CHAPTER NINE

Age of the Universe

Every variation of evolution requires billions of years, as do the Gap Theory and Progressive Creation. Recent Creation stands alone in postulating a recent beginning. Who is right? The only eyewitness, God, has not told us exactly when He started everything. All we can do is look at circumstantial evidence to see whether it favors an old or young age.

Because written history goes back about 4,000 years, we can conclude that the universe is at least that old. At the opposite extreme, many evolutionists believe the big bang occurred fifteen to twenty billion years ago. If they are wrong, it could be anything less.

VII. BIBLICAL REASONS FOR BELIEVING THE UNIVERSE IS YOUNG.

We cannot determine the exact age of the earth from the Bible. Though Archbishop James Ussher in 1701 calculated the date of creation as 4004 B.C., others through the years have reached conclusions that vary from his by several hundred years. Nevertheless, the Bible strongly implies that the universe is not billions but thousands of years old.

A. HEBREW USAGE.

The Hebrew word translated "day" in the first chapter of Genesis is *yom*. Depending on the context, it can mean a literal 24-hour day, the daylight portion of a day, or an indefinite period of time (e.g. the day of the judges).

Visual #9-1

Throughout the Old Testament, the latter meaning occurs only when *yom* is used without a number. Every time it appears outside Genesis 1 with a specific number (over 350 times) it always refers to a literal 24-hour day. This is the way *yom* is used in the first chapter of Genesis. If we take it to mean an indefinite period of time there, we should do the same everywhere else. This would not make sense. The context in all these cases indicates ordinary days, as does the context in Genesis. One may disagree with the author of Genesis, but he obviously intended to convey the idea that creation took six 24-hour days.

B. THE TEN COMMANDMENTS.

God Himself reiterated the time span of creation in the Ten Commandments (Exod. 20:11), the only part of the Bible that claims to be written with His own finger. The King James version renders the passage as "in six days the LORD made heaven and earth, the sea, and all that in them is." Everything in the heavens and the earth was made during these six days, not billions of years before.

Visual #9-2

Those who follow the "Gap Theory" (actually a hypothesis rather than a theory because it is not testable) believe that God originally created the universe, allowed it to be destroyed by Lucifer, and then remade it from the ruined parts. If this were correct, about 10^{80} atoms would have to be left out from "all that in them is" that God wrote on the tablets of the Ten Commandments with His own finger. This would be quite a significant omission on His part!

C. LIMITS TO POSSIBLE GAPS IN GENESIS.

Death entered the world only after Adam sinned, some time after the end of the creation week. From that point on, the genealogies in Genesis add up to just a few thousand years. Even if there are gaps in the genealogies, they would still add up to thousands of years rather than millions or billions.

Visual #9-3

Some argue that the time was much greater because with the Lord "a day is as a thousand years" (2 Pet. 3:8). However, taking this clause out of context completely changes the meaning. The whole passage reads,

> "But the heavens and the earth, which are now, by the same word are kept in store, reserved unto fire against the day of judgment and perdition of ungodly men. But, beloved, be not ignorant of this one thing, that one day [is] with the Lord as a thousand

years, and a thousand years as one day. The Lord is not slack concerning his promise, as some men count slackness; but is **longsuffering** to us-ward, not willing that any should perish, but that all should come to repentance." (2 Pet. 3:7-9)

The reference to a thousand years has nothing to do with creation. Instead, it shows that the reason judgment has not yet fallen on the earth is that God is not in a hurry but is still giving men time to repent. If this were meant to say that the days in Genesis are a thousand years, why only the days of the creation week? Why wouldn't each day Noah was in the ark be a thousand years too, keeping him on board for 40,000 years? Ridiculous. 2 Pet. 3:8 is only meant to show that God is patient.

One may disagree with the Bible or dislike what it says, but there is no mistaking its implication that the earth is only a few thousand years old.

VIII. CHARACTERISTICS OF AN ACCURATE CLOCK.

Even if the Bible did tell us exactly how old the universe is, many skeptical scientists wouldn't believe it. From a scientific standpoint, we need some sort of clock in order to estimate its age. We can use any process that changes through time, providing the process meets certain criteria:

Visual #9-4

A. INITIAL CONDITIONS KNOWN.

We must know the initial conditions. What time did the clock say when it was wound up?

B. KNOWN RATE OF CHANGE.

The rate of change must be known. The clock need not always run at the same speed, but if it doesn't, we must know how often it changes and by how much.

C. CLOSED SYSTEM.

The clock must not have been reset or tampered with at any time. If it was, it is useless.

There is no such thing as a perfect clock for the age of the universe. (A) We do not know the initial conditions; (B) we cannot be sure that the process we use to measure has always occurred at the same rate; and (C) we cannot be sure the clock has never been interfered with a single time. We can only assume these conditions have been met. If we are wrong, so is the clock; if we are right, it may be fairly accurate. The fewer the assumptions and the more reasonable they are, the more likely it is that the method is reliable.

Visual #9-5

Because of these uncertainties, we would be foolish to rely on just one clock. We should use a variety of methods to get an idea of the upper limit on the universe's age, recognizing that the accuracy of each method depends on the number of assumptions it involves. A method based entirely on assumptions may be uncertain by billions of years, while one that involves direct measurements may point toward a much narrower range of possible ages.

Of all the methods available to estimate the age of the universe and the earth, only a few can be forced to yield ages on the order of billions of years. Most of these depend on radioactive dating, which we will examine when we focus on the age of the earth in Chapter Eleven. For now, let's look at the universe outside the earth as we consider some arguments from astronomy for an old universe, the creationist response to these arguments, and some arguments for a young universe. We will see that there is no compelling reason to believe that the universe has to be billions of years old. Several interesting dating methods point toward a young age instead.

IX. EVOLUTIONARY ARGUMENTS FOR AN OLD UNIVERSE.

Visual #9-6

Some people object to recent creation because they wonder what God was doing all that time before He created the universe. This objection is philosophical, not scientific. It shows a lack of understanding of what "time" is: a measure of change in a physical system. Before creation, there was no physical system in which to measure change. There was no "before," because time did not exist. Even if it had, compared to eternity, it wouldn't matter if the universe were ten thousand or ten trillion years old. God would still have existed forever before He began to create.

