CHAPTER EIGHT

How Did the Universe Get to Its Present Condition?

As we saw in the last chapter, any model of origins must attempt to deal with four major areas:

Visual #8-1

(I) The origin of matter and energy.
(II) How matter and energy developed to their present condition.
(III) The origin of life.
(IV) How living things developed to where they are today.

We saw that no known natural process is capable of bringing matter and energy into existence, whether in a complex form as creation says or in a "singularity" as evolution requires. We also saw that there is no known process by which elements heavier than lithium could come together from protons, neutrons, and electrons. All of us, whether creationists, theistic evolutionists, or atheists, must admit that matter and energy came into existence by some process beyond the scope of science.

In this chapter we will deal with the next question: Once matter and energy came into existence, can known natural processes explain how they developed into the present universe? In Chapter Eight we will deal with a related topic: Is the universe old enough for evolution to have occurred?

- We will see that if we accept creation's premise of initial complexity (one event not explainable by known processes), known natural processes are sufficient from that point.
- If we accept evolution's premise of initial disorganization, known natural processes are not sufficient. We will need to appeal to unknown processes spread out over billions of years, whether operating by random chance or under the direction of God.

Thus, evolution requires a far greater exercise of faith than creation.

IV . ORGANIZATION OR DISORGANIZATION?

Visual #8-2

Scientific methods involve making a hypothesis and devising ways to test that hypothesis. Though we can't directly test whether the universe was disorganized or complex in the beginning, we can make testable predictions about the way the universe should be operating in the *present* if one or the other of these ideas is correct.

A. PREDICTIONS.

1. *CREATION: TENDENCY TOWARD DISORGANIZATION.*

Visual #8-3

Creation begins with the postulate that a creator started the universe in a complex, organized condition from which it has deteriorated ever since. Since He established laws of nature to govern the way it would operate, the laws of nature should include an overall trend toward deterioration. Thus, we expect that such a trend should still be evident in the present.

This is not to say that everything in the universe always deteriorates instantly. However, there should be an overall trend.

2. *ATHEISTIC EVOLUTION: TENDENCY TOWARD ORGANIZATION.*

Materialism begins with the postulate that random chance brought the universe and the laws of nature into existence in a disorganized state. Those laws have made the universe become more and more organized. Thus, we should find an overall tendency toward increasing organization throughout nature. This is not to say that everything in the universe always organizes itself instantly; however, there should be an overall trend.

3. *THEISTIC EVOLUTION: TENDENCY TOWARD ORGANIZATION.*

Theistic evolution begins with the postulate that a supernatural being brought matter and energy into existence in a disorganized state and put the laws of nature into effect. Since the universe has become more and more organized since then, one of these laws should be an overall tendency toward increasing organization.

B. ACTUAL OBSERVATION: Deterioration.

In physics, a *system* is any collection of matter and energy around which we can construct an imaginary box so as to consider it self-contained. A system is *open* if matter and energy can get in and out; it is *closed* if energy can get in and out but matter cannot, or it is *isolated* if neither matter nor energy can get in or out. First, we will consider what happens in isolated systems, then we will discuss open systems.

1. ENTROPY IN ISOLATED SYSTEMS: 2nd Law of Thermodynamics.

Throughout nature scientists have discovered a tendency not toward increasing organization but toward randomness. This tendency is described in the Second Law of Thermodynamics, perhaps the best documented principle in all of science. The Second Law is often expressed in terms of a measure of disorganization called *entropy* and says that the total entropy of an isolated system always increases. No matter what the system is composed of, it displays a steady tendency to move from organization toward randomness.

As the name "thermodynamics" suggests, the Second Law specifically applies to the flow of heat energy. However, since energy can be converted back and forth between different types (electricity to light, kinetic to heat, etc.), it applies to other forms of energy as well. Scientists have found that unless forced to do otherwise, energy always tends to flow from greater to lesser concentration. Not only that, but since every chemical bond in the universe contains a certain amount of stored energy, the Second Law implies that the molecules held together by this energy also tend to fall apart as the energy escapes. Nature tends to move away from concentrations of energy toward equilibrium. Something may delay the energy from spreading out, but there is still a tendency for it to do so.

Any way we describe it, the Second Law tells us that in an isolated system the probability of randomization is extremely high and the probability of increasing organization is virtually zero. Everything tends to fall apart.

a. Entropy and Energy.

Visual #8-4

In order for energy to be useful, there must be a greater concentration of it in one area and a lesser concentration in another. As the concentrated energy is used to do work, more and more of it is converted to randomly distributed heat. In the process, the system moves toward equilibrium. Since there is less difference between the energy levels of different parts of the system, less of the energy is available for useful work.

Consider the atoms in a star. They contain a great deal of nuclear and gravitational potential energy. As gravity pulls them together and nuclear fusion occurs they release energy into space in the form of randomly distributed light and heat. Though it may take a very long time, the star gradually cools as it moves toward thermal equilibrium with the region of space around it. It's a one-way process.

b. Entropy and Structure. (Thanks to Dr. Martin Ehde for the following illustration.)

Suppose you put a bottle of perfume in a perfectly sealed room. You arrange a robot arm to pull the stopper out of the bottle. What happens? The perfume gradually evaporates. After a few days nothing is left in the bottle but sediments. The fragrance is mixed evenly with the air.

Because there was a greater concentration of chemical energy stored in the bottle than in the air at the beginning, the system was not in equilibrium. As time passed and the perfume spread out randomly the perfume's structure became less organized. The entropy of the system became higher and higher. Because nature tends toward randomness and equilibrium rather than organization, we do not expect that the perfume will ever go back into the bottle of its own accord.

c. Entropy and Information.

Since entropy is a measure of disorganization or randomness, it can also be ex-

Visual #8-5

pressed in terms of a system's information content. In general, the fewer the instructions needed to produce a desired system, the greater its entropy and the less information it contains.

i. *Low information, high entropy.*
Imagine a handful of atoms of random elements randomly strewn throughout space. Neither the kinds of atoms nor their exact location matters. How many instructions would you need to give to someone who wanted to produce such a system? Not many. All you would have to say is "Scatter a handful of atoms of random elements randomly throughout space." Such a system would start out in a state of maximum entropy. Its information content would be at a minimum.

ii. *High Information, Low Entropy.*
Suppose instead that you wanted a highly ordered system -- an exact copy of the Empire State Building -- built on your property. How many instructions would you need? Millions, at least. You would have to specify exactly what materials were to be used in which places, what the wires were to be made of, what kind of screws and light bulbs, the exact composition of the fill in the sheet rock, the grain of the wood in the paneling, etc., down to the tiniest detail. Since the arrangement of energy and materials in the system would be anything but random, the entropy would be low and the information content high.

Let's isolate both the low and high information systems by putting imaginary boxes around them so nothing can get in or out. (Of course, we'll need to put in an internal electric generating plant complete with fuel to power the building.) Here's how the Second Law applies to their structure, energy, and information.

