

Where Did The Universe Come From?

New Scientific Evidence for the Existence of God

A Seminal Presentation by Astrophysicist Dr. Hugh Ross, given in South Barrington, Illinois, April 16, 1994

Editor's note: This lecture was selected not *in spite of* being more than 10 years old, but *because* it is more than 10 years old. Virtually every statement and inference given in this speech has been reinforced and further validated during the last decade by measurements from the COBE Satellite, the Hubble Telescope, and advances in physics and astronomy.

The hallmark of a truly reliable scientific theory is that it is **thoroughly testable, scientifically falsifiable, and makes accurate predictions**. Dr. Ross's origins model has stood the test of time for nearly two decades, literally receiving further validation on a monthly basis as physics and astronomy journals publish new papers. I believe you'll enjoy this ground-breaking information from Hugh Ross.

New Scientific Evidence for the Existence of God

"The Discovery of the Century" -Stephen Hawking

I want to take you back to almost two years ago, April 23, 1992. On that day, a discovery was announced that, in the words of the British physicist Steven Hawking, "...is the discovery of the century, if not of all time." This is remarkable because Steven Hawking has a reputation for understatement.

Michael Turner, from the University of Chicago, says the significance of this discovery cannot be overstated. They have found the Holy Grail of cosmology. As to how holy of a grail we're talking about, George Smoot, who led the team of 30 American astrophysicists who made the discovery said, "What we have found is evidence of the birth of the Universe. It's like looking at God."

Frederick Burnham, a science historian, said in response to this discovery, "The idea that God created the Universe is a more respectable hypothesis today than at any time in the last 100 years."

The reason I'm starting with these quotes is because anything that is being called 'The greatest discovery of the century' and anything that makes belief in God more credible than it's ever been before, is something that every Christian should be apprised of and equipped to share with his friends at home, in the neighborhood and at work.

The Day They Found 90% of the Universe

Now, what exactly was it that these astronomers discovered? They found 90% of the universe. Any day that you find 90% of the universe is a red-letter day. What they essentially found was a new kind of matter. For a couple of years, physicists have suspected that the universe must have a different kind of matter. Ordinary matter is the stuff that we're used to. Electrons, protons, neutrons, everything we see here on planet Earth is made up of ordinary matter. Ordinary matter is a property that strongly interacts with radiation, so it's rather easy for astronomers to detect the stuff.

But we found the problem, which was this: In 1990, the cosmic background explorer satellite proved that the universe is extremely entropic. In fact, the universe has a specific entropy measure of 1,000,000,000. Entropy measures the efficiency with which a system radiates heat and light, and the inefficiency in which it performs work.

The universe is by far the most entropic system in all existence. To give you a point of comparison, a burning candle has a specific entropy of two. A burning candle is something we realize is very efficient in making heat and light, and very inefficient in performing work. The universe is far more entropic than a candle, by many orders of magnitude.

But it led to a problem. If the universe has that high a degree of entropy and all matter strongly interacts with radiation, and the radiation left over from the creation event measures to be incredibly smooth, then the matter likewise should be that smoothly distributed. But it isn't. As you look at the galaxies and clusters of galaxies, rather than being smoothly distributed like the radiation from the creation event, it's clumpy. Astronomers wanted to know why. We have proof that the universe was created in a hot, big, bang due to the incredible entropy, but how do we explain the galaxies?

The discovery of exotic matter explains the clustering of the galaxies. Exotic matter does not strongly interact with radiation, and because it doesn't, it can clump independent of the radiation. Since it doesn't really matter in gravity whether the matter is exotic or ordinary, the laws of physics still apply. Two massive objects will attract one another under the law of gravity, and if one of those massive objects is made of ordinary matter and the other is made of exotic matter, they will still attract. Once exotic matter clumps, it can draw ordinary matter to it, and hence we can have the universe we see today. The radiation from the creation event is still very smoothly distributed, but the galaxies and clusters of galaxies are clumped.

April 23, 1992 was the first detection an astronomer made of this type of matter. Since that time, there have been seven other independent detections of this exotic matter. If you're interested, you can read all about it in my book, *The Creator and the Cosmos*, which was published a few months ago. In this back issue, we describe the set of discoveries that established the existence of exotic matter which led to the conclusions from the scientific community that we now have conclusive proof that the universe was indeed created, and that's why we say that we're looking at the face of God.

On April 24, 1992, I was on the radio with three other physicists to discuss this discovery. A couple of the gentlemen were from George Smoot's team, but the one that I was most curious about was Geoffrey Burbidge, who I had as a professor while I attended the University of Toronto, and who I knew to be an atheist.

Physicists Join "The First Church of Christ of the Big Bang"

I was wondering how Geoffrey was going to respond to the news of this discovery. The first words out of his mouth were a complaint, and they were that as a result of this discovery, his peers in physics and astronomy were rushing off to join the First Church of Christ of the Big Bang. What encouraged me about Jeffrey's statement was that even Jeffrey, as an atheist, recognized the equation, Big Bang = Jesus Christ. If you prove the Big Bang, you prove Jesus Christ. I want to briefly explain to you how that follows and I want to reveal something to you that leads to that.

Why Big Bang = Jesus Christ

It's something that's probably more beautiful than anything that you've ever seen living here in Illinois . Or for that matter California or where I grew up, British Columbia, which I think is the most beautiful place in the world. I want to show you something that far transcends the beauty of even the scenery that we see on this planet Earth. [Shows Einstein's singularity equation.] But, then what could possibly transcend the beauty of equations of physics? For those of you who are starting to break out into a cold sweat, this will be gone in less than a minute and I'll never show you another one again.

I thought that you might be curious of the equation that convinced Albert Einstein that God exists, that God created the universe. This equation falls under the theory of general relativity. For those of you who have a background in calculus, you'll recognize this term here as an expression for acceleration. What Einstein had done was to drive the equation for the acceleration of the entire universe. On the other side of the equation, you see four physical constants. I don't really have to explain them to you, except to point out that they all have positive values.

Four well-known physical constants with positive values, yet there's a minus sign in front. That immediately tells us that the entire universe experiences negative acceleration. The universe is decelerating. That was a tremendous challenge to the theology of his day because in the 200 years previous to Albert Einstein's theory of general relativity, academic scientific society was operating on the premise that the universe was static.

Belief in a Static Universe Led to Darwinian Evolution

That was really what fostered the birth of Darwinian evolution, the idea that the universe is static, infinitely old and infinitely large. Static, in that it maintained the conditions essential for elements to assemble themselves into living systems, as Emanuel Kant reasoned, long before Charles Darwin came up with a theory.

Emanuel Kant longed to come up with a theory of biological evolution but he didn't have the biological data to develop it. Nevertheless, he laid the philosophical foundation that if the universe is infinitely old and infinitely large and static, maintaining the ideal chemical situation for life chemistry to proceed, then one can posit that the dice of chance is thrown an infinite number of times and in an infinite variety of ways.