There are also two more or less scientific reasons people believe the universe is billions of years old. Both have to do with its size.

A. TIME NEEDED TO REACH PRESENT SIZE.

Almost every astronomer believes the universe is billions of light years across. If it expanded from a cosmic singularity the size of an atom, it would have taken billions of years to reach the present size. However, remember the inflation model we saw in Chapter Seven? If it is correct, the universe could have reached a significant portion of its present size within the first few seconds.

Visual #9-7

B. LIGHT FROM DISTANT STARS.

How could light from stars billions of light years away reach us in only a few thousand years?

X. CREATIONIST RESPONSE.

Though each side can present some interesting arguments, this is a case where neither side can prove anything. All we have are uncertainties. Whether we believe the universe is old or young, we have to take a step of faith.

A. SIZE OF THE UNIVERSE.

There are so many uncertainties involved that using the size of the universe to determine its age is a poor clock indeed.

1. INITIAL CONDITIONS UNKNOWN.

First, this argument depends upon the assumption that there was a big bang. If there was not, we have no way to know the initial conditions. A supernatural God could have created the universe close to its present size.

Remember that in order to reconcile the even distribution of energy and uneven distribution of matter throughout the universe, cosmologists had to invent the idea of an inflationary universe which expanded far faster than the speed of light for a short time. What they usually don't mention is that inflationary models imply that the universe was a significant fraction of its present size by the end of the inflation period. This is essentially the same condition creationists believe in, so it is of no advantage to evolution.

2. PRESENT SIZE UNCERTAIN.

Second, we don't even know for sure how big the universe is now.

We saw in the last chapter that calculations of the universe's size and age are based on a very uncertain Hubble relation and on major assumptions about how red shifts should be interpreted. Hubble's constant may not be constant after all. Different astronomers have obtained different values ranging from 50 to 100/second/megaparsec depending which objects they observe. The Hubble age given by these extremes is uncertain by a hundred percent - anywhere from 7.5 billion to 15 billion years. Perhaps there is not a unique Hubble parameter, but several possible values (Hodge, 1993, 21). We simply can't use the Hubble relation to tell how old the universe is.

No one doubts that the universe is enormous. However, since we calculate its size by a series of assumptions (Chapter Seven), it may be much smaller than astronomers think. If we are wrong about the Hubble value and the meaning of red shifts, we really don't know how big it is.

3. GLOBULAR CLUSTERS OLDER THAN THE HUBBLE AGE.

The most widely accepted value for the Hubble parameter yields an age of about 15 billion years for the universe. However, astronomers have been busily at work trying to solve a perplexing problem: the ages of a number of globular clusters have been determined by other methods to be at least 16 billion, a billion years older than the universe itself. (*Sky & Telescope* 1994a, 10; Hodge, 1993, 21) As *Sky & Telescope*

magazine puts it,

> "... either the Big bang cosmology or the theory of stellar evolution needs a major overhaul." (*Sky & Telescope* 1994a, 10).

Since the Hubble parameter is used to calculate both the size and age of the universe, we would do well to be skeptical when anyone tells us how big or how old it is.

Even if the universe is only a few million light years across, though, this still leaves us with the question: *how could light get from there to here in only a few thousand years?*

B. BEHAVIOR AND SPEED OF LIGHT.

At least six factors may be part of the answer to this question.

1. "LIGHT PATHS."

Some believe that God may have created light already on its way from distant stars to earth at the time he created the stars. However, astronomers have observed many supernovae believed to have taken place millions of years ago. If the "light path" explanation is correct, God would have had to create illusions of these phenomena in the stream of light. Many creationists find this idea unsatisfactory on philosophical grounds - *who wants to believe in a God who deliberately deceived us?* - and look for a different answer.

2. RIEMANNIAN GEOMETRY AND CURVED SPACE.

Visual #9-8

We know how light behaves in the solar system because we can directly observe it. However, we have no way to be sure that it behaves the same way in interstellar and intergalactic space as it does nearby. It may not.

Einstein's theory of general relativity predicted that massive objects should bend light, producing a "gravitational lensing" effect. From our earthly vantage point we should see at least a few duplicate images of distant stars whose light had to pass massive objects on their way to us. As a result of their study of such binary stars, MIT's Parry Moon and Domina Spencer (not creationists) proposed in 1953 that light traveling in deep space does not follow the straight-line paths of Euclidean geometry, but that it follows Riemannian (non-Euclidean and curved) space.

According to relativity, the curvature occurs because gravity distorts space. (The direction of the distortion is toward that mysterious fourth dimension that we saw in Chapter Seven.) The enormous mass of the universe would cause a tremendous "gravity well." However, in Moon and Spencer's model light would not have to go to the bottom of the well to get from point A to point B; instead, it would go around it on the shortest path. If their calculations are correct, the curvature of space is such that light would take no more than 15.71 years to get to us from the farthest reaches of the universe (Moon & Spencer, 1953, 635-641). It doesn't matter whether there was a big bang or not, nor does it matter how old or young the universe is. The 15.71 year value follows from the curvature of space caused by the enormous quantity of matter in the universe.

Critics say that if Moon and Spencer are correct, we should see the effects of curved space on more than just a few binary star systems. Nevertheless, though there is no way known to experimentally verify their calculations, the mathematics behind the Riemannian model are sound. It well illustrates how much of astronomy is theory and how little is observed fact.

3. POSSIBLE DECAY IN THE SPEED OF LIGHT.

Visual #9-9

While almost all physicists believe that light has always traveled at the same speed it does now, there may be experimental indications that it has slowed down. We just never noticed. In *The Atomic Constants, Light, and Time* (an invited research report published by Stanford Research Institute International, 333 Ravenswood Ave., Menlo Park, CA

Visual #9-10

94025, phone 415 326-6200), Researchers Barry Setterfield and Trevor Norman tabulated the results of speed-of-light experiments over the last several centuries. They report that the speed of light has showed a steady exponential decay ever since we started measuring it. This means that the farther we go back in time, the faster light would have been traveling. At some point in the past, its speed would have approached infinity. No matter how far away the source, the light would have reached earth quickly.