- In the first, both the energy and matter are already randomly distributed. Everything is at equilibrium. Entropy is high and information content is low. Though a few atoms might accidentally come together and form chemical bonds, there is always an energy cost. The system as a whole will not become more organized over time; if anything, it will become even more random as it releases energy to compensate for the chemical bonding.
- The second system starts with low entropy and high information content, but it won't stay that way. The chemical bonds will break down and the structure will deteriorate as the walls buckle, the ceilings crumble, and the steel beams sag. All the lights that haven't already burned out will go off when the power plant's fuel is gone. The atoms from the used up fuel will still exist, but only as pollution. The energy formerly in the fuel will be distributed as random, useless heat. As the components of the system move toward equilibrium, the information content decreases and the entropy increases.

d. *Entropy and Chemical Processes.*

If things tend to proceed toward randomness, how can chemical reactions take place at all?

Visual #8-6

Many molecules consist of more than one atom, often of more than one element. These molecules are held together by discrete amounts of stored chemical energy. The energy it is more or less localized, associated with the position of the electron orbitals of two or more atoms so that it holds the chemical bond together. Since the binding energy is localized it is relatively low in entropy.

Remember that the Second Law does not say that everything falls apart instantly, but that energy *tends* to move toward disorder. Depending on what kinds of atoms make up a molecule and how they are arranged, some molecules break down easily while others are quite stable. The less potential energy stored in a molecule, the more stable it is.

Even in relatively stable molecules, the tendency for the chemical bonds to break apart and release energy to the universe is still present. Several conditions can speed up the process of decay. In one case, if the bond is bombarded with sufficient energy (called the *energy of activation*), it will break. Even if there is not a source of external energy, quantum mechanics tells us that it is still possible for stored chemical energy to change to heat energy, delocalize, and go to a more randomized condition. If so, it will no longer hold the molecule together. Thus, even if there is no source of external energy, the molecule can still fall apart.

i. *Exothermic (heat-releasing) reactions.*

Visual #8-7

Water (H_2O) is a good example of a stable molecule. It forms when hydrogen and oxygen link together and release heat energy to the universe. Though the water molecule seems more organized than the separated atoms that compose it, when the hydrogen and oxygen combine they have less potential energy than if they remained separate. After joining, their atomic structure makes them bind together tightly so that it takes more energy to separate them than to hold them together. A relatively low energy of activation is needed to start the reaction to get hydrogen and oxygen together, but a relatively high amount is required in order to pull apart them apart.

Though it might sound like the system ends up with less entropy than it started with, this is not the case. The system also includes the surrounding environment. The individual atoms are more organized when bound than when separated, but a relatively large amount of heat is released to the surroundings as the chemical bonds form. The larger increase in entropy due to heat release more than makes up for the smaller decrease in entropy as the atoms become more organized.

The net increase in entropy makes the process by which hydrogen and oxygen combine to form water a *thermodynamically favorable* reaction. It can happen spontaneously apart from outside influences.

ii. *Endothermic (heat-absorbing) reactions.*

More complex molecules such as gasoline are different. When atoms such as hydrogen, oxygen, and carbon are subjected to a great deal of energy in the form of heat and pressure, they can store some of the energy in chemical bonds as they combine into crude oil. Even after we refine the oil into gasoline this energy remains stored in the molecules.

Though the increasing organization of the atoms brings about a temporary decrease in their structural entropy, it comes at a cost. By contrast to the hydrogen and oxygen atoms that *release* heat when they combine into water, the atoms that come together into oil *absorb* heat from the environment. In order to furnish enough heat, the environment has to increase in entropy more than enough to offset the decrease in entropy in the oil molecules.

Because the processes involved in producing oil require large amounts of heat, they are *thermodynamically unfavorable* and do not happen spontaneously. Likewise, gasoline does not come together by itself. That's why we have to build refineries.

The opposite reaction, burning, is *thermodynamically favorable.* Since the carbon and hydrogen atoms in gasoline are not tightly bound, it takes a relatively small energy of activation to break the bonds between them and start a chain reaction that also breaks down nearby molecules. The stored energy is freed in the form of heat. Though the products include relatively stable compounds such as water and carbon dioxide, there is an overall increase of entropy in the universe.

Thermodynamically favorable events can happen spontaneously in a closed system, but nobody has ever reported seeing thermodynamically unfavorable events occur in one. The reason that a great many thermodynamically unfavorable processes are able to occur in living cells is that they are open systems. They need an outside influence, as we will see shortly.

e. Entropy and the Fate of the Universe.

Visual #8-8

Given enough time, perhaps billions or trillions of years, we expect that even relatively stable molecules such as water will break down without needing an input of activating energy. This is because matter is made up of subatomic particles (protons, neutrons, electrons, etc.) which operate according to the principles of quantum mechanics. Though they usually act predictably, these tiny particles sometimes behave in bizarre ways. Likewise, the energy that holds them together (*quanta* such as photons) can behave very strangely.

These quanta act like particles in some ways but like waves in others. Because of this wave-particle duality we can only predict the *probability* that each one will behave a certain way. It doesn't always do the most probable thing. It may do something slightly less probable or even something extremely improbable. Over the short term each will probably remain as it is. However, given enough time, it will "probably" do something very improbable such as delocalize from the place it's been. Once it's gone, it has no reason to come back. If it was holding a molecule together, the molecule will come apart.

This means that if the universe really is a closed system as atheists believe, the most probable event of all is that its energy will move inexorably toward random distribution. Unstable molecules will deteriorate relatively quickly, while the most stable ones could theoretically remain as they are for trillions of years. Nevertheless, because of an individual quantum's ability to do the unlikely, it can spontaneously go to a different energy state and escape into the universe as random heat from even a relatively stable molecule. Once it leaves it is no longer available as useful energy. Thus, given enough time almost all the molecules in the universe will fall apart into their component atoms. (Even some of the atoms, the radioactive ones, will fall apart too.) The universe will die a "heat death" as it reaches thermal equilibrium just above absolute zero. It's not getting more organized; it's falling apart.

2. ENTROPY IN OPEN SYSTEMS.

Evolutionists argue that the Second Law is irrelevant to the creation/ evolution controversy because there is no such thing as a completely isolated system. If evolution is correct this is false, because evolutionists postulate that the universe itself must be an isolated system. (See Chapter 7.) But what about open systems, those which *are* subject to outside influences? In such cases a temporary reversal of the tendency toward increasing entropy is possible, but only under certain conditions.

a. Supply of Usable Energy.

Visual #8-9

There must be a supply of energy coming into the system from outside – not just any type of energy, but energy in a form usable by the system.

Let's consider a baby as an example of an open system. He needs energy to grow. Fine. We'll give him plenty by setting off an atomic bomb next to him. Will he grow? Of course not. It's the wrong kind of energy. He needs a specific type of energy available only in the form of food.

b. Conversion Mechanism.