If you have infinite throws at the dice of chance, then any matter of complexity would be conceivable - even something as complicated as a German philosopher. But this equation challenged that very notion by saying that the universe is not static; it decelerates. Einstein was well aware that the term for pressure (P) in the universe is rather tiny compared to the term for mass density (represented by the Greek letter Rho). It's divided by a huge number - the velocity of light squared. You've got this extremely small number divided by a huge number. This means that for all intents and purposes, we can ignore that " $3P/C^2$ " relative to the density. We can drop that term out, and then we have something much simpler to solve.

Proof that the Universe is Not Static, but Expanding

It's still a non-linear differential equation, so it's not all that easy. But Einstein was able to perceive and demonstrate that, according to this equation, the universe not only decelerates, it positively expands. Hence, the Big Bang. How so? Normally, I demonstrate this for audiences by bringing a grenade, but they no longer let you take grenades on airplanes.

I only do that demonstration when I'm on TV or in California, so you're just going to have to pretend that I've got a grenade here in front of me. If I were to pull the pin from the grenade, you'd feel a few effects. One being that the pieces of the grenade would expand outward from the pin. That's positive expansion.

Those outwardly expanding pieces of the grenade would inevitably bump into obstacles into this room. When they collide with those obstacles, they slow down. That's deceleration. After a grenade has exploded, a physicist could make measurements of the positions and the velocities of the pieces of shrapnel, and through the equation $\text{Velocity} = \text{Distance}/\text{Time}$, he could calculate the moment that the pin was pulled on the grenade.

We can do the same thing with the galaxies in the universe. We can measure their positions and their velocities and calculate the moment that the "pin" was pulled on the entire universe. As Einstein pointed out, the significance is that the universe has this moment of pin pulling. It has a beginning. Through the principle of positive fact, if the universe has a beginning, it must have a beginner, hence the existence of God. To his dying day, Einstein held to his belief that as the result of the verification of his theory of General Relativity, God exists. (Good book on Einstein's extensive discussions of religion and theology: *Einstein and Religion: Physics and Theology* by Max Jammer -Ed) God created the universe and God is intelligent. Today, we don't deny that God is personal. Einstein died too soon.

If he had lived to the late 1980's, he'd have seen direct scientific proof for the personality of the creator. But he acknowledged as a result of the confirmations of his equations and his theory that God is transcendent. That God exists, he is intelligent, he is creative and he is responsible for the universe. But he didn't know the details of that transcendence. The details of that transcendence had to equate to a deeper solution of those equations of General Relativity. They are non-linear, which means they're hard to solve.

Stephen Hawking and Friends Solve The Equation

By 1970, three British astrophysicists had combined to produce a deeper solution of the equations of General Relativity. They culminated the paper, *The Singularities of Gravitational Collapse and Cosmology*, published in 1970. You should all go get it - its exciting reading. It closes with the Space-Time theorem of General Relativity, which states that if the universe is governed by the equations of General Relativity, not only are we faced with an ultimate origin, we are all of the matter in the universe, and all of the energy in the universe. But we're faced with a coincident ultimate origin for even the dimensions of length, width, height and time.

Even Time Itself Was Created

As Steven Hawking, one of the three authors, boasted many years thereafter, we proved that time was created. We proved that time has a beginning. But through his contacts with certain Christians like his wife Jane, who's an Anglican, as a friend of mine from Cal Tech, Don Page, who had daily Bible studies with Steven and Jane Hawking while he was doing research pointed out, if you prove that time has a beginning, that it was created, it eliminates all theological possibilities but Jesus Christ.

Of all world religions, only Judeo-Christian theology says Time has a beginning

Why? Because if you were to open up the Holy books of the religions of the world, only one of them would describe God as a being that creates the universe independent of time, space, matter and energy. The other Holy books describe God as creating within time. The Bible states that God creates independent of time. That's the difference.

Some verses that you might be familiar with: The first verse which states, "In the Beginning, God created the Heavens and the Earth..." The Hebrew words for heavens and Earth literally refer to the entire physical cosmos of matter, energy space and time. The universe.

Hebrews 11:3 makes it more specific stating, "The universe that we detect was made from that which we cannot detect." We can make detections within matter, energy, length, width, height and time, but not beyond.

Eight places in the Bible tell us that God created time. I'll give you two examples: 2 Timothy 1:9 which states, "The Grace of God that we now experience was put into effect before the beginning of time" and Titus 1:2 which states, "The hope that we have in Jesus Christ was given to us before the beginning of time."

The three things that the Apostle Paul was saying in those two verses were that time is beginning, that God created the time dimension of our universe and, most importantly, that God has the capacity to operate through cause and effect before the time dimension of our universe even exists. Your friendly neighborhood physicist will tell you that time is defined as that dimension or realm in which cause and effect phenomena take place. What the Apostle Paul is telling us in these two places and in the six other portions of Scripture, is that we are confined to a single dimension of time.

In fact it's worse than that. We're confined to half of a line of time. Time, for us, is a line that goes forward only. Have you ever noticed that you cannot stop or reverse the arrow of time? No matter what you do, it just keeps going forward in one direction. Any entity confined to half of the line of time, must have a beginning and must be created. I can walk home tonight, and that's it. It's the simplest, most rigorous proof of the existence of God.

We're confined, and the entire universe is confined to half of the line of time. Therefore, the universe must be created and we must be created. But God is not so confined. When I present this evidence to atheists, their most frequent response is the same one I got from both of my sons when they were three years of age. It's, "If God created us, then who created God?"

God: Not Confined by Time

My sons and the atheists are assuming that God is confined to time in the same way that we are. But the Bible and the equations of General Relativity tell us that the entity that brought the universe into existence is not confined in time like we are, or the way that the universe is.

God can move and operate in at least two dimensions of time. In two dimensions of time, time becomes a plane, like a sheet of paper, length and width. In a plane, you can have as many lines as you want and as many directions as you want.

It would be possible for God to dwell on a time line running through a sheet of paper that's infinitely long, and that never crosses or touches the timeline of our universe. As such, God would have no beginning, no end and he would not be created. Sound familiar?

Why the God of Modern Physics Matches the God of the Bible

Both John Chapter One and Colossians Chapter One make that claim about God; He has no beginning, no end and He is not created. The Bible is the only Holy book that makes that statement about God. What I've done for you in these few minutes is to establish the doctrine of the independent transcendence of the Creator. But we can go beyond this abstract, rigorous proof of the existence of the God of the Bible. It's Jesus Christ because we proved that the Creator must be an independent, transcendent being. What I've discovered, even on the University campus, is that audiences much prefer tangible proof for the existence of God, to the abstract proof of the existence of God. Today we have that, thanks to the efforts of astronomers in measuring the universe. Ours is the only generation of man that has ever lived to witness the measuring of the universe. This wasn't the case 15 years ago.