A decrease in the speed of light would have at least three significant implications relating to creation.

Visual #9-11

(1) It could help to explain the red shift of light from distant stars. As light slowed down, its wavelength would shift toward the red end of the spectrum. The farther away the stars, the greater the shift.

(2) Radioactive decay rates are believed to depend on the speed of light. An extremely high velocity of light in the first few days of the creation week would have resulted in much faster decay rates, producing heat to help separate the "waters above the firmament" from the "waters below the firmament" on Day Two.

(3) This accelerated radioactive decay would explain why there are so many elements on earth that are supposed to be formed over long times by radioactive decay. (More on radioactivity in Chapter Eleven.)

Visual #9-12

Because the speed of light is supposed to be one of the most fundamental constants in physics, Setterfield and Norman have encountered a great deal of opposition. If light slowed down, physicists have some major changes to make in their theories. Critics point out that there is little data available on speed-of-light experiments before the 1840s and that the amount of decrease reported over the last 300 or so years is less than one percent. This is not a significant enough amount to convince many scientists. However, no one has proved that Setterfield and Norman are wrong either.

4. SPEED OF LIGHT IN DEEP SPACE.

Visual #9-13

The only place we have been able to measure the speed of light is in our immediate region of space. It may travel much faster in interstellar or intergalactic space.

No one knows exactly how light travels. Since it usually behaves like a wave, we would expect to find that it needs a medium on which to propagate. However, there is no known medium in space. In its ability to move through what appears to be a void, light seems to act like a particle. Scientists may be overlooking possible media that extend throughout space, such as gravitational and electromagnetic fields or even the fabric of space itself.

Visual #9-14

To see how these potential media might affect the speed of light, we can use an analogy to its behavior on earth. We know from observation that it travels slower in a denser medium such as water and faster in a less dense one such as air. We also know from observation that it slows down and/or bends in a strong gravitational field. If gravitational fields are serving as a medium on which light propagates, it may travel much faster in deep space where the fields are extremely weak.

Visual #9-15

The twin Pioneer 10 and Pioneer 11 spacecraft launched in the 1970's give us a clue that this may indeed be happening. As these craft moved farther and farther from the sun and out of the solar system, they displayed a phenomenon known as the "Pioneer Anomaly." In order to track their distance from earth, NASA scientists beamed radio waves at the craft which were then bounced back to earth. Much to the surprise of the scientists, the signals took less time to return than expected. Many have concluded either that we have miscalculated the distance or that there must be some unknown type of matter in the solar system slowing the probes down. However, an alternative that seems to have been universally ignored is that we may be wrong about the speed of light in space. If it goes faster as it moves farther away from the sun's gravity, we would expect exactly such a phenomenon as the Pioneer Anomaly.

5. GRAVITATIONAL TIME DILATION. (See D. Russell Humphreys, *Starlight and Time*, Master Books, available from ICR.)

Visual #9-16

Physicist D. Russell Humphreys has proposed a fascinating concept: he believes that God used relativity to allow the far reaches of the universe to age millions or billions of years while the earth aged only a few days. This took place during the creation week, only a few thousand earth years ago. Humphreys believes the universe expanded some time in the past because the Old Testament says at least 17 times that God "stretched out" or "spread out" the heavens. However, his ideas about relativity and expansion are quite different from those underlying the big bang models.

Visual #9-17

BIG BANG	HUMPHREYS MODEL *("White Hole" Expansion)*
1. Space is 4-dimensional and is defined by the presence of matter and energy. Where there is no matter or energy, there is no space.	1. Space is 4-dimensional, but it exists independently of matter and energy. They may expand through space, but they do not define it.
2. Matter began in the form of hydrogen, which was the raw material out of which all the other elements later formed.	2. The earth was covered by "the deep" (Gen. 1:2) consisting of ordinary water (H_2O). Thus, both hydrogen and oxygen were present. They were the raw materials God later used to manufacture the rest of the elements. (The Bible hints at such a conclusion in 2 Peter 3:5, which says that the earth was "standing," or possibly "formed" - Greek συνεστωσα - out of water.)
3. All matter was concentrated in an almost infinitely dense point known as a singularity.	3. The deep contained enough water at ordinary density to later be used as raw material for the rest of the universe. It was a sphere perhaps two light years or more in diameter.
4. Expansion began 7.5 to 15 billion years ago and is still going on in the present.	4. Expansion began on day two when God separated the waters above the "firmament," or expanse, from the waters below (see also Ps. 148:4). Humphreys believes the expanse was interstellar space.
5. The universe is still expanding, but at an ever-increasing rate.	5. Though the universe may still be expanding today, the initial expansion was substantially complete by the end of the creation week -- possibly as early as day four.
6. Since space is unbounded, there is no center and no edge. Earth has no special status.	6. Matter fills only a small part of 4-dimensional space. There is a definite center and edge to the distribution of matter in the universe. The earth started at the center, and should still be fairly close to it.
7. Since there is no center for gravity to point toward, the universe has never been in a black hole.	7. Since there was a definite center and edge from the beginning, there was a definite center for gravitational forces to point toward. There was so much mass in a relatively small area that the universe began as a black hole. God changed it to a "white hole" (a black hole running in reverse) on day two when He began the expansion.
8. The heavenly bodies formed as clouds of dust and gas came together by gravity.	8. The expanding waters furnished the raw material for the heavenly bodies.

Visual #9-18

One of the most important differences between Humphreys' idea and the Big Bang is that while he believes space is 4-dimensional, he does not believe that it exists only in the presence of matter and energy. Instead, space is a thing in and of itself whether it contains matter or not. Thus, it is possible to have a four-dimensional universe inside which the 3-dimensional distribution of matter has a center and definite edges. This opens the door to all sorts of possibilities. First, the Copernican principle would be wrong, and the distribution of matter in the universe would indeed look different from the center than from the edge. Second, since the density of matter would have been far different at the beginning, the rate at which time passed would have been different in different places.