Visual #8-10

There must be a mechanism to convert the supply of energy into a form usable by the relevant parts of the system. We can pile lobsters and steaks around our baby but they won't do him any good because his digestive system is not yet mature enough to break them down into the proteins he needs. Until he develops a proper conversion mechanism, he has to drink milk. He even needs a conversion mechanism for that!

Think about our perfume illustration. No matter how much energy we put into the room, the perfume is never going to un-mix from the air unless we put in a filtering mechanism to do the job. Energy by itself isn't enough.

c. Pre-Existing Information.

There must be a preexisting source of information guiding the increase in organization. Even with food and a digestive system, our baby needs a building plan -- DNA
Visual -- to put together new cell structures. Without DNA he will not grow. If he has
#8-11 defective DNA he will be deformed or dead. And in our perfume illustration, somebody has to design the mechanism that gets the perfume out of the air and back into the bottle. It will not just materialize by itself.

Information vs. Order.

Some evolutionists confuse information with order. They argue that order can
Visual increase spontaneously in crystalline structures such as ice. While this is true, the
#8-12 argument is irrelevant to the study of life.

In any chemical process, whether in an open or closed system, there is an interplay between energy (*enthalpy* -- the heat absorbed or released by the process) and entropy. Chemists use the equation

$$\Delta G = \Delta H - T\Delta S$$

to describe this interaction. (The Greek letter delta, Δ, is used to represent the difference between the before and after conditions of the reaction.) ΔG stands for the energy absorbed from or released to the universe, ΔH stands for the enthalpy change, T stands for the temperature in Kelvins, and ΔS stands for the entropy change. Only when ΔG is negative, that is, when energy is released to the universe, does a process occur spontaneously. This can happen under one of three conditions:

- If the process releases heat (the enthalpy change ΔH is negative) and the entropy increases because $T\,\Delta S$ is positive then both factors will be negative, giving a negative ΔG.
- If the process absorbs heat (the enthalpy change is positive) but the entropy due to $T\,\Delta S$ increases more than enough to offset it, then subtracting the larger $T\,\Delta S$ gives a negative result.
- If the entropy decreases ($T\,\Delta S$ is negative) but the process releases more than enough heat ΔH to offset it, then the more negative ΔH also gives a negative result.

The formation of ice is an example of the third set of circumstances. Though there is a decrease in the entropy of the water molecules as they link into crystals, the overall entropy of the universe increases as the molecules release energy in the form of heat.

Besides the release of heat, let's also consider the role of information in the formation of ice. There is no more information in the solid vs. liquid states of water or any other substance that forms crystals. Using water as an example, the solid form (ice) is more orderly than the liquid form only because the molecules slow down enough to link together. However, the arrangement of the crystals is determined by the atomic structure of hydrogen and oxygen.

Water is not a straight molecule with an oxygen atom sandwiched between two hydrogens; instead, there are two unshared pairs of electrons on the oxygen atom that deform the molecule to about a 109° angle, somewhat like Mickey Mouse ears with oxygen (negative) as the head and the two hydrogens (positive) as the ears. Crystals do not form until the water molecules slow down enough for the positively charged hydrogen ends to link up with the negatively charged oxygen end of others nearby, but the potential for the crystalline structure is present even in the liquid and gaseous states. No information is added as they cool down to form ice crystals.

We can illustrate the difference between order and information as follows. Suppose we take a random assortment of 113 letters:

Visual #8-13

VTERABUTSHEOLHGFOEHNWYTEHTSVDHEAONTIEVHL
STEHIDVOAVLDEHTUOIORSPEGELORSBOHILEDOERTO
NATBOELIMSOEAFRLINSTHENGNIHTVEGW

If we put them in alphabetical order it comes out like this:

Visual #8-14

AAAAA BBB DDDD EEEEEEEEEEEEEEEEFF GGGG
HHHHHHHHHHH IIIIIII LLLLLLL M NNNNNN OOOOOOOOOOOO
P RRRRR SSSSSSS TTTTTTTTTTT UU VVVVVV WW Y

It may be orderly, but it doesn't mean anything. However, when these same letters are arranged in a specific way, they say

Visual #8-15

FOR GOD SO LOVED THE WORLD THAT HE GAVE HIS
ONLY BEGOTTEN SON THAT WHOSOEVER BELIEVETH IN
HIM SHOULD NOT PERISH BUT HAVE EVERLASTING LIFE.

This arrangement contains not just order but information.

In order for a collection of matter and energy to form a living cell with all its complex parts, it must contain not just order but a vast amount of information. The information determines the specific pattern in which the cell's atoms are arranged into amino acids, proteins, DNA, and the like. This kind of specified complexity is exactly the opposite of what happens when chemicals are left to themselves.

d. ***Entropy Increase at the Energy Source.***

Visual #8-16

Any open system is part of a larger system that also includes the energy supply. In order for entropy to decrease in the smaller system, it has to increase at least as much at the energy source. For example, a teenager uses a hamburger as fuel for growth. The hamburger came from a cow that ate plants that grew by getting energy from the sun. The plant, cow, and teenager temporarily decrease in entropy as they grow, but the sun's entropy increases at least as much as theirs decrease. There is always a cost.

There is not a single documented case of either an open or closed system spontaneously increasing in organization apart from these conditions.

Remember, evolutionists argue that living things are open systems and thus immune to the Second Law of Thermodynamics. While the term "Second Law" applies specifically to closed systems, the tendency toward increasing entropy applies to living cells as well as everything else.

- Entropy allows simple components of cells such as amino acids to come together spontaneously because they are thermodynamically favorable. (ΔG is negative in the aforementioned equation $\Delta G = \Delta H - T\,\Delta S$.)
- The more complex components such as proteins and DNA are thermodynamically very *un*favorable. Entropy prevents them from coming together apart from the conditions described above.

Because living cells are open systems that meet all the conditions described above, they can decrease in entropy for a while. Nevertheless, since they consist of matter and energy far out of equilibrium with their surroundings, they eventually fall prey to entropy. They die, causing thermodynamically unfavorable reactions to stop abruptly. The tendency toward increasing entropy takes over and they begin to decay into simpler, more thermodynamically favorable substances. It's a one-way process.

3. *CHAOS THEORY.*

Visual #8-17

Some evolutionists look for support to Ilya Prigogine, Nobel Prize winner for his work in chaos theory. Prigogine received his award for devising a mathematical model which showed that under chaotic conditions, temporary local areas of order could occasionally develop. However, this has nothing to do with evolution.

a. Lack of Experimental Verification.

This is a mathematical model. Such a process has not been observed in nature. It's one thing to say something *can* happen, but quite another to say that it *does*.

b. Lack of Relevance.

Evolution is supposed to involve the entire universe. It requires something far more comprehensive than Prigogine's model, which deals with chaos on a microscopic scale.

c. Instability.

Since evolution requires a series of events to build one upon another, evolutionary changes would have to be stable. Those in Prigogine's model are not. The local areas of order are transient and break down quickly.