Measuring The Universe

Ours is a privileged generation because we have seen the measuring of the universe. The theological significance is that if you can measure the universe, you are measuring the creation. If you can measure the creation, you are measuring the Creator himself. Not all of his characteristics, of course, but many that are theologically significant.

What we've discovered in measuring the universe is that the third assumption of Emanuel Kant; that we have infinite time, the universe is static and that we have an infinite supply of building blocks for life isn't true. We proved that the universe isn't static, that time isn't infinite. It's finite. The age of the universe is only 1,000,000,000,000,000,000 seconds (10 to the 18th power). We also discovered that we do not have an infinite supply of building blocks. In fact, we discovered that it takes exquisite design to get any building blocks at all. Molecules, without which, life is impossible. Atoms must be able to assemble in the molecules in order to gain sufficient complexity for life chemistry to proceed. That applies to any conceivable kind of life.

The Extreme Precision of Physical Constants

Unless the force electromagnetism takes on a particular value, molecules won't happen. Take the nucleus of an atom. There's an electron orbiting that nucleus. If the force electromagnetism is too weak, the electron will not orbit the nucleus.

Electromagnetism

There won't be sufficient electromagnetic pull to keep that electron orbiting the nucleus. If electrons cannot orbit nuclei, then electrons cannot be shared so that nuclei can come together to form molecules. Without molecules, we have no life.

If the force electromagnetism is too strong, the nuclei will hang onto their electrons with such strength that the electrons will not be shared with adjoining nuclei and again, molecules will never form. Unless the force electromagnetism is fine-tuned to a particular value, the universe will have no molecules and no life.

Strong Nuclear Force

We also have a problem in getting the right atoms. Now take a neutron and a proton. Protons and neutrons are held together in the nucleus of an atom by the strong nuclear force, which is the strongest of the four forces of physics.

If the nuclear force is too strong, the protons and neutrons in the universe will find themselves stuck to other protons and neutrons, which means we have a universe devoid of Hydrogen. Hydrogen is the element composed of the bachelor proton. Without Hydrogen, there's no life chemistry. It's impossible to conceive of life chemistry without Hydrogen.

On the other hand, if we make the nuclear force slightly weaker, none of the protons and neutrons will stick together. All of the protons and neutrons will be bachelors, in which case the only element that would exist in the universe would be Hydrogen, and it's impossible to make life if all we've got is Hydrogen.

How sensitive must this strong nuclear force be designed for life to exist? It's so sensitive that if we were to make this force 3/10 of 1% stronger or 2% weaker, life would be impossible at any time in the universe.

Mass of the Proton and Neutron

We also have a problem with the protons and the neutrons themselves. The neutron is 0.138% more massive than the proton. Because of this, it takes a little more energy for the universe to make neutrons, as compared to protons. That's why in the universe of today we have seven times as many protons as neutrons.

If the neutron were 1/10th of 1% less massive than what we observe, then the universe would make so many neutrons that all of the matter in the universe would very quickly collapse into neutron stars and black holes, and life would be impossible.

If we made the neutron 1/10th of 1% more massive than what we observe, then the universe would make so few neutrons, that there wouldn't be enough neutrons to make Carbon, Oxygen, Nitrogen, Phosphorus, Potassium, etc. These are the elements that are essential for life. So, we must delicately balance that mass to within 1/10 th of 1%, or life is impossible.

Electrons

With electrons we see an even more sense of the balance. In order for life to exist in the universe, the force of gravity must be 10,000,000,000,000,000,000,000,000,000,000 (10 to the 40th power) times weaker than the force of electromagnetism. It's essential that the force of gravity be incredibly weak compared to the other three forces of physics.

Gravity

Yet planets, stars and galaxies will not form unless gravity is dominant in the universe, so the universe must be set up in such a way that the other forces of physics cancel out and leave gravity, the weakest of the forces, dominant.

It's necessary for the universe to be electrically neutral. The numbers of the positively charged particles must be equivalent to the numbers of negatively charged particles or else electromagnetism will dominate gravity, and stars, galaxies and planets will never form. If they don't form, then clearly life is impossible.

The numbers of electrons must equal the numbers of protons to better than one part of 10,000,000,000,000,000,000,000,000,000,000 (10 to the 37 th power). That number is so large that it's difficult for laymen to get a handle on it. So I compare that number with another very large number - the national debt.

The National Debt

The national debt stands at \$5,000,000,000,000. One way to visualize this is to imagine we cover one square mile of land with dime piles 17 inches high. We can pay off the entire national debt with a pile of dimes 17 inches high in one square mile.

That's truly a lot of dimes. Our national debt problem is serious. But to get 10,000,000,000,000,000,000,000,000,000,000, we would have to cover the entire North American continent with dimes, but 17 inches high won't do.

We'd have to cover the entire North American continent from here all the way to the moon. That's a 250,000-mile high pile of dimes covering 10,000,000 square miles, and you'd have to do that with a billion North American continents from here all the way to the moon. *That* is one chance in 10,000,000,000,000,000,000,000,000,000,000 (10 to the 37 th power).

To give you an idea, imagine that in those piles of billions of dimes, there's one dime colored red. If you were to randomly shuffle your way through those billions of dimes blindfolded, and you choose one dime, the odds that you would pick up that one red dime is one chance in 10,000,000,000,000,000,000,000,000,000,000.

God's Fine-Tuning vs. Man's Fine-Tuning

Another way of looking at this incredible fine-tuning of the universe in this one characteristic is to compare it with the very best that we humans have achieved. It's not built yet, but towards the end of this year, a machine will come online at Cal Tech. This machine will have the capacity to make measurements to within one part in 100,000,000,000,000,000,000 (10 to the 23rd power). The best machine man has ever designed.

But the very best machine that man has ever designed, with all of our money, technology and education, falls one hundred trillion times short of the level of fine-tuning that we see in just this one characteristic of the universe.

Purposefully, I didn't choose the best example. In my book, *The Creator and the Cosmos*, I describe two other characteristics of the universe that are much more fine-tuned than the balance of electrons to protons. Some of these characteristics reveal more than what I've described here. If the universe is fine-tuned in one part to the 10 to the 37th power, one part in 10 to the 40th power and one part in 10 to the 55th power on three different characteristics, then that tells us that God must be personal; that He's not only transcendent, he's personal!

God: 100 Trillion Trillion Times More Precise than Man

Why do we say this? Because only a person is capable of fine-tuning to the degree that we've observed, and that person must be orders of magnitude more intelligent and creative than we human beings. One hundred trillion times more intelligent and creative than we human beings, just based on that one characteristic. But he's also creative and loving.

