for life on earth all begin with a haphazard, arbitrary explosion that subsequently developed brilliantly into the remarkably precise mosaic of marvels we see all around us? Could all of this creation, crowned by the supreme masterpiece of the conscious human being, really have developed by sheer accident, by blind chance, from absolutely nothing? Doesn't that call for even more faith than is required to believe in God?

One theory advanced by biblical sceptics to account for the fine-tuning of the universe is the multiverse hypothesis. This proposes that there is a multiplicity of universes, and in that case it is no surprise that the right conditions for life would exist, because with an infinite number of universes this is bound to happen in at least one of them. But there is absolutely no evidence that there is another physical universe. And even if there were a multiverse, the question would still remain: where did it come from?

We saw earlier that the evidence points to the universe being generated by a separate agent already in existence, and we noted that the Bible offers input in this area.

A number of Biblical writers speak of the origin of the universe. For instance, the book of Psalms says: "The heavens declare the glory of God; the skies proclaim the work of his hands".[20]

Written perhaps 3,500 years ago, the book of Job describes the greatness of God:

> He alone stretches out the heavens and treads on the waves of the sea. He is the Maker of the Bear and Orion, the Pleiades and the constellations of the south.[21]

The ancient prophet Jeremiah described it this way:

> He made the earth by his power; he founded the world by his

> wisdom and stretched out the heavens by his understanding.[22]

Another prophet, Isaiah, stated: "He stretches out the heavens like a canopy, and spreads them out like a tent to live in".[23]

The passages above, along with many others[24] refer to God "stretching out" the heavens like a curtain or a tent. How remarkably similar to the image cited by today's cosmologists, who describe the expansion of the universe by inflation after the Big Bang as being like the expansion that occurs as a rubber band or a balloon stretches out.[25]

Where did God come from?

In response to these assertions, the question has been asked: But where did God come from? It's a fair question, and should be carefully considered.

The Bible answers that God is eternal, declaring that he was in existence "before the beginning of time".[26]

It's hard for us to comprehend something that is eternal, because we live in a material, physical world, and we naturally think of everything as being physical. Because of their temporary nature, all physical things have a beginning and an ending, and they all deteriorate over time. The Big Bang model shows that the entire universe falls into this category.

But according to the Bible, there is also a spiritual dimension which God inhabits. The Bible states that "God is spirit",[27] that he "inhabits eternity",[28] and is "invisible, immortal and eternal",[29] "having no beginning or ending".[30] This is because God lives outside the constraints of time and space, in a different level of existence, the spirit realm. When he created the universe, and the material world sprang into existence, time and space began.[31]

We know that if there was a time when there was nothing, there would still be nothing. But there is something! Things do exist. Therefore something always had to be in existence. That ever-existing or self-existent agent is God. And that is precisely what he reveals himself to be in the Bible, giving his name as simply "I Am",[32] or the self-existent one.

Christians cannot absolutely prove to unbelievers that God exists. The Bible itself says that this is something they must accept by faith.[33] But they do have a wealth of reasonable evidence on which to base that faith.

Only things that have a beginning need to be created. The universe had a beginning, and scientists have tracked that down to the Big Bang. So the universe had to be created, but God didn't, because he has always been there, living in the spirit realm, outside the confines of space and time.

Science is unable to probe back beyond the beginning of time at the Big Bang, but the Bible boldly declares that the eternal God was there before the Big Bang!

Notes

1 Fred Heeren, *Show Me God: What the Message from Space Is Telling Us about God,* Day Star Publications, 2000, p.177.

2 Nigel Hawkes, "Hunt on for Dark Secret of Universe", *London Times,* 25 April 1992, p.1.

3 LIGO stands for the Laser Interfero-meter Gravitational-Wave Observatory.

4 Quoted by Professor Nathan Aviezer of Bar-Ilan University in his book, *In the Beginning.*

5 Robert Jastrow, God and the Astronomers, W.W. Norton, 1978, pp.113-114.

6 Quoted from a lecture by Stephen W. Hawking, "The Beginning of Time".

7 Genesis 1:1.

8 Genesis 1:3.

9 John C. Lennox, *God's Undertaker,* Lion Hudson 2007, p.70

10 Robert H. Dicke, Dirac's Cosmology and Mach's Principle, *Nature* 192 (1961), pp.440–41. Also see John Polkinghorne and Nicholas Beale, *Questions of Truth,* WJK Press, 2009, pp.100–101.

11 Lee Strobel, *The Case for a Creator,* Zondervan, 2004, p.160.

12 Stephen W. Hawking, *A Brief History of Time,* Bantam Books, New York, 1988, p.125.

13 Stephen W. Hawking quoted in Fred Heeren, *op.cit.,* p.186.

14 Stephen W. Hawking, *A Brief History of Time,* Bantam Books, New York, 1988, p.134.

15 http://worldnewsdailyreport.com/stephen-hawkins-admits-intelligent-design-is-highly-probable/

16 Fred Hoyle, "The Universe: Past and Present Reflections", *Annual Review of Astronomy and Astrophysics* 20 (1982), p.16.

17 Brad Lemley, "Why Is There Life?", *Discover* (Nov 2002), and Martin Rees, "Just Six Numbers: The Deep Forces that Shape the Universe".

18 Hugh Ross, *The Creator and the Cosmos,* Navpress, 1993, p.111; and Hugh Ross, *Fine-Tuning for Life in the Universe,* Appendix C, "Lights in the Sky and Little Green Men" (Colorado Springs, NavPress, 2002).

19 Paul Davies, *The Cosmic Blueprint,* Simon and Schuster, New York, 1988, p.203.

20 Psalms 19:1.

21 Job 9:8-9.

22 Jeremiah 51:15.

23 Isaiah 40:22.

24 Psalms 104:1–2; Isaiah 42:5; 44:24; 45:12; 48:13; 51:13; Jeremiah 10:12; Zechariah 12:1.

25 "The Implications of Hubble's Law: An Expanding Universe", https://www.e-education.psu.edu/astro801/content/l10_p4.html

26 2 Timothy 1:9; Titus 1:2.

27 John 4:24.

28 Isaiah 57:15 (NKJV).

29 1 Timothy 1:17.

30 Hebrews 7:3.

31 Hebrews 11:3.

32 Exodus 3:14.

33 Hebrews 11:3.

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