Changes in the rate at which time passes are not just the stuff of science fiction. We know from direct observation that atomic clocks slow down slightly where gravity is stronger. If we compare the time recorded by an atomic clock at sea level to one at the top of a mountain, we find that the lower one runs slower by a few billionths of a second a year. Since the Law of Gravity $F_{grav} = \frac{Gm_1m_2}{d^2}$ shows that gravity decreases as we move farther from the center of the earth, we conclude that the clock at lower elevation runs slower due to stronger gravity. (No one has come up with a different explanation, though we can't rule out the possibility that they will some day.) Thus gravitational time dilation, which is the key to Humphreys' model, has at least some observational support.

Visual #9-19

Time would be dilated the most inside a black hole, a theoretical object so massive that not even light could escape its gravitational pull. (Because of the way matter behaves near several objects in space we conclude logically that they are black holes, but they are so far away that we can't be absolutely sure.) Since the Law of Gravity tells us that the force of attraction drops off by the square of the distance between two objects, we conclude that there is a certain distance called the *event horizon* beyond which light passing a black hole at a glancing angle will not be drawn in. Current theory says that time inside the event horizon slows down greatly compared to time at an ideal place far enough away to be unaffected by gravity, or *Schwarzschild* time (after the physicist of that name). The difference between Schwarzschild time and *proper* time measured by an observer in the presence of a gravitational field depends on the strength of the field.

If relativity is correct, time inside a black hole could virtually stop as compared to the rest of the universe. An observer crossing a black hole's event horizon would see his proper time passing at its normal rate, but a distant observer on Schwarzschild time watching him would see the time of crossing approach infinity. If the distant observer used a telescope to watch an astronaut approach a black hole, he would seem to slow down more and more. The observer would never see him cross the horizon because the image of the astronaut would be more and more red shifted until it passed out of visible range. From the astronaut's point of view, however, his watch would keep ticking at its normal rate. If he could look back at the astronomer through a telescope he would see him moving faster and faster until he became a blur of motion.

Which observer is right? According to relativity, both are. And this, says Humphreys, is the key to how light could have gotten here from distant stars in just a few earth days. Humphreys points out that the same gravitational equations apply to a black hole and a "white hole," a black hole running in reverse. According to these equations, proper time within the event horizon of either object would be at a virtual standstill as compared to Schwarzschild time. So could the universe have started as a black hole? Genesis seems to indicate that it could.

- If God created a sphere of water ("the deep") of sufficient mass to produce all the

Visual #9-20

matter in the known universe, there would have been so much gravity that the sphere would have been at the center of a black hole. At the ordinary density of water, the sphere would be about two light years in diameter, with an event horizon perhaps 450,000,000 light years from the center. As long as the sphere was well inside the horizon, proper time would have been about the same throughout it. Then, on Day Two, God began to spread out the heavens, changing the black hole into a white hole. He was not limited to the speed of light, but could have expanded the universe as fast as He wanted to. (Evolutionists who hold to the inflation model have no grounds to criticize, because they, too, believe the universe expanded faster than the speed of light.)

Visual #9-21

Visual #9-22 -23

- As long as the outermost edge of the expanding waters remained within the event horizon, time would still have been fairly uniform throughout.
- As the expansion reached the event horizon, a transition began to take place. Those parts of the expanding universe just at the edge would have begun to experience a slightly faster passage of time.

Visual #9-24

- As the matter began to pass the horizon, the horizon began to collapse inward because of the lessening amount of mass within. Proper time began to pass much faster outside.

Visual #9-25

- As more and more matter passed the horizon, it continued to shrink. The parts of the universe closest to the center stayed within it the longest, causing their proper time to pass much more slowly than that of the parts that left earlier. From the perspective of the center, the outer parts of the universe would have been aging at tremendous speed.

Visual #9-26

- After enough matter passed outward through the former event horizon, it shrank inward to nothing. Proper time once again began to pass at a fairly even rate throughout the universe, except near black holes.

Visual #9-27

Humphreys believes that millions or even billions of years of proper time could have elapsed in galaxies far away from the center while only a few days of proper time passed here on earth. Since Genesis is written from an earthly perspective, there would have been plenty of time for those objects to age and for light from them to reach us even though only six of our days elapsed.

This is just a brief summary of Humphreys' model. Students interested in the technical details can obtain his book *Starlight and Time* through ICR or a number of other sources. (For those who have Internet access, do a search for "Starlight and Time.") He is the first to admit that the model is very preliminary and in need of a great deal of fleshing out. Perhaps one of your students may be inspired to contribute to this fascinating study.

6. LIMITATIONS OF HUMAN KNOWLEDGE.

Visual #9-28

We pretend to know a great deal about what goes on in space, but we really don't. We take a tiny bit of data and make up elaborate stories about it. We ought to be honest enough to admit that there are probably other factors we just haven't thought of.

Until we travel out of the solar system and observe the behavior of light and the passage of time in deep space, we will never be able to know if any of these is right. However, evolutionists can't prove any of them is wrong either. We have no way to be sure how long light really took to get here. Whether you believe it took thousands or billions of earth years to get here, you have to take a step of faith.

XI. ARGUMENTS FOR A YOUNG UNIVERSE.

Now let's look at some of the creationist arguments for a young universe and the evolutionary responses, if any. We'll start at the far reaches of the universe and work our way in toward the sun. (We'll postpone dealing with the age of the earth itself until Chapter Twelve.)

A. BREAKUP OF GALAXY CLUSTERS. (Slusher, 1980a, 7-14).

Visual #9-29

Stars do not occur by themselves but are found in galaxies. Likewise, galaxies are not found alone but in clusters. One such cluster which has been carefully studied is the Coma Cluster. According to the standard interpretation of red and blue shifts, it is moving away from us at about 7,000 kilometers per second while individual stars within the cluster are moving apart at speeds varying by several hundred kilometers per second. Given enough time the cluster will break up.