Earth: An Insignificant Speck?

When I was a young man, questioning the holy books of the religions of the world, I knew God must exist because of the Big Bang. There's a beginning, there must be a beginner. But I doubted that God was personal and caring because I felt that planet Earth was just an insignificant speck in the eyes of a God that created a hundred trillion stars. What could we matter to such an awesome God?

Mass of the Universe

Astronomers have discovered that the total mass of the universe acts as a catalyst for nuclear fusion and the more massive the universe is, the more efficiently nuclear fusion operates in the cosmos. If the universe is too massive, the mass density too great, then very quickly all the matter in the universe is converted from Hydrogen into elements heavier than iron, which would render life impossible because the universe would be devoid of Carbon, Oxygen, Nitrogen, etc.

If the universe has too little mass, then fusion would work so inefficiently that all that the universe would ever produce would be Hydrogen, or Hydrogen plus a small amount of Helium. But there again, the Carbon and Oxygen we need for life would be missing. What does this tell me about the Creator? That God so loved the human race that he went to the expense of building one hundred billion stars and carefully shaped and crafted those hundred billion trillion stars for the entire age of the universe, so that for this brief moment in time, we could have a nice place to live.

It's the same logic that my five and eight year old sons use on me. They measure my love for them by how much money I spend on the gifts that I buy for them. We can use the same kind of logic to draw the conclusion that the God who created the universe must love we human beings very much, given how much he spent on our behalf.

We live in a Special Solar System, Too

We can extend this argument of design from the universe to the solar system itself. When we look at the solar system, we discover that we have a heavenly body problem. It's not that easy to get the right galaxy. Life can only happen on late born stars. If it's a first or second-generation star, then life is impossible because you don't yet have the heavy elements necessary for life chemistry. There's a narrow window of time in the history of the universe when life can happen.

If the universe is too old or too young, life is impossible. Only spiral galaxies produce stars late enough in their history that they can take advantage of the elements that are essential for life history, and only 6% of the galaxies in our universe are spiral galaxies. Of those 6%, you must go with galaxies that produce all of the elements that are essential for life. It's not that easy.

Besides Hydrogen and Helium, the other elements are made in the cores of super giant stars. Super giant stars burn up quickly; they're gone in a just a few million years. When they go through the final stages of burning up their fuel, they explode ashes into outer space, and future generations of stars will absorb those ashes.

Births & Deaths of Multiple Stars Required to have Metals in Earth's Crust

When *those* stars go through *their* burning phase, they will take that heavy element ash material. This time when they explode, they make a whole bunch of material, capable of forming rocky planets and supporting life chemistry.

But we want these supernovae exploding early in the history of the galaxy. We don't want them going off now. If the star Cereus goes Super Nova, we're in serious trouble because it's only eight light years away. It would exterminate life on our planet. We observe in our galaxy that there was a burst of Super Nova explosions early in its history, but it tapered off to where it isn't a threat to life that is now in existence. The Super Nova explosions took place in the right quantity and in the right locations so that life could happen here on Earth.

What does location have to do with it? Life is impossible in the center of our galaxy, or in the heel of our galaxy. It's only possible at a distance 2/3 from the center of our galaxy.

Mormon Astronomy - Accurate or not?

That's why I'm not a Mormon. Mormons tell us that life originated on a master planet right smack at the center of our galaxy. That's probably also why I've never met a Mormon astronomer. The stars at the center of our galaxy are jammed so tightly together that the mutual gravity would destroy the planetary orbits. Moreover, their synchrotron radiation would be destructive to life molecules. But we don't want to be too far away from the center, either. If we get too far away, then there aren't enough heavy elements from the exploded remains of supernovae to enable life chemistry to proceed.

There's one life essential element that the supernovae do not make, however, and that's Fluorine. Fluorine is made only on the surfaces of white dwarf binaries. A white dwarf is a burned out star. It's like a cinder in a fireplace, just glowing.

Orbiting this white dwarf is a star that hasn't yet exhausted its nuclear fuel. It's an ordinary star, like our Sun. The white dwarf has enough mass relative to the ordinary star orbiting around it that it is capable of pulling mass off of the surface of the ordinary star and dragging it down so that it falls on its surface. When that material falls on the surface of the white dwarf, it ignites some very interesting nuclear reactions that produce Fluorine.

We need a white dwarf binary whose gravitational interactions between the white dwarf and the ordinary star are such that a strong enough stellar wind is sent from the white dwarf to blast the Fluorine beyond the gravitational pull of both stars, putting it into outer space, so that future generations of stars can absorb it. Then we have enough Fluorine for life chemistry.

A Trillion Galaxies - but as far as physicists know, only ours can support life

Two American astrophysicists concluded about a year ago that rare indeed is the galaxy that has the right number of this special kind white dwarf binary pair in the right location, occurring at the right time, so that life can exist today. The universe contains a trillion galaxies. But ours may be the only one that has the necessary conditions for life to exist.

The right star is needed. We can't have a star any bigger than our Sun. The bigger the star, the more rapidly and erratically it burns its fuel. Our Sun is just small enough to keep a stable enough flame for a sufficient period of time to make life possible. If it were any bigger, we couldn't have life on planet Earth. If it were any smaller, we'd be in trouble, too.

Smaller stars are even more stable than our star, the Sun, but they don't burn as hot. In order to keep our planet at the right temperature necessary to sustain life, we'd have to bring the planet closer to the star.

Tidal Forces

The physicists in the audience realize that when you bring a planet closer to its star, the tidal interaction between the star and the planet goes up to the inverse fourth power to the distance separating them. For those of you who are not physicists, that means that all you have to do is bring that planet ever so much closer to the star, and the tidal forces could be strong enough to break the rotational period. That's what happened to Mercury and Venus. Those planets are too close to the Sun; so close that their rotational periods have been broken, from several hours to several months.

Earth is just barely far enough away to avoid that breaking. We have a rotation period of once every 24 hours. If we wait much longer, it will be every 26 or 28 hours, because the Earth's rotation rate is slowing down.

Going back in history, we can measure the time when the Earth was rotating every 20 hours. When the Earth was rotating once every 20 hours, human life was not possible. If it rotates once every 28 hours, human life will not be possible. It can only happen at 24 hours.

Speed of Earth's Rotation

If the planet rotates too quickly, you get too many tornadoes and hurricanes. If it rotates too slowly, it gets too cold at night and too hot during the day. We don't want it to be 170 degrees during the day, nor do we want it to be below -100 at night, because that's not ideal for life. We don't want lots of hurricanes and tornadoes, either. What we currently have is an ideal situation, and God plays this. He created us here at the ideal time.