No scientist has observed either creation, atheistic evolution, or theistic evolution. Each belief requires a step of faith. However, creation's concept of initial complexity leads us to predict the First and Second Laws of Thermodynamics, verified through centuries of observation and experimentation. The evolutionary concept of initial disorganization requires that we discard them and look for some unknown process instead. Creation requires us to believe that the laws of nature were superseded only once, by an intelligent designer; evolution requires us to believe that they have been violated countless times, whether by random chance or by deliberate action of the designer. Which step of faith is more reasonable?

V . THE BIG BANG.

Visual #8-18

Suppose you walk into a kitchen and see a fried egg on the table. The most likely explanation for how it got there is that somebody cooked it. But what if you refused to believe in the existence of a cook? If you were creative enough you could probably come up with an alternative. Perhaps a distant star exploded in a supernova, sending out a tremendous burst of energy that bounced off a satellite and hit a chicken. The chicken exploded, releasing an egg which was so hot that the shell cracked and fell away while the contents became cooked sunny side up before it finally landed it on the table. Of course, this is not very likely; but if you were clever enough at mathematics, you might be able to come up with some equations to show that it *could* have happened. Any time you ran into trouble with your equations, for instance, as the egg approached a closed window, you could introduce hypothetical force fields that appeared and disappeared as necessary to open and re-close the window. Let's call them "eggs fields." If you made your math persuasive enough, you might convince someone that's how the egg got there.

Visual #8-19

Ridiculous, isn't it? All of us instinctively recognize the previously mentioned principle of logic known as "Occam's Razor," , which says that "Entities should not be multiplied beyond necessity" – in other words, the simplest explanation that fits all the facts is usually the best. Yet evolutionists spend billions of tax dollars trying to come up with elaborate made-up stories of how the universe got here. They have to. The evidence argues so strongly against a natural explanation that it takes a great deal of imagination to keep the government grants coming in.

Visual #8-20

Most evolutionists reject the Biblical account which says that God made the heavens and the earth, and that the earth was in darkness and covered with liquid water before light appeared. (They don't want to admit there was a cook.) Instead, they say that all the matter and energy in the universe first appeared in a singularity - a single, unimaginably dense mass the size of an atom. This cosmic egg then exploded in a flash of light known as the "Big Bang" and

Visual #8-21

started evolving into the present universe. Billions of years later, the earth finally cooled from molten rock and reached the temperature where water could exist as a liquid.

There are dozens of big bang models, each of which contradicts the others in key areas. However, all of them rely on the same rather bizarre presuppositions. Most people who believe in a big bang are unaware of these presuppositions and think of the big bang as if it were just a big explosion. The theory is far more complicated. It seems that few besides theoretical physicists are aware of the true implications of a big bang.

A. PRESUPPOSITIONS OF BIG BANG THEORY. (From Humphreys, *Starlight and Time*, pp. 86-99)

Remember that the most fundamental axiom of evolution is that everything must be explainable by purely natural processes. The Big Bang idea is an attempt, based on that bias, to get rid of the need for God.

From the perspective of the earth, the overall distribution of matter in the universe seems roughly the same in any direction. It looks like we are near the center. However, because evolutionists attribute everything to natural processes they think that the earth and its inhabitants are nothing special and do not have a special place in the universe. In order to explain away our apparent central position, they say that the universe should look pretty much the same in any direction, no matter where you look from.

How could this be? After all, if you are standing at the edge of the universe and look toward the center you will see a great deal of matter, while if you look the other direction you will see nothing at all. Evolutionists respond that you don't understand - there is no edge.

Like evolution in general, this belief is based on axioms. Some of them require us to think of space in ways contrary to our experience; all are necessary in order for the mathematics of a big bang to work. There is no way to test any of them. They must simply be taken by faith.

1. EXPANSION OF SPACE.

Visual #8-22

A big bang would not be like a bomb going off and expanding through three- dimensional space. There would have been no "space" outside the singularity. Space itself expanded along with the expanding cloud of matter. Since "inside" and "outside" refer to positions in space, it is meaningless to ask what was outside the expanding cloud. There was no space for there to be an outside. (Yes, it sounds weird, but that's the way the theory goes.)

Imagine you mark two points on a balloon, then begin to inflate it. The two points will be two inches apart, then three, four, five, and so on as it expands through preexisting space. This is how we picture the universe according to classical physics. However, according to the non-Euclidean geometry required by the big bang, the balloon *is* space. As it expands, the two point maintain their relative positions. Even though the physical distance between them increases, they are still at the same positions in "balloon-space" they were from the beginning. The balloon has not expanded through space; space itself has expanded.

2. FOUR-DIMENSIONAL SPACE.

The balloon illustration is far too simple. All the big bang models depend upon general relativity, which requires space to be curved. It has to have four spatial dimensions, not three. We just can't figure out which direction the fourth is. (There is also a fifth dimension, time, in the equations of relativity.)

Visual #8-23

Imagine a completely flat ant living inside a piece of paper. He can see two dimensions (front to rear and side to side), but the paper prevents him from knowing that there is a third dimension. "Up" and "down" are meaningless to him. Even if the paper were curved around like a balloon, he couldn't detect it. All he can see is what's near him.

According to general relativity, we are the ants. Instead of living inside a piece of paper, we live in a universe that curves back on itself, just as if we were trapped inside the surface of a balloon. Our universe is actually the three-dimensional surface of a four-dimensional "hypersphere." We have no way to detect the fourth dimension of space because we have no way to get out of the balloon's surface.

3. SPEED OF EXPANSION.

Though matter cannot travel faster than the speed of light in its local region of space, there is no theoretical limit to how fast space itself can expand. Matter at the opposite edge of the universe (whatever "opposite" means in four dimensions) could be moving away from us faster than the speed of light, as long as it was not moving faster than light with respect to its local area of space.

4. UNBOUNDED SPACE.

Visual #8-24

This 4-dimensional geometry points toward a bizarre conclusion. Because we are confined to the 3-dimensional surface of the 4-dimensional balloon, no matter which direction we travel we can never reach its end. We will eventually arrive back at our starting point. Since the balloon represents space, no matter how far we travel we can never come to the outer edge of the universe. In the terminology of physics, the big bang requires the universe to be unbounded. By contrast, if space is 3-dimensional like an ordinary balloon, then it has a center and a definite boundary. Such a universe would be bounded.

5. THE COSMOLOGICAL PRINCIPLE: No Preferred Frame of Reference.

Visual #8-25

We have now arrived where evolution requires us to be: in an un-special place where God is not needed. To carry the balloon illustration farther, imagine that we are trapped inside the surface of a roughly spherical balloon. No matter where we go, things look pretty much the same. There is no special place on the balloon where things look radically different. In other words, there is no preferred frame of reference.

This is known as the *cosmological* or *Copernican* principle, after the astronomer Copernicus. It follows logically from the requirement of unbounded space. No matter where in the universe you go, things will look roughly the same in any direction. You can never come to the middle or the edge because those are three-dimensional concepts that do not apply in four-dimensional space. (Contrary to the Oscillating Universe model, there is no center for gravitational forces to point toward.)