Recommended resources: Harold Slusher, *Age of the Cosmos*, ICR Technical Monograph #9, available from ICR; Paul D. Ackerman, *It's a Young World After All*, Baker Book House, Grand Rapids, Mich., 1865

Most astronomers believe the Coma Cluster is billions of years old. To generate enough gravity to prevent these moving stars from flying away over such an enormous length of time, the cluster would need over seven times its observed mass. Evolutionists must believe that 84 percent of its mass is invisible "cold dark matter" -- six times the visible amount!

Other clusters are missing *fifty to ninety percent* of the mass needed to hold them together for more than a few million years. The Virgo Cluster is one of the worst. We have observed only about two percent of the mass needed to prevent it from flying apart. *Ninety-eight percent is missing.*

The alternative, of course, is that maybe the clusters haven't flown apart because they are not billions of years old after all.

B. SPIRAL GALAXIES. (Slusher, 1980a, 15-16; 1980b, 53).

Visual #9-30

A galaxy can contain millions or billions of stars. Many galaxies, such as our own Milky Way, are in the shape of a spiral with outstretched arms. Since these galaxies do not rotate as rigid bodies, the center moves faster than the arms. Within just a few rotations - 200 million to 500 million years - the spiral arms would be wound up tightly toward the center. Yet many galaxies throughout the universe have clearly defined arms. Since they have not wound in toward the center, these galaxies must be considerably less than a billion years old.

C. CHEMICAL SIMILARITY OF STARS OF SUPPOSEDLY DIFFERENT AGES.

Stars are supposed to start as balls of hydrogen, then gradually produce helium by nuclear fusion. Very massive stars are believed to produce heavier elements as they explode in supernovae. The more massive a star the shorter its life span.

Visual #9-31

The problem: it is common knowledge that the spectra of all known stars show that within 1% or so, they are made up of basically the same mix of elements. If they are all different ages, there is no way this should be true. A star a few million years old should have a chemical composition vastly different from one billions of years old. The similar chemical composition of all the stars implies that they came into existence within a relatively short time of each other.

D. PRESENCE OF TECHNETIUM IN STARS.

As we saw earlier, astronomers are able to detect the presence of various elements in stars by searching for the element's spectrum in the light emitted from those stars. One of the elements not known to occur naturally on earth is Technetium (atomic number 43), for which every known isotope is radioactive. We will discuss radioactivity more in Chapter 11, but for now we can note that half of any radioactive sample decays into a different element within a period of time known as a *half-life* unique to that radioactive isotope. Within ten half-lives, less than one-thousandth of the beginning amount remains.

Visual #9-32

Technetium is of special interest because its longest-lived isotope has a half-life calculated at about 4.2 million years. Within ten half-lives, or about 42 million years, it should be all gone. Yet it is common knowledge among astronomers that technetium appears in S-, M-, and N- type stars that are supposed to be billions of years old. Something is wrong here. There is not even a theoretical mechanism to produce new technetium, yet it appears in significant quantities in stars that are supposed to be many times too old for it to exist. The alternative, of course, is that the stars are just not as old as they are supposed to be.

E. LACK OF SUPERNOVA REMNANTS.

(From Davies, "Distribution of Supernova Remnants in the Galaxy," 1994)

Every so often a star explodes in a supernova. The expanding cloud of debris left over is known as a supernova remnant, or SNR for short. A SNR should theoretically go through three stages, detectable either by optical or radio telescopes:

Visual #9-33

- Stage one, rapid expansion accompanied by a great deal of visible light, results from the initial blast.
- Stage two begins 60 to 600 years later (with an average estimated at 317 years), when the SNR begins to radiate much less visible light and heat. Throughout this stage it radiates mainly in the radio or X-ray frequency ranges.
- Stage three theoretically begins at about 120,000 years. The SNR now radiates mainly heat energy until it reaches thermal equilibrium with its surroundings. It should be detectable for up to about a million years, until it loses enough energy to be indistinguishable from the background material of its galaxy.

Astronomers scanning the entire observable universe have determined that supernovae occur at the rate of about one every twenty-five years in galaxies similar to our Milky Way. Since both we and the SNRs are in the flattened disk of our galaxy, some of them are blocked from our view by interstellar dust and intervening bodies such as stars. Because of these blockages, instrument limitations, and other unknown factors, astronomers use a complicated series of calculations to estimate that we can detect about 19% of the Stage One SNRs in the galaxy, 47% of Stage Two, and 14.3% of Stage Three. We can use these figures to make predictions about how many SNRs of each stage we should find in an old Milky Way versus a young one.

	SNRs That Should Be Detectable in Milky Way for Age of		**Actual Number of**
	At Least 1,000,000 Years	About 7,000 Years	**SNRs Detected**
Stage One	2	2	5
Stage Two	2256	268	200
Stage Three	5033	0	0

The fact that there are so few Stage 2 SNRs and not a single Stage 3 is inexplicable if the galaxy is even one million years old, let alone billions. Over 7,000 Stage 2 and Stage 3 SNRs are missing! Yet the observed numbers of SNRs of all three stages match closely with what we expect if our galaxy is less than 7,000 years old.

A nearby galaxy known as the Large Magellanic Cloud confirms the conclusion that there are far too few supernova remnants for a multibillion year age. Since it is about 1/10 the size of the Milky Way, supernovae should occur an average of about every 250 years. Based on an assumed age of billions of years, astronomers expected to find hundreds of SNRs there. A 7,000 year age, on the other hand, should reveal about 24 detectable SNRs. The actual number observed? 29. Once again, our observations are incompatible with an old universe but fit well with one only a few thousand years old.

F. THE SOLAR SYSTEM.

1. SHORT-PERIOD COMETS (Slusher, 1980a, 43-54).

Visual #9-34

Comets are divided into two classes: short-period, which orbit the sun in less than two hundred years, and long-period. (Halley's Comet, with a 76 year period, belongs to the former group.) Every time a comet comes close to the sun it loses a considerable portion of its mass. Because of this, it has been calculated that a short-period comet will completely disintegrate in less than 10,000 years (Lyttleton, 1968, 110). The fact that many short-period comets still exist indicates that the solar system is thousands of years old, not billions.