We need the right Earth. If the Earth is too massive, it retains a bunch of gases such as Ammonia, Methane, Hydrogen and Helium in its atmosphere. These gases are not acceptable for life, at least, not for advanced life. But if it's not massive enough, it won't retain water. For life to exist on planet Earth, we need a huge amount of water, but we don't need a lot of ammonia and methane. Remember high school chemistry? Methane's molecular weight 16, ammonia's molecular weight 17, water's molecular weight is 18. God so designed planet Earth that we keep lots of the 18, but we don't keep any of the 16 or the 17. The incredible fine-tuning of the physical characteristics of Earth is necessary for that.

Jupiter Necessary, too

We even have to have the right Jupiter. We wrote about this in our *Facts and Faith* newsletter a few issues back, but it was also discovered by American astrophysicists just this past year. Unless you have a very massive planet like Jupiter, five times more distant from the star than the planet that has life, life will not exist on that planet.

It takes a super massive planet like Jupiter, located where it is, to act as a shield, guarding the Earth from cometic collisions. We don't want a comet colliding with Earth every week. Thanks to Jupiter, that doesn't happen.

What these astrophysicists discovered in their models of planetary formation was that it's a very rare star system indeed that produces a planet as massive as Jupiter, in the right location, to act as such a shield.

We Even Need the Right Moon

The Earth's moon system is that of a small planet being orbited by a huge, single moon. That huge, single moon has the effect of stabilizing the rotation axis of planet Earth to 23½ degrees. That's the ideal tilt for life on planet Earth.

The axis on planet Mars moves through a tilt from zero to 60 degrees and flips back and forth. If that were to happen on Earth, life would be impossible. Thanks to the Moon, it's held stable at 23 ½ degrees.

Just as with the universe, in the case of the solar system, we can attach numbers to these. In this case, I've chosen to be extremely conservative in my estimates. I would feel justified in sticking a few zeros between the decimal point and the one. I would feel justified in making this 20 percent, 10 percent, for example, and on down the line.

We Even Need the Right Number of Earthquakes

I've got so many characteristics here, and I let the Californians know that you have to have the right number of earthquakes. Not too many, not too few, or life is not possible. I share them with my wife, who doesn't like earthquakes, but I just tell her that when you feel a good jolt, that's when you have to thank God for his perfect providence.

At Least 41 Fine-Tuned Characteristics, to have One Planet that Supports Life

The bottom line to all of this is that we have 41 characteristics of the solar system that must be fine-tuned for life to exist. But even if the universe contains as many planets as it does stars, which is a gross overestimate in my opinion, that still leaves us with less than one chance in a billion trillion that you'd find even one planet in the entire universe with the capacity for supporting life. This tells us that we're wasting valuable taxpayer money looking for intelligent life elsewhere in the universe. Worse than that, we're wasting valuable telescope time. In the words of William Proxmyer, "It would be far wiser looking for intelligent life in Washington than looking for it in other galaxies."

Planet Earth: Not an Accident

It also tells us that God wasn't wandering throughout the vastness of the cosmos saying, "Wow, that's the best one, I'll use that". No. With odds this remote, we must realize that God especially designed and crafted, through miraculous means, planet Earth, so that it would support life and human beings. Planet Earth is not an accident; it is a product of divine design.

I would also say that's true of life on Earth. The fossil record testifies of life beginning on planet Earth 3.8 billion years ago. Over those 3.8 billion years, we have more and more species of greater and greater complexity and greater and greater diversity. But there's no fossil tree. We have no evidence for the horizontal branches.

Peculiarities in the Fossil Record

All we have is evidence that a certain species exists for a certain period of time without significant change, which then goes extinct to be replaced at a different time with a radically different species, with no connection from the previous species to the next one. What the textbooks don't mention is that there's been a reversal of this fossil tree; it's only true up until the creation of man. Since the creation of man, the whole thing reverses. As time proceeds, we have fewer and fewer species with less and less diversity and complexity, and it's the land mammals that are being impacted in the worst way.

There were 30,000 land mammals on planet Earth when God created Adam and Eve. There are only 15,000 remaining today. In just a few thousand years, 15,000 species of mammals have disappeared.

Admittedly, man has a lot to do with that.

As Paul and Ann Erlich pointed out in their book on extinctions, though, even if we were to get rid of every vestige of humanity and civilization on planet Earth, a minimum of one species would still become extinct every year. How many species do we see appearing?

No New Species

Paul and Ann Erlich say we have yet to document the appearance of a single animal species in the world of nature, and in the vast majority in the world of species, we cannot even detect any genetic movement. It's a virtual zero.

The Bible offers the perfect explanation for this. For six days (periods of time), God created. On the seventh day, he rested. For six days, he replaced the species that were going extinct with more complex and diverse species. For six days, he created through special, miraculous means, the evidence of which we clearly see in the fossil record.

But the Bible tells us that when He created Eve, He ceased from his work of creating new species of life. God is at rest. We're now in the seventh day, where God is resting from his work of creating. All we see today is the natural processes. The natural processes tell us that the planet is heading to a culmination in death.

When Will God Create Again?

Revelation 21 tells us that the very instant that God conquers the problem of evil in man, he will create again. There is an eighth day of creation coming. It's exciting to think about the fact that God may have many weeks of creation planned for the future. We're simply through the first week. Can you imagine what's going to happen in the second, third of fourth week, etc? It would be exciting news if we could be a part of that work with him.

Creation vs. Evolution?

Whenever I discuss this whole issue of creation evolution, everyone wants to talk about what we know the least about - the origin of man. You know the story. We begin with a primitive bipedal primate species, and wind up with an advanced character. The truth of the matter is that the evidence of the bipedal primates that God created before Adam and Eve fills only one coffin full of bones. We don't have a lot of evidence. It's not like the dinosaurs. In no case are any of those bi-pedaled primate finds more than 30% complete; that's the most complete fossil find that we have.

Fossil Record: Not a Fraud!

Some Christians like to claim that this is all fraudulent, but that's not true. There are bones. They can be seen in museums and they are definitely bipedal species. But they existed long ago. They are extinct, and there's no relationship between those

bipedal primates and human beings. The Bible tells us that God created only one species of life on planet Earth that is spiritual in nature: Adam and Eve, and their descendents. All other species of life are either body only, or body and soul, like the birds and the mammals. Only the human species is comprised of body, soul and spirit.

You can go to any secular anthropologist and ask him to provide you with the most ancient evidence for spirit expression. They will confess that the most ancient evidence dates back to only 8,000 to 24,000 years ago. In the form of a moral code or religious relics, the most ancient finds have been these primitive Venus Idol figurines from 10,000 years ago.

What's the Biblical date of the creation of Adam and Eve? The genealogies are useless for giving us the creation date of the universe or the Earth, but they are effective for giving us the creation date of Adam and Eve. It was the very last event on the sixth day of creation. I should say only slightly effective because there are gaps in the genealogy. The genealogies of Luke and Matthew contain names that are not in Genesis 5, but the best Hebrew scholars that I've spoken to say that it's about a factor of ten.