We cannot think of a big bang as just the biggest explosion of all time. It requires us to accept at least five bizarre presuppositions that have nothing to do with testable science and everything to do with philosophy. The motivation is, *How can we get rid of that cook?*

B. CRITIQUE OF BIG BANG ARGUMENTS.

Now that we see the beliefs underlying the big bang, we can begin to examine the arguments in its behalf. Despite the fact that the dozens of big bang models contradict each other in key areas, all of them have two predictions in common: (1) The universe must be expanding, and (2) there should be some leftover evidence of the initial explosion. (By comparison, we will look in the next chapter at a Biblical creation model that implies expansion in the past, but not necessarily in the present.)

Visual #8-26

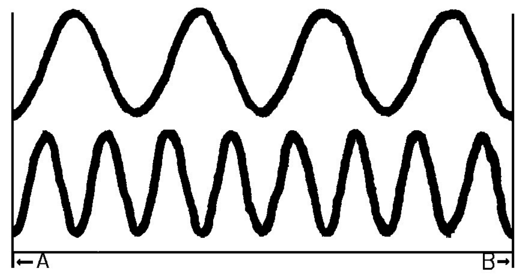
What do we find? If a Big Bang occurred, it would have taken place billions of years ago, so any direct evidence would have long since faded away. Evolutionists base their belief in the big bang on two pieces of *indirect* evidence: (1) the "Red Shift" of starlight and (2) the Cosmic Microwave Radiation, or CMB. Since both of these have to do with properties of electromagnetic waves, you should make sure your students understand some basic terminology.

WAVES, FREQUENCY, AND WAVELENGTH

Shown are simplified graphs of two waves. (For purposes of illustration, we use two-dimensional drawings. Waves are usually three-dimensional.)

Visual #8-27

If the distance between points A and B represents one second, the upper wave goes through a cycle of minimum to maximum and back four times a second, while the lower goes through eight cycles per second. The upper has a *frequency* of 4 hertz (Hz), while the lower has a frequency of 8 Hz.



If the space between A and B represents distance instead of time, we measure *wavelength* rather than frequency.

Suppose A and B are one centimeter apart. The wavelength of the lower wave is 1/8 cm, while that of the upper is 1/4 cm. (For extremely short wavelengths, we use nanometers. One nm =10^{-9} meters.)

Visible light has a wavelength between 390 nm (extreme violet) and 760 nm (extreme red). Its frequency is between about 10^{14} and 10^{15} Hz. Microwaves have a wavelength between a few millimeters and a few centimeters, and a frequency from about 10^{10} to 10^{12} Hz.

For electromagnetic waves, the frequency times the wavelength = c, the speed of light (about 3 X 10^{8} meters per second in a vacuum).

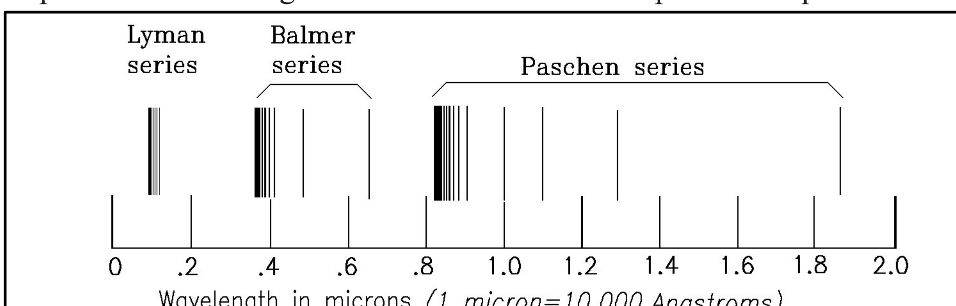
1. RED SHIFT OF STARLIGHT.

The most widely accepted argument for a big bang is the belief that the universe is still expanding as a result of the explosion. This belief is based on the "red shift" of starlight, which most astronomers attribute to the Doppler effect. This effect is responsible for the way a passenger on a railroad train hears the bell at a crossing seem to make a higher-pitched sound as the train approaches and a lower-pitched sound as it leaves. The apparent shift in wavelength occurs because of the relative motion of the source and the observer toward or away from each other. The phenomenon applies not just to sound but to light and all other forms of electromagnetic radiation as well.

Visual #8-28

So what does this have to do with a big bang? Starlight comes from great numbers of individual atoms in distant stars releasing or absorbing energy. Each atom has electrons which can jump from one energy level to another in discrete steps. Since each element has a different combination of possible energy levels, each has a unique set of available electron jumps which show up visibly when the electrons absorb or release quanta of energy (photons) of specific wavelengths. When viewed on a *spectrometer*, these produce visible bright or dark colored lines in a pattern unique to that element.

Visual #8-29



Spectral lines of hydrogen. Lines are bright as the atom releases energy (higher to lower energy state) and dark as it absorbs it. (After Halliday and Resnick, *Physics*, John Wiley & Sons, NY, 1962)

Visual #8-30

Since stars are composed mostly of hydrogen, they should produce mainly hydrogen spectra such as the one above. However, we often see something different. Though the pattern is recognizable, it is usually shifted toward the red (longer wavelength) end of the spectrum. Most astronomers believe this red shift is a Doppler effect produced by high speed motion of the stars away from us. They interpret it to mean that the universe is still expanding rapidly due to the big bang. However, there are other possible explanations for red shifts (Sagan, 1980, 255-256).

a. Transverse Doppler Shift.

Visual #8-31

It is not necessary for two objects to move directly toward or away from each other in order to produce a Doppler shift. If an outside observer sees them moving at an angle to each, the observer will note a *transverse* Doppler shift due to sideways motion. A certain amount of transverse red shift would occur if the universe were rotating around two centers rather than expanding (Ellis, 1978, 87-94).

It might take hundreds of years of observation to determine how much of an object's shift was due to expansion and how much to transverse motion. Since the equipment to detect red shifts has existed for only a few decades, it would be foolish of us to say that transverse motion could not be a factor.

b. Gravitational Red Shifts.

Gravitational red shifts are a well-known phenomenon of astronomy. In a sense, gravity stretches out the wavelength of light. When light passes through a strong gravitational field (such as that of the star which produced it) it receives a certain amount of red shift. The stronger the gravity, the greater the shift. The light from a massive star would start with a red shift even if it were not moving away from us.

Even if light came from a smaller star, the farther it traveled through space, the more gravity it would encounter and thus the more it could be red shifted. It stands to reason, then, that the farther away an object is, the more red shift we should see. It has nothing to do with a Big Bang.

c. Effects of Dust in Space.

Interstellar space contains a great deal of dust. Starlight passing through it is absorbed and re-emitted by the dust. The light comes out redder than it started.

d. Relativistic Red Shifts.

If we apply classical Newtonian physics to red shifts, a shift of 1 would mean that the star is moving away from us at the speed of light. Since some red shifts are greater than 4.5, Big Bang advocates must abandon classical physics in favor of relativity in order to avoid the impossible situation of stars moving four and a half times the speed of light.