Evolutionists cannot accept such a short age for the solar system. They believe that

there must be some mechanism to replenish the supply of short-period comets. However,

a. ***Capture by the sun's gravity*** is insufficient to explain why there are so many of them. Also, the plane of their orbits is incompatible with this explanation (Vsekhsviatskii, 1972, 413-418)

b. ***Asteroids*** are an unlikely source for two reasons: their composition is much different than that of comets, and they orbit the sun in a different plane.

c. Some have proposed that ***volcanic eruptions on Jupiter*** produce comets. This is unlikely for several reasons:

i. Nobody has ever seen it happen.

ii. An object would have to travel over 133,000 miles per hour to escape Jupiter's gravity. Such speeds would produce so much friction with Jupiter's atmosphere that the object would vaporize.

iii. Space probes have flown close enough to several comets to show that they have a different chemical composition than Jupiter does.

Visual #9-35

Since no one has ever seen new short-period comets form, the most popular evolutionary explanation for where they come from is the "Oort Cloud," a hypothetical sphere of about 200 billion comets far beyond the edge of the solar system and beyond our ability to observe. Every so often, the story goes, new comets are dislodged by gravitational effects from nearby stars and fall into short-period orbits around the sun.

R.A. Lyttleton is one of those who has raised mathematical objections to the Oort Cloud hypothesis (Lyttleton, 1974, 385-401). The most obvious problem, though, is that no one has ever seen the Oort Cloud. It was invented to avoid the obvious conclusion that the solar system is only a few thousand years old.

Visual #9-36

Another common hypothesis in the search for comet ancestry is the "Kuiper Belt." Dutch astronomer Gerard Kuiper proposed in the early 1950s that there should be hundreds of millions of small objects orbiting the sun beginning at Neptune and extending past Pluto. In 1995 astronomers' hopes of finding such objects were at least partially fulfilled by the Hubble Space Telescope. Mixed in among the static of some extremely faint Hubble images are tiny blips thought to represent a few dozen Kuiper Belt objects. These are believed to range in size from a few kilometers to a few hundred kilometers across. Based on these questionable blips, astronomers believe there are hundreds of millions of comets in the Kuiper Belt just waiting to be dislodged and go into short-period orbits (Flamsteed, 1995, 80-90).

It doesn't solve the problem. The Kuiper Belt is in roughly the same plane as the orbits of the planets. However, the great majority of short period comets orbit at considerable angles to this plane. (This is why the Oort Cloud is supposed to be spherical; comets come in from all different directions.) The Kuiper Belt might be able to account for some comets that orbit in the plane of the solar system with a period of less than 20 years, but they are a small minority. There is still no evolutionary explanation for the vast majority of short period comets. Their presence points toward a young age for the solar system.

2. ***THE RINGS OF SATURN.*** (Slusher, 1980a, 65-72)

Visual #9-37

Many of us have marveled at the beauty of Saturn's rings. But when NASA's Voyager spacecraft flew by the planet, scientists were stunned. Many newspaper reports said that the rings "appeared to defy the laws of physics." They were much thinner and less stable than anyone had previously thought. They are so unstable that they would have disappeared within a million years -- and since we have already decided that the solar system is billions of years old, the laws of physics must be wrong!

The alternative: Since most astronomers agree that the rings had to form at the same time as the planet, it would seem that Saturn - and presumably the rest of the solar

system - is no more than a million years old. Of course, this destroys evolution so it can't be allowed.

3. VOLCANIC ACTIVITY ON IO.

Most evolutionists believe the planets and their moons formed about 4.5 billion years ago. At the time, each of them is supposed to have consisted of a superheated ball of gas which gradually cooled to a liquid, then a solid. Since very little of the sun's heat reaches the outer planets and moons, almost all the heat they contain should be left over from the beginning. The smaller bodies should be cold and geologically inactive.

Visual #9-38

In 1979, the Voyager spacecraft shocked astronomers as it flew by Jupiter's tiny moon Io. Io receives almost no energy from the sun, so if it really is 4.5 billion years old, it should be only a few degrees above absolute zero. Yet as the cameras photographed it, a volcano erupted with more force than any ever seen on earth, spewing fire and brimstone over a hundred miles into space. NASA technicians have since discovered that there are at least six active volcanoes on Io. (A later discovery is that Saturn's moon Enceladus -- even farther away from the sun -- is also very active geologically, with violent geyser eruptions.)

In an attempt to explain how this tiny moon could still be hot after all this time, evolutionists have proposed several scenarios:

a. Gravitational Pumping.

According to the "gravitational pumping" hypothesis, the gravitational pull of Jupiter continually makes Io's crust flex, keeping it hot because of friction.

Such a belief overlooks the fact that Io, like many of the moons in the solar system, always keeps the same face toward the planet it orbits. Because it is not turning with respect to Jupiter, there would be no reason for its crust to flex. Even if the gravitational pumping idea were correct, Io would be heating from the outside in. Instead of a solid surface with a few volcanic openings, it should have a surface of molten rock. Since it does not, this explanation is unlikely.

b. Electrical Heating.

Some think that the heat comes from electric currents induced by Io's motion through Jupiter's magnetic field. However, if this is correct, it is further evidence that Io must to be young.

A charged body moving through an electric or magnetic field encounters resistance. Unless something keeps pushing it, it slows down. Due to Jupiter's strong electric field, NASA estimates a continual current flow of about five billion amperes between Jupiter and Io. This much current would induce a great deal of resistance to Io's motion. Within a relatively short time, far less than billions of years, it would slow down enough to spiral in and crash into Jupiter's surface.

c. Radioactivity.

It would take far more radioactivity than the amount detected so far to produce the amount of heat needed to melt Io.

The obvious conclusion is that Io is quite young, much less than a million years old.

4. EXCESS HEAT IN JUPITER, SATURN, and NEPTUNE. (Samec, 2007, 30-35)

Visual #9-39

The most common evolutionary scenario for the origin of the planets is the "planetary nebula" hypothesis, that they began in a swirling cloud of dust and gas over four and a half billion years ago. At the time the planets formed, their surface temperatures would have been thousands of degrees. A time went on they radiated heat into space. Logically, then, they would eventually reach a point of equilibrium where the energy they put out would match the energy they take in from the sun.