When Did Man Appear?

Six thousand to 60,000 years ago, God created Adam and Eve. That 6,000 to 60,000 encompasses the secular date of 8,000 to 24,000. Even at this most controversial level, we have so little data to work with that we see fundamental agreement between scientific evidence and the words of the Bible. I close with a quote from Revelation 3:8, "See I place before you an open door that no one can shut." In my book, *The Creator and the Cosmos*, I have a whole chapter filled with quotes from astronomers and physicists in response to this evidence.

Fine Tuning of the Universe: Proof Positive of the Existence of God

Let me read you one from the British cosmologist, Edward Harrison, who says, "Here is the cosmological proof of the existence of God. The design argument of William Paley updated and refurbished. The fine-tuning of the universe provides prima facie evidence for theistic design. Take your choice: blind chance that requires an infinite number of universes, or design that requires only one." Many scientists, when they admit their views, incline towards the theistic or the design argument, and for good reason. It's because the appeal to an infinite number of universes where ours by pure chance out of that infinite number takes on the conditions essential for life, is committing the gamblers fallacy.

To Assume it Happened By Chance = "The Gambler's Fallacy"

You're assuming the benefit of an infinite sample size, when you can only provide evidence for one. Let me give you an example. If I were to flip a coin 10,000 times and it were to come up heads 10,000 times in a row, you could conclude that the coin has been fixed with a purpose to come up heads. That's the rational bet.

But the irrational better would say that conceivably, two to the 10,000 coins could exist out there. And if those two to the 10,000 coins are like my coin, but all getting different results than I see here, then this coin could be fair.

It's the gamblers fallacy because you have no proof of the existence of those other coins or that they take on similar characteristics of the coin that you're flipping, and you have no evidence that those coins are producing different results.

The equations of General Relativity guarantee that we will never discover another universe. God may have created two, but we'll never know about it because the equations of General Relativity tell us that the Space-Time manifold of universe A will never overlap the space-time manifold of universe B.

Other Universes? No Way to Know

That means we will be forever ignorant about the possibility of other universes, because the sample size will always be one. Therefore, the appeal to infinite chances rather than to the God of the Bible is the gambler's fallacy.

Q&A from the Audience

Moderator: Okay, I know what you're thinking. Why didn't he tell us something that we don't already know? Right? Why do we keep doing all this mental cotton candy stuff, why don't we get to something deep?

Actually, I'm sure there are a lot of questions, so I'm going to make my way around with the mike, and I'll try to get around to the sides. We want to give you the chance to ask Dr. Ross some questions, and we'll do that for about 20 minutes.

If we have any spiritual seekers here, who have some questions, I'm especially interested in your perspective.

Why do we need earthquakes? Can you explain that a little more?

Hugh: Before I begin, let me just say that if you think of a question two hours from now, the ministry I work for, Reasons to Believe, maintains a daily hotline. You are welcome to call, two hours per day, to ask your questions. The number is (626)335-5282, 5:00pm to 7:00pm Pacific Time. You are also welcome to write, and we'll respond to your questions in writing. The service is available, free of charge, to anyone who'd like to take advantage of it. [Website is www.reasons.org-ed.] In response to your question about earthquakes, without earthquakes or plate tectonic activity, nutrients that are essential for life on land would erode off of the continents and accumulate in the oceans. After awhile, life would be impossible on land, though you'd still have life in the oceans.

Thanks to earthquake activity, that stuff in the oceans gets recycled into new continents. We see here on earth precisely the right number and intensity of earthquakes to maintain that recycling, but not to such a degree that it's impossible for us to live in cities. If it's any comfort to you, the risk of earthquake damage here in Chicago is greater than it is in Los Angeles. But that's only because we have stiffer building codes.

How do you account for the difference in time as described in Genesis for creation in a week, versus the vast span of time you describe since the Big Bang?

Hugh: You need to get a copy of my book *Creation and Time* that was just released a few days ago. In it, I point out that the idea that the days of creation in Genesis One are six consecutive 24-hour periods arose from the King James translation, not from church history or tradition.

Augustine & other Church Fathers: "Day" in Genesis is a long period of time

If you read the early fathers of the church, the vast majority of them adopted the view that these days of creation were long time periods, not 24-hour periods. Why King James? The English language is the largest vocabulary language that man has ever invented. There are 4,000,000 nouns in the English language. The Hebrew language, by contrast, is one of the most noun poor languages that man has ever invented.

English vs. Hebrew

So, the English reader has a difficult time appreciating that in the Hebrew Old Testament, there are very few words to describe periods of time. The Hebrew word Yom, for "day long" can mean 12 hours, 24 hours or a long time period. You have to examine the context, to determine which of the three definitions to use.

Incidentally, we have the same problem with the word "heaven", for which the Hebrew language has three different definitions. In Genesis One, you have to examine the context in order to determine which heaven is being used in which place. That's why Paul referred to the third heaven. So you'd know which one he was talking about.

Day 7: No Evening & Morning

I didn't know Hebrew when I first read the Bible. But I immediately recognized that they must have been talking about a longer period of time, because there is no evening or morning for the seventh day. Notice that the first six days are closed off with an evening and a morning. The seventh day is not, and there's a good reason for that.

When you read into the Bible, Psalm 95 and Hebrews 4, you discover that God's seventh day, the day of rest, is still proceeding, through the present and on into the future. Live your lives so that you will enter God's seventh day, day of rest.

Seventh Day is Now

We're still in the seventh day. If the seventh day is a long time period, then the first six days must likewise be long time periods. I also saw as a 17 year old that the fact that we're in the seventh day answers the enigma of the fossil record. Why we see it in the past but we don't see it today. In the book, *Creation and Time*, I give you 21 biblical arguments for why the days must be long, and not 24 hours. It's helpful to realize that there is no Hebrew word to describe a long period of time. The only option is to use the word yom. Likewise, the words evening and morning also mean beginning and ending.

If you want the details, they're covered in the book. This opens an opportunity, because there are many non-Christians out there who are convinced that Christianity has no credibility because it speaks of the universe as being a mirage.

A Young Universe could only be an Illusion

If the universe is only thousands of years old, then it would have to be an illusion, because astronomers measure it to be a tremendous size and that size speaks of the billions of years. Non-Christians say that if the Bible has no credibility with respect to astronomy and physics, why should they trust it for anything else?

The Bible: Speaks of Billions of Years, Consistent with Astronomy

One reason I wrote this book was so that non-Christians would realize that the Bible is not speaking in terms of thousands of years; it's speaking in terms of billions of years. In speaking in terms of billions of years, we realize that there's no basis for claiming that the Bible is filled with scientific error.