The information on relativistic redshifts is from Sten Odenwald & Richard Tresch Fienberg, "Galaxy Redshifts Reconsidered," *Sky & Telescope*, Feb. 1993, pp. 31-35. Students wanting more details should read the complete article.

Using red shifts to determine the size of the universe or the velocity of stars is a grave mathematical error. Red shifts can be used to calculate size only in a special (as opposed to general) relativity model in which space and time are not curved but are essentially "flat" as in classical physics. As in traditional Euclidean geometry, the shortest distance between two points is a straight line. However, the Big Bang concept depends upon *general* relativity, in which space and time are curved. (There's that fourth dimension again!) Euclidean geometry is useless.

In a big bang model based on general relativity, we need to recall our illustration of space as an expanding four-dimensional balloon. Light has to travel farther and farther to get from distant objects to earth not necessarily because they have changed their position in space, but because space itself is expanding. As space stretches out, so does the wavelength of light traveling through it. This produces a red shift determined by the amount of expansion that took place while the light was in transit. If the size of the universe doubled the red shift would be the same whether the expansion took ten minutes or ten billion years.

Visual #8-32

Suppose we compare the light from two galaxies and find that the red shift of the first is half that of the second. All it means is that the universe doubled in size between the time the first and second galaxies emitted their light, not how long ago either galaxy produced the light or how far away either one is. Yet this is the precisely the argument astronomers use to determine how old and how big the universe is. *The argument is invalid.* The need to involve relativity means that we cannot legitimately use red shifts for either distance or age calculations.

Relativity defies intuitive understanding. The important point is that the Big Bang rests upon the non-Euclidean concept of curved space. We'll come back to this in the next chapter when we consider how long it took light to reach us from distant stars.

e. Uncertainty of Distance Calculations.

Visual #8-33

The distance to faraway objects is calculated using a formula called the Hubble relation (after astronomer Edwin Hubble, for whom the space telescope is named). The formula says that the red shift of a distant object is directly proportional to its velocity. However, there are serious problems.

- In order for us to use such a relation to calculate distances, we need to use Euclidean geometry. A Big Bang requires some form of non-Euclidean geometry. You can't have it both ways.
- The Hubble Constant used in the formula is not very constant. Presently accepted values range from 50 to 100 km/second/ megaparsec, an uncertainty of 100%. (A parsec is a *parallax second*, about 3.26 light years. Assuming that light travels the same speed in space that it does on earth, a light year is about 6 trillion miles.)

  The varying values could be explained by gravitational red shifts. Since there is not an exactly equal distribution of matter throughout space, we would expect that there would be somewhat of a "blurring" effect on red shifts from different directions.
- Some scientists argue that red shifts are instead proportional to the *square* of the velocity (Gentry, 1986, 283-292; Nicoll & Segal, 1982, 3913). If so, we are all wrong about distance and velocity calculations. This would mean the universe is much smaller and is expanding much more slowly than we thought.

Perhaps red shifts show that the universe is expanding, but perhaps not. The only thing we know about them for sure is that we don't know very much about them for sure.

1a. SIZE OF THE UNIVERSE.

Big Bang theorists tell us that the universe is billions of light years across. But how do they know that? We have very little actual data about objects in deep space. As astronomer Halton Arp says,

> "Cosmology is unique in science in that it is a very large intellectual edifice based on very few facts. Certainty in science cannot be forthcoming from minimal positions such as those which currently exist in cosmology." (Arp et al., 1990, 807-812)

To begin with, we cannot directly calculate the distance of any but the nearest stars, nor can we directly measure their velocity relative to us. No one has ever stretched a tape measure between the earth and the faraway heavenly bodies. For distant objects, we must use a series of interpretations of data, each of which depends on the accuracy of the steps leading up to it.

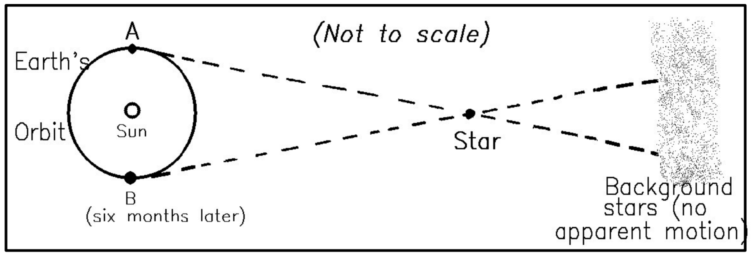
a. Triangulation.

Our average distance from the sun (about 93 million miles) is calculated by a process of triangulation against the sun and the stars as we move through a complete orbit in the course of a year.

b. Parallax.

You can easily see an effect called *parallax* by holding your hand out at arm's length with the thumb pointing up. Focus on an object some distance away, such as a wall. Without moving your head or hand, alternately close the right eye and open the left, then open the right and close the left. Because of the distance between your eyes, the thumb will seem to move back and forth. Likewise, because of the distance between the earth's position over a six-month period (from one side of its orbit to the other), the closer stars seem to move against the distant ones. However, the apparent change of angle is so small that we can only use parallax to calculate the distance to stars less than a few dozen light years away.

Visual #8-34



c. Main Sequence Method.

The next group of distances is calculated using the Main Sequence method. This relies on the Hertzsprung-Russell diagram, named after astronomers Ejnar Hertzsprung of Denmark and Henry N. Russell of the United States who began early in the 1900s to plot the relationship between surface temperature and luminosity (brightness) of stars (Dixon, 1984, 339).

The H-R diagram shown below is the key to calculating how far away most stars are. However, it involves some significant uncertainties.

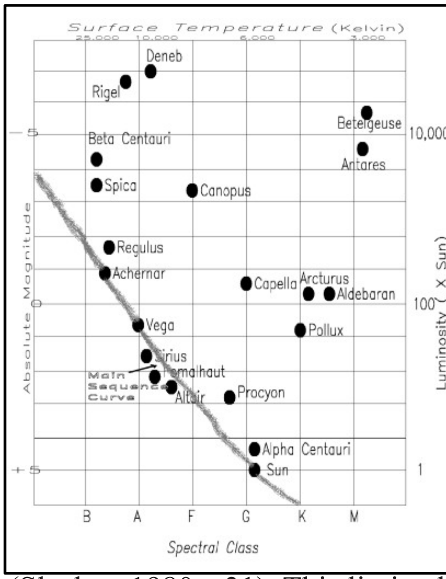
- We need to know a star's spectral class (the letters across the bottom of the diagram) in order to plot its position. We use its emission spectrum to determine the spectral class, but the spectrum we see on earth may not be exactly the same as at the star's surface. Interstellar dust and gas tend to absorb higher energy emissions such as ultraviolet (Snow, 1987, 371). If there is a significant amount of dust and gas between us and the star, we may not be getting a completely accurate picture of its spectral class. We have no way to know if this is the case.