At least three of the planets -- Jupiter, Saturn, and Neptune -- aren't cooperating. Samec (2007) tells us that Jupiter puts out about 3×10^{17} watts more than it takes in, enough to power about 50,000 hundred watt light bulbs for each man, woman, and

child on earth. Saturn puts out about half as much as Jupiter but has only a fourth as much mass, so it emits twice as much energy per unit of mass. Neptune emits about twice as much energy as it receives.

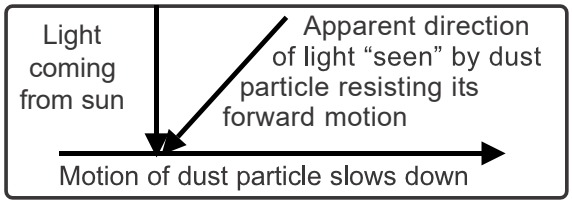
Where is all this excess energy coming from? There are two possibilities:

(1) Perhaps there is some unknown internal energy source such as nuclear fusion. One of the biggest problems is that fusion would require internal temperatures eight times hotter than current models of Jupiter allow, and which would be impossible under current models for Saturn and Neptune.

(2) Perhaps the planets are radiating excess heat into space because they are just not that old and haven't had enough time to cool down.

5. THE POYNTING-ROBERTSON EFFECT. (See Slusher, *The Age of the Cosmos*, pp. 55-64.)

Visual #9-40



Suppose you were driving down the road and it began to rain. Suppose also that there was no wind. Even though the rain was falling straight down, it would look to you as if it were falling at an angle to your windshield. Because your car would be moving across the rain's direction of travel it would encounter resistance from the rain. If not for the energy furnished by the engine, the car would slow down and eventually stop.

The same thing happens to dust in orbit around the sun. As the dust orbits, it crosses the path of light streaming from the sun. Even though light has no known mass it still possesses momentum.

Because of this, small dust particles in space slow down because of the drag imparted by light, and eventually fall into the sun. (This is known as the Poynting-Robertson Effect, named after British physicist J.H. Poynting and American physicist H.P. Robertson.) Slusher shows (p. 60) that within 189,000 years after the solar system began, all dust particles 1/10 mm or smaller would have been "vacuumed up" at least as far as earth's orbit. Yet millions of tons of this fine dust fall on the earth and moon every year. Space probes heading toward Venus, even closer to the sun, have also encountered a great deal of dust. It should all have disappeared billions of years ago. The presence of so much dust orbiting the sun implies that the solar system's age should be measured in thousands of years, not billions.

6. RECESSION OF THE MOON. (Sarfati, 1998, 36-39)

The moon orbits the earth at an average distance of about 384,000 kilometers, or 240,000 miles. Its gravitational force is strong enough to cause a bulge in the earth and move entire oceans to produce tides. As a result, the earth's rotation is slowing down at a rate of about 2/1000 of a second every century.

Because of its rotation, the earth-moon system possesses angular momentum. (See Chapter 7 regarding rotating galaxies). The Law of Conservation of Angular Momentum says that this quantity remains constant unless an outside force causes it to change. Since angular momentum is the product of velocity times diameter, any decrease in the speed at which an object or system rotates must be offset by a proportional increase in its diameter.

Visual #9-41

You can see this in the way a figure skater on TV starts spinning slowly with arms outstretched, then pulls them in and spins faster and faster. Conversely, as the earth-moon system slows in its rotation, it must increase its diameter. The moon has to recede from the earth in order to conserve the system's angular momentum. Direct observation (e.g., bouncing laser beams off the moon) shows that the rate of recession is between 3 and 4 cm/year.

Dr. Jonathan Sarfati points out that the forces exerted by the moon and the earth on each other are inversely proportional to the cube of the distance between their centers. The rate of recession is thus inversely proportional to the sixth power of the distance. In other words, the closer the moon is to the earth the faster it recedes, and the farther it is the more slowly it recedes. If the moon had started out so close that it was rubbing the surface of the earth, it would have taken only about 1.37 billion years to reach its present distance.

This is not to say the earth/moon system is really that old. The moon could never have been that close. What it does show is that the system has far younger than the 4.6 billion years demanded by evolution -- at least 3.2 billion years younger. It could be any age less, depending how far away the moon started. Even if it were 1.37 billion years, this is far too short for evolution to occur.

7. ***THE SUN'S SOURCE OF POWER*** *- an outdated young-sun argument NOT to use.*
Different types of nuclear fusion produce exotic particles called *neutrinos*, which can occur in three "flavors": *electron*, *muon*, and *tau* neutrinos. The type of fusion believed to occur in the sun produces only electron neutrinos. For many years it was thought that the sun produced only about a third of the number expected according to theoretical physics. Many creationists, including this author, used this as an argument that large-scale fusion does not seem to be happening in the sun and that it thus would have burned out in far less than billions of years.

It turns out that the theoretical model of neutrinos was wrong. In June 2001 several international teams announced that they had developed more sophisticated techniques for detecting the tau and muon varieties, and that even though the number of electron neutrinos coming from the sun is less than expected, the total number of muon and tau neutrinos makes up for it. In some way not yet understood, neutrinos seem to be able to change between the three forms. It seems the sun is performing nuclear fusion after all, so this is no longer a good argument for creationists to use.

8. ***THE SOLAR TEMPERATURE DILEMMA (Faint Young Sun Paradox)***

Visual #9-42

If fusion has been the sun's power source for 4.6 billion years, it could not have furnished the right conditions for life to begin.

The sun's temperature would have been steadily increasing throughout its life. A billion years ago, it would have been about 5 percent cooler than at present. While this doesn't sound like much difference, it would be enough that the earth would have been frozen in a crust of ice. (Ackerman, 1986, 60) The evolutionary time scale dates the oldest plants (*stromatolites*, also known as cyanobacteria or blue-green algae) at over three billion years, when the earth would have had to be colder still. They could not have survived under freezing conditions. The evolutionary dilemma: if the sun does not get its energy from fusion it could not be billions of years old. If it does, the earth would have been far too cold for life to begin. The solution? Maybe the earth and sun are not billions of years old after all.