On the contrary, in Genesis One, we see a testimony to scientific perfection. When, as a 17 year old, I compared the Bible to other holy books of the religions of the world, I noticed that only the Bible gets a perfect score on the creation account.

Biblical Account: 14 Statements, all 100% Consistent with Modern Observations

It gives three initial conditions and 11 creation events, and describes all 14 perfectly and puts them in the correct chronological sequence. The best I've found outside of the Bible is the New Militia of the Babylonians, which scores two to 13 correct. The only reason it got such a high score is because the Babylonians weren't too far culturally from the descendents of Abraham. They probably heard a little bit about their story from them.

Do you differ with the scientists at the Institute for Creation Research?

Hugh: Yes, I differ with them about the age of the universe. I would agree with them on the recency of the creation of man. Though, we both hold that we are all descendent from Adam and Eve and that God created Adam and Eve only thousands of years ago. Where we disagree is on the age of the Earth and the age of the universe, but I'd like to point out that it really doesn't matter. I believe that the universe is 17,000,000,000 years old [that was the best figure available in 1994; today we know the universe is 13.7 billion years old – *Ed*] and they believe that the universe is less than 10,000 years old. We only differ by a factor of 1,000,000. That's only six zeros.

I say this because I've brought another book here with me, written by an agnostic, Hubert Yockey, who founded the field of information theories that apply to molecular biology. He and others, including atheists, point out that in order for life to arise by natural processes, you would need an Earth in excess of 10 to the one hundred billionth power, years old. That's a hundred billion zeros after the one. It would fill 25,000 Bibles with zeros to write that number out long hand.

The fact that I differ with the Institute of Creation Research by only six zeros has no bearing on the creation evolution debate. Nor does it have any bearing on salvation. When God created is doctrinally insignificant.

I say that because in my opinion, there has been far too much emotion invested in what I consider to be a trivial issue in terms of creation evolution and basic viable doctrine. If we can get away from the emotion, I think we can resolve it.

How do you respond to the theory that the Big Bang that you're studying now is merely one of a series of Big Bangs? That the matter of the universe is constantly exploding, accelerating, decelerating, concentrating and re-exploding?

Hugh: I whizzed right past that in my talk, thinking no one would pick up on it, but you did. If the universe has sufficient mass, then its expansion will stop. Two massive objects tend to attract one another. The universe contains enough galaxies and quasars and other material that the mutual attraction would eventually take the steam out of the expansion of the universe, forcing the universe into a subsequent period of collapse.

There have been those of the Hindu persuasion who first began to believe 3,000 years ago that when the universe collapses, it will go through a bounce. It will rebound into a second stage of expansion, collapse, expansion, collapse, etc.

Then we're back to infinite time. If there are an infinite number of bounces of the universe, then you can postulate that this just happens to be that lucky bounce of the cosmos in which conditions were just right for the formation of life.

The truth of the matter is that it's physically impossible for the universe to bounce. In 1983, Alan Guth and Mark Sher published a paper in the *British Journal of Nature* titled, "The impossibility of a Bouncing Universe".

The reason it's impossible for the universe to bounce is because of its enormous entropy. It has a specific entropy of 1,000,000,000. That translates into a mechanical efficiency for the universe of 1/100,000,000 of a percent.

In terms of a bounce, if I have a ball in front of me, and I let it fall towards the carpeted floor, we can measure its mechanical efficiency by how far it bounces off of the floor compared to the height from which I drop it. It's about 30% efficient. The universe has a mechanical efficiency of 1/100,000,000 of a percent. Engineers in the audience will tell you that anytime an engine falls below a 1% mechanical efficiency, it will not oscillate. The universe falls 8 orders of magnitude short of that limit. Therefore, it's impossible.

This impossibility has not only been demonstrated in the classical physical sense, it's also been demonstrated under the conditions of quantum mechanics. Even if we're talking about a bounce in that period of time in which the universe is compressed smaller than a quantum entity, there too, it's impossible.

The universe could collapse, but we're still talking about only one creation event, only one beginning. Therefore, we pull the rug out from under Hinduism, Buddhism and New Age philosophy, because all of those religions preach that the universe reincarnates. The fact that astrophysicists have demonstrated the impossibility of reincarnation scientifically demonstrates the fallibility of Hinduism, Buddhism and New Age philosophy.

I'm still savoring the fact that since this is the seventh day, every day is Sunday and I'm living in a day of rest. I ask this somewhat naively, because I don't know much about astrology, but what relevance does your work have to do with astrology and the planets, etc? Or does it? Have you done any study in that?

Hugh: Are you trying to contrast astrology with astronomy?

Participant: No, I mean astrology, since it is very related to the planets and their placement and all that.

Hugh: The effect of the obstetrician is six times greater than the effect of all of the planets, the sun and the moon combined. On that basis, there is no scientific credibility to the claims of astrology. I've written a little paper called, "Astrology: Science or What?" in which I very carefully document the scientific incredible claims of astrology.

I'm not saying astrology has no validity. It has no physical validity. It may have some spiritual validity, but it's easy to prove that its spiritual validity is dangerous, and coming from the adversary of God, rather than from God himself. If you want to get it, it's a free handout that we make available for people who have questions on astrology.

It's my understanding that quantum mechanics, the quantum theory, is the latest method to shove God out of the way. Could you elaborate on the quantum theory?

Hugh: I have a whole hour lecture prepared on the quantum challenge to Christianity. It's exactly the opposite. Quantum mechanics does not provide a challenge to the Christian faith; it provides support. The reason people perceive it as a threat is because quantum mechanics is such an esoteric physical study that the vast majority of laymen have no clue what it means.

Therefore, when some New Age philosopher tells us that it establishes that we human beings can create independent of God, some of them actually believe it. But what quantum mechanics actually tells us is that the human observer or experimenter, is even more limited in his capacity to influence cause and effect than we thought, under the conditions of classical mechanics and physics. It makes the human condition worse, not better.

Quantum mechanics, rather than demoting God and elevating man, does exactly the reverse. If you have a specific question on quantum mechanics, I'd be happy to deal with it. Let me just share this. There are a couple of chapters on this in my *Creator and the Cosmos* book. Quantum challenges to the Christian faith were first proposed in 1983 and culminating in some claims that were made a few months back, have moved in the direction of progressive absurdity.

In 1983 Paul Davies said, "The universe was created through a quantum fluctuation." The problem with that is that the smaller the time interval in quantum mechanics, the smaller the probability the quantum fluctuation will occur.

If we're talking about the beginning of the universe, the time interval is zero, so the probability is zero. So we know for sure that quantum mechanics doesn't do it.

The latest challenge coming from quantum mechanics is that the universe is evolving together with the human race, and the fossil record gives the evidence for this. If you look at the fossil record, you see improvement with respect to time.