> Note: If you want to practice examining and classifying the emission spectra of stars, you can download an excellent computer program called Speclab.exe for free from the "Project Clea" website at www.gettysburg.edu/academics/ physics/ clea/speclab.html. Though it takes for granted that there was a Big Bang, the program is an excellent introduction to spectroscopic analysis.

- In order to draw reliable conclusions, we also need to know the star's absolute magnitude or brightness (the numbers down the left side). We can determine the *apparent* brightness of a light source simply by looking at it. However, this doesn't tell us the *absolute* brightness (the brightness we would perceive at a standard distance, arbitrarily chosen as ten *parallax seconds*, or *parsecs*, with nothing blocking our view). Within our experience, a light's apparent brightness decreases by the square of the distance: as the distance doubles, the apparent brightness is only one-fourth as great, and so forth. Since we have no way to test this rule at multi-light-year distances, we can't be certain that it holds for distant stars – especially if space is curved as a Big Bang demands. In addition, other factors besides distance (e.g., interstellar gases) can affect apparent brightness and can lead us to be mistaken about both distance and absolute magnitude.

Visual #8-35

In order to determine absolute as opposed to apparent brightness, we must know how far away the star is. However, any distances we calculate beyond a few dozen light-years depend upon a series of assumptions - most importantly, that the H-R distances are correct. Since the H-R diagram requires that we *know* the distance of a star in order to determine its absolute brightness, we can't use it to *determine* the distance! Another problem with the Main Sequence Method: as stars go, those on the Main Sequence are not particularly bright (Slusher, 1980a, 31). This limits their usefulness in calibrating the distance of stars farther away than themselves.



Some familiar stars plotted on the Hertzsprung-Russell Diagram. (After Dixon, *Dynamic Astronomy*.)

d. Cepheid Variable Stars.

Visual #8-36

The next rung on the cosmic distance ladder is occupied by Cepheid (pronounced seh-fee-id) variable stars. These vary in brightness over periods ranging from one to a hundred days: the longer the period, the brighter the star. Distance to the Cepheids is calculated based on the assumption that the relationship between period and brightness is the same for all stars of this class no matter where in the universe they are.

This is a bold assumption by us who have never been outside our own star system. Perhaps it is true, but perhaps not. We have no way to be sure. We don't even know what causes the variation in brightness! Besides, only a few of these stars are found in galactic clusters whose distances have been determined by the Main Sequence method, so their usefulness as distance standards is also limited.

e. Absolute Magnitude of Brightest Stars and Supernovae.

Visual #8-37

Once we use Cepheids to decide how far certain galaxies are, we look for the brightest stars in those galaxies. We then assume that the brightest stars in every galaxy have the same absolute brightness as those, and use them as reference points for yet more distant galaxies. There is no way of knowing this assumption is correct either. If the Bible is accurate, it is probably false, "... for one star differeth from another star in glory" (1 Cor. 15:41).

Recommended resources: Kofahl & Segraves, The Creation Explanation, pp. 147-155; Slusher, Age of the Cosmos, pp. 25-28.

Evolutionists are so confident that they are right about the size of the universe that they apply the belief that all similar objects are equally bright to supernovae as well. This has caused a major problem. As many as 20 supernovae in distant galaxies are not as bright as the distance calculations based on red shifts said they should be. Rather than admit that they might be wrong about how bright these supernovae really are, evolutionists say that the reason they are dimmer than expected is that they are farther away than expected, because the universe is expanding at an ever-increasing rate.

Visual #8-38

It doesn't matter that no known force could make the universe expand faster and faster; we can always make up a story! The latest invention is that over eighty percent of the universe is made up of invisible, undetectable "dark energy" driving it apart. Rather than adjust the theory to fit the facts, evolutionists adjust the facts to fit the theory.

Visual #8-39

According to Occam's Razor, which is more sensible: believing that threefourths of the universe is an exotic, undetectable form of energy, or that we're wrong in our assumptions about the brightness of supernovae?

f. ***Galactic Red Shift.***

Visual #8-40

Finally, based on all the previous steps, we calculate the distance of most galaxies by using the Galactic Red Shift method. This relies on the Hubble relation, which says that the distance and relative velocity of the farthest observable objects are directly proportional to their red shifts. The method assumes that:

(1) *The currently accepted value for Hubble's constant must be correct.*
Astronomers have changed this "constant" repeatedly. Its currently accepted value is between 50 and 100 km/second/ megaparsec. Those who accept the lower value say the universe is about 7.5 billion years old; if the upper is correct, the indicated age could be up to 15 billion.

Where else but in evolution would scientists proclaim an uncertainty of a hundred percent as "proven scientific fact"?

(2) *The distance and velocity must be proportional to the red shift, not to its square,* and

(3) *Red shifts must be due only to the Doppler effect.*
We already saw that the theory of relativity rules out this possibility because it relies on non-Euclidean geometry. If there was a big bang, the expansion of space would be responsible for at least a large portion of the observed red shifts.

Because of these problems, we simply cannot rely on red shifts to determine how far away a distant galaxy is. Yet the Galactic Red Shift Method is precisely how astronomers calculate their distance. They have to simply ignore the crucial contradiction between the two forms of geometry.

1b. SOME PROBLEMS WITH SIZE CALCULATIONS.

No one would deny that the universe is vast. However, we should view the whole process of determining distances, especially the Galactic Red Shift Method, with a critical eye. Besides the fact that expansion is not the only possible explanation for red shifts, there are other problems. For instance:

a. Quasars.

Visual #8-41

Quasars ("quasi-stellar objects") are believed to be among the most distant objects in the universe because of their high red shifts, yet they are among the brightest objects in the sky.

At least in Euclidean geometry, the apparent brightness of an energy source drops off by the square of its distance. The problem is that quasars radiate far too much energy for an object of their supposed size and distance. The amount of energy any object can radiate is described by the Stefan-Boltzmann Law, which tells us that the energy output is directly proportional to the surface area and to the fourth power of the temperature.

We can deduce a maximum possible surface area for quasars from the fact that they exhibit a periodic change in brightness that repeats in less than a day. Since matter cannot travel at the speed of light, we conclude that they are not more than one light-day in diameter and use the geometric formula $A = 4 \pi r^2$ (r is one-half the diameter) to calculate the surface area. In astronomical terms this is not particularly large. A quasar would have to have an extraordinarily high temperature in order to look as bright as it does to an observer on earth, billions of light-years away. At the kind of temperatures required, the atoms in the quasar would be moving so fast that they would easily achieve escape velocity. The quasar would quickly burn itself out. Either we are wrong about the Stefan-Boltzmann Law, derived from observation, or else we are wrong about the size and/or distance of quasars, calculated using a series of untestable assumptions based on the requirements of a Big Bang.

Another problem: quite a few quasars have significantly higher red shifts than the galaxies to which they appear gravitationally bound. Some astronomers now admit that for these quasars, at least, red shift does not indicate distance (Burbidge & Hewitt, 1994, 32-33). If we can't use red shifts to tell how far away these quasars are, how can we be sure we can use them for anything else?

b. Quantized Red Shifts.

Visual #8-42

A recent discovery concerning red shifts has baffled big bang advocates. If the universe really underwent a big bang, we should see a continuous spectrum of red shifts. The galaxies nearer to us should have a lower shift, those farther away should have a higher shift, and those in between should have many in-between values. Yet to the amazement of astronomers, galactic red shifts fall into discrete groups with calculated velocities differing by a multiple of 72 km/sec (Tifft, 1992, 128; Guthrie & Napier, 1991, 533-544). If red shifts really indicate expansion, the galaxies are expanding in concentric shells like the rings of an onion.

Imagine a policeman on the highway checking motorists' speeds with a radar gun. He would think it very strange if every car were going exactly 50, 60, or 70 miles per hour, with no one driving at any speed in between. Yet the situation with red shifts is similar. A big bang would have produced a continuous range, but we can't find any in-between values. Either there was no big bang or else astronomers just don't know what red shifts really mean. In either case, one of the only two pieces of evidence for a big bang doesn't support it very well at all.

Visual #8-43

Creationists point out that there is a simple explanation for the quantization of red shifts. If the earth is somewhere near the center of a universe with many different shells of stars and galaxies (like the layers of an onion), it would make perfect sense for the stars to be arranged in discrete distance intervals. Of course, that defeats the purpose of evolution: to get rid of the cook!

Visual #8-44

All the big bang models predict that the universe should be expanding at high velocity. Biblical creation implies that the universe expanded some time in the past (at least 17 passages in the Old Testament say that God stretched out the heavens), but it is neutral on the question of whether the universe is expanding, shrinking, rotating, or staying the same in the present. In all fairness, then, we would have to say that rapid expansion would be a plus for evolution and neutral for creation. But while we haven't proved that the universe is *not* expanding, the uncertainty of red shifts shows that we just don't know very much about what's going on out there.

Now let's look at the other argument used in favor of a big bang, the microwave background radiation. (We *have to* get rid of that cook!)

2. COSMIC MICROWAVE BACKGROUND RADIATION (CMB).

Visual #8-45

Imagine a firecracker exploding in a large unventilated room. The smoke from the explosion would gradually spread until it was evenly distributed throughout the room. Likewise, evolutionists believe that microwave background radiation from the "primordial fireball" should eventually spread evenly throughout space. In 1965 Penzias and Wilson of Bell Telephone Laboratories discovered such a background radiation at 2.73 degrees above absolute zero. (They received a Nobel Prize in 1978 for their work.) This radiation has been used ever since as proof of the big bang. However, this "proof" has serious problems.

a. Energy Level of the Radiation.

According to the Standard Big Bang Model, the temperature of the singularity at the instant of the big bang (between 7 and 15 billion years ago) was billions of Kelvins. (Scientists do not refer to degrees Kelvin – just Kelvins.) Big Bang theorists believe that at such high energy levels matter was freely changing to energy

Visual #8-46

and energy was just as freely changing to matter. Thus, what we might call the "temperature" of the radiation and the temperature of matter were equal.

As the newly formed universe expanded, its temperature dropped. (We see such a temperature drop in a refrigerator. A hot gas is allowed to expand, resulting in a much lower temperature and keeping our ice cream cold.) After about 300,000 years, matter and energy had cooled enough to decouple from each other, that is, the energy left over from the fireball would go right through the matter without interacting with it. The radiation could no longer turn into matter. It would still have been about 3000 Kelvins.

In an attempt to explain how this 3000 degree radiation cooled to 2.73 degrees – almost absolute zero – Big Bang believers say that the decoupled radiation must have lost energy as the universe expanded. It imparted its energy to the fabric of space itself.

This is a very creative story, but there is nothing in experimental physics to back it up. Within our experience, pure energy does not behave like a gas. A hot gas cools as it expands because its molecules are spread farther apart and collide with each other less often. However, radiation quanta only lose energy when they transfer some of it to particles of matter. Since matter and energy had decoupled, the radiation should not have lost any of its energy since then. It should still be at 3000 Kelvins (Gentry, 1986, 284-285).

Some theorists try to explain away the discrepancy by saying that the energy of the radiation decreased because the expansion of space made the radiation stretch out to a longer (less energetic) wavelength. They also say the universe is still expanding. If so, we should still see a gradual stretching out of wavelength for all forms of electromagnetic radiation. We do not. Space may have expanded in the past (resulting in red shifts), but there is no direct evidence that it is still doing so. All the claims of expanding space are interpretations, not evidence.

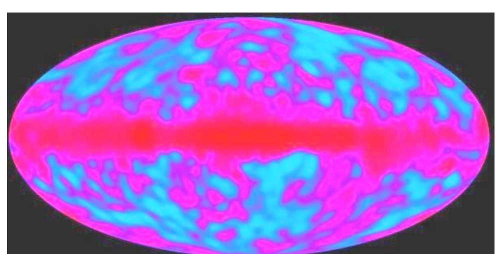
Recognizing the temperature problem, various astronomers have made different assumptions in calculating the radiation's expected strength. Depending which assumptions we use, we find that the 2.73 degree radiation is at best one-tenth, or at worst one one-thousandth, as energetic as it should have been if it really were evidence left over from the big bang (Hoyle, 1983, 181). They don't tell you that on TV.

b. Distribution of the Radiation.

The CMB is distributed all wrong to be a leftover of the big bang. As we look out in space we see vast regions of practically empty space interspersed with enormous lumps of matter in the form of galaxies, galactic clusters, and the like. If a big bang were responsible for both the microwave radiation and the distribution of matter, the two should match. Where there are lumps of matter there should be a stronger radiation field; where there is less matter, there should be less radiation.

Visual #8-47

In April of 1992 the national media reported what ABC's *Nightline* television program called the "Biggest Story of All Time." The reports stated that the Cosmic Background Explorer (COBE) satellite found fluctuations of about 30 parts per million in the intensity of the microwave background radiation in different directions. Many astronomers proclaimed the discovery of these variations as proof of the Big Bang.



Computer generated image of microwave background radiation based on COBE data - released by NASA in 1992. The image is deceptive. The "hot spots" are exaggerated due to extensive computer manipulation.

We've known for years that the CMB is almost perfectly even or *isotropic* in every direction (Gentry, 1986, 284-285; Weisskopf, 1983, 473). However, the COBE reports show just how desperate evolutionists are for evidence. Despite the fact that COBE showed a temperature variation of no more than thirty millionths of a degree (*Science News* 1992a, 292), such minor fluctuation was big news.

The media hype was based on preliminary findings. Further analysis showed that the conclusion was wrong. After hundreds of millions more measurements by COBE, John C. Mather of NASA's Goddard Space Flight Center announced in January 1993 that the CMB seems to be perfectly smooth - a perfect *blackbody radiation* curve (*Sky & Telescope* 1993a - more on this later). He says this is the best evidence yet for the big bang. Amazing! In 1992 the news that there was a slight fluctuation proved the big bang. A year later