9. ***ARGUMENTS FOR A YOUNG SUN.*** (The following is from Keith Davies, "Evidences for a Young Sun," ICR *Impact* article #276, June, 1996, available from ICR.)

   a. ***Abundances of Lithium and Beryllium.***

   The standard model says that a star the size and age of the sun should have a temperature of about 15 million degrees. However, direct evidence suggests otherwise.

Visual #9-43

Lithium nuclei break down into protons, neutrons, and/or alpha particles (two protons and two neutrons, forming the nucleus of a helium atom) above 3 million degrees. Since the sun has only 1/1000 of the initial amount of lithium to be expected in a star its size, it is reasonable to believe its temperature is at least 3 million degrees. Beryllium, on the other hand, breaks down at 4 million degrees. The sun has about the amount of beryllium expected in a new star. Either the standard model

is wrong or the sun has not been burning long enough to reach the temperature needed to destroy beryllium. Maybe it is not as old as it is supposed to be.

These recent discoveries have astonishing ramifications. Remember that the Hertzsprung-Russell Diagram is crucial in calculating the distances of most stars. We use a star's spectral class to determine its temperature, which we then use to calculate its absolute brightness and distance. Yet the sun is our next door neighbor and we've been wrong about its temperature all along! How can we be sure we are right about *any* star? All the H-R distances and ages are suspect. We have no way to know how big or how old the universe is.

b. Period of Radial Oscillation.

Imagine you hit a rubber ball with a bat. If you could measure precisely enough, you would see that the shock wave caused it to compress, expand, compress, expand, etc. until it stabilized again. This is called *radial oscillation*. The period of oscillation depends on the size and density of the ball. A hard rubber ball would oscillate much faster than a ball of Jello, while a ball of Jello with a hard rubber core would have yet a different period.

What does this have to do with the sun? Plenty. The sun is supposed to be a Main Sequence star (see Chapter 7). The standard model for a multi-billion-year-old star its size predicts that it should have a dense core around 350,000 km in diameter surrounded by a gaseous outer layer. The interaction of gravitational and nuclear forces should cause it to expand and contract about once an hour. However, recent observations have shown that it oscillates every 2 hours and 40 minutes instead. This period of oscillation is incompatible with a dense core, pointing instead to the conclusion that the sun is fairly homogeneous throughout. It must not have been around long enough to develop a dense core.

Though these arguments don't prove that the universe is young, they show that there is good scientific evidence to support such a belief. We can't prove the universe is less than ten thousand years old, but evolutionists can't prove it's twenty billion either. Whichever you believe, you have to take a step of faith. Do you prefer to base your faith on the word of men who weren't there, or the Word of God, Who was?

CHAPTER 9 REVIEW

A straightforward reading of the Bible implies that the earth is only a few thousand years old. Evolution requires billions of years.

1. Two arguments besides radioactivity are used to support a great age of the universe:
   a. If the universe started in a big bang, it would have taken billions of years to reach its present size.
   b. Since it would have taken billions of years for light to reach us from distant stars, the universe must be billions of years old.
2. There are answers to these objections.

a. Those who believe the inflation model must admit that the universe could have reached something near its present size in a short time after the Big Bang.

The distances to most stars are calculated by using the Hertzsprung-Russell diagram and the Hubble relation. However, the Hubble constant is not constant. Astronomers have calculated different values depending on the direction. Thus, this method is not a reliable distance or age indicator. We cannot use it to determine how big or old the universe is. Besides, some globular clusters have been dated at 16 billion years, a billion older than the universe itself. Something is wrong with the dating methods.

b. Light may travel in curved space, which would enable it to reach earth in just a few years from anywhere; it may have traveled much faster in the past; and it may travel much faster in deep space than it does close to earth. In addition, gravitational time dilation may have allowed billions of years worth of development to take place at the far reaches of the universe while only six days elapsed on earth. It did not necessarily take billions of earth years for light to get here.
c. Some believe that light may have slowed down from its initial velocity.
d. It is possible that the "Pioneer Anomaly" could be occurring because light travels faster in deep space than it does near the sun.
e. Gravitational time dilation is one possible answer to the question of how light could have reached the earth in only a few thousand years.

3. There are good arguments for a young universe.
   a. Breakup of galaxy clusters indicates maximum ages on the order of millions of years, not billions.
   b. Spiral galaxies would break up in much less than one billion years, but evolution requires between 7 and 15 billion.
   c. The similar chemical composition of stars of all "ages" indicates that they came into existence within a short time of each other.
   d. The number of supernova remnants is consistent with an age of a few thousand years, not billions.
   e. The presence of technetium in stars limits their possible ages to millions, not billions of years.
   f. The solar system seems to be quite young.
      i. Short-period comets indicate a maximum age of 10,000 years.
      ii. The rings of Saturn would break up in less than a million years.
      iii. Volcanic activity on Jupiter's moon Io indicates a young age.
      iv. The Poynting-Robertson effect on space dust indicates that the solar system's age should be measured in thousands of years, not billions.
      v. The moon would have been scraping the surface of the earth a mere 1.37 billion years ago.
      vi. Since the sun operates by fusion, it would have been about 5% cooler a billion years ago. The earth would have been covered with a crust of ice. Yet blue-green algae, which require the kind of temperatures found in the world today, are dated at over 3 billion years old. The sun could not have been much cooler at the time they lived. This is a problem if the earth is really billions of years old.
      vii. The sun's period of radial oscillation indicates that it does not have a solid core as an old star should; the presence of large amounts of beryllium indicates that it has not been burning long enough to reach 4 million degrees. This indicates that it is much younger than its supposed 4.5 billion year age.

None of these arguments proves that the earth and the universe are young, but none of the arguments for great age proves it is old either. Whichever we believe, we have to take a step of faith.