Since the author of this theory doesn't believe in God, and he believes that there's some kind of self-ordering factor in nature that explains that fossil record, he concludes that the universe is improving with time, and that we human beings are improving in time.

He believes that if we wait long enough, we'll meet at one another at the Omega point, where we'll become omnipotent, omnipresent and omniscient. Then we become God and we'll be able to create in the past, which explains why we're here today. God doesn't exist yet, but he will. When he exists, he'll create the universe 17 billion years ago.

Skeptic Martin Gardener analyzed this theory a few months ago, and said, "This is not the FAP theory. This is the CRAP theory." It was called the Final Anthropic Principle (FAP). He called it the Completely Ridiculous Anthropic Principle (CRAP). The thing I've noticed in quantum mechanics in an attempt to refute the Christian faith, is as time goes on their attempts to bypass the God of the Bible get progressively more absurd. The analogy of that would be the flat Earth society, which has been in existence for 100 years.

During those 100 years, the rationale for defending a flat Earth has become progressively absurd. They'll never run out of evidence for a flat Earth, but the fact that their evidence is being demonstrated as becoming progressively more absurd tells us that they don't have a strong case. Likewise, I would say atheists pushing through quantum mechanics do not have a strong case. You can read the details in my book.

Can you tell us what your thoughts are on Eric Lerner's book *The Big Bang Never Happened* ?

Hugh: I have a few pages on it in both of my books. The book is passé now because he was assuming that there'd be no resolution to the problem of the clumping of the galaxies and the smoothness of the radiation from the creation event. That was his basis for saying the Big Bang model is in trouble. With the discovery of exotic matter, we've dealt with that puzzle. Eric Lerner overlooked independent measures for the date of the creation. He was pushing for creation date in excess of quadrillions of years. He assumed that our only basis for establishing the age of the universe was its expansion velocity.

In fact, we have several methods for age dating the universe. The burning of the stars, the ages of the oldest stars, the radiometric elements, and how we still have Uranium and Thorium in the universe. If the universe were one quadrillion years old, there'd be no Uranium or Thorium left at all. The fact that they exist tells us that the universe is relatively young.

That's a quick response to Eric Lerner's book. It had some following before the COBE satellite discoveries, but that following has since evaporated.

Dr. Ross, my question is about the order of creation described in Genesis, which seems to teach a geocentric view of the universe in that the Earth is created and then the lights are created, the lesser lights, and the greater light, the Sun. Could you talk about that?

Hugh: Genesis One follows the scientific method, in that it doesn't begin to describe the sequence of creation events until it first identifies the point of view in the initial conditions. That's not strange because that's where the scientific method came from, so of course the Bible follows the scientific method. We see in the second verse of Genesis, chapter one, that the spirit of God was brooding on the surface of the waters. We're told the account of creation from the point of view of the observer at the surface of the waters, *below* the clouds, not *above* the clouds. That's makes all the difference in how you interpret the text.

If you put the point of view up in the heavens, almost everything you get in Genesis One is wrong, compared to the record of nature. If you place it on the surface of the ocean, below the cloud layer, then everything is a perfect fit.

What happens on the first day of creation is not the creation of light, but the appearance of light. It says, "Let there be light", and uses the Hebrew verb meaning "to be". It doesn't say God created the light. The light was created in the beginning. In the beginning, God created the heavens and the Earth. The Hebrew word for heavens & Earth refers to the entire physical cosmos, the stars, galaxies, matter, energy, space and time. Light was created in the beginning. It was dark on the surface of the waters because Earth had an atmosphere that was opaque to the passage of light at that time.

There was an intense interplanetary debris cloud and the gases in the Earth's atmosphere itself combined with that debris cloud to prevent the passage of sunlight to the surface of the Earth. On the fourth day of creation, we again see the Hebrew verb meaning, "let there be", the sun, moon and stars. The observer on the surface of the waters, for the first time, sees the objects that are responsible for the light that came through in the first stage of the fourth day.

It was not until the fourth day of creation that the Earth's atmosphere became transparent. Before the first day, it was opaque. From the first day to the fourth day, it was translucent, permanently overcast, and on the fourth day the clouds broke and the observer could now see the objects responsible for the light.

The problem is the 16th verse, which says, "So God made the sun, moon and stars." The Hebrew verb for "made" means to manufacture or fabricate. What the English reader often doesn't pick up on is that the Hebrew language does not have verb tenses. They have strange forms which mean the action is either complete or has not yet been completed.

The 16th verse has the verb in its "completed" form, meaning the action was completed at some time in the past. It could have been completed on the fourth day, the third day, the second day, the first day, or in the beginning.

That sentence itself doesn't tell us which of those five options we should choose. We think, wouldn't it be nice if Moses told us? Well, he did. "In the beginning, God created the heavens and the Earth," and that [Hebrew word for heavens and Earth] would include the sun, moon and stars. They were made in the beginning, but the observer doesn't see them until the

fourth day. What's fascinating is that the fifth and sixth days of creation, for the first time, mention species of life that require the visibility of the sun, moon and stars to regulate their biological clocks.

If you want to pursue this in more depth, you can read articles on [Hugh Ross's website](#), which take you step by step through the details of the three initial conditions and the 11 creation events.

About Hugh Ross

Hugh Ross launched his science career at age seven when he went to the library to find out why stars are hot. Physics and astronomy captured his curiosity and never let go. At age seventeen he was the youngest person ever to serve as director of observations for Vancouver's Royal Astronomical Society. With the help of a provincial scholarship and a National Research Council (NRC) of Canada fellowship, he completed his undergraduate degree in physics (University of British Columbia) and graduate degrees in astronomy (University of Toronto). The NRC also sent him to the United States for postdoctoral studies. At Caltech he researched quasi-stellar objects, or "quasars," some of the most distant and ancient objects in the universe.

Hugh Ross is author of numerous peer-reviewed technical articles in leading publications such as *The Astrophysics Journal* and more than a dozen books. He is president of [Reasons To Believe](#), an organization that integrates the latest discoveries in science with theology, demonstrating that faith and facts are not in conflict, but perfect agreement.

Other Articles:

[If You Can Read This, I Can Prove God Exists](#) - The same communication technology that gave us our modern digital age shows that language is proof of the existence of God, and that all evolution is driven by intelligent processes.

[The Atheist's Riddle](#) - "So simple, any child can understand; So complex, no atheist can solve." An airtight inductive proof for the existence of a Superintelligence.

[The Intelligent Evolution Quick Guide](#) - Proof that DNA was designed by a mind; a 21st century update to Paley's design argument, and 3 kinds of evolution - all on a single sheet of paper

[Q&A on Information Theory](#) - Frequently Asked Questions on what the information sciences tell us about God

Software Tool:

[The Random Mutation Generator](#) - Paste text into the box and MUTATE it! A useful tool you can play with that visually demonstrates that random mutation can only destroy information, not create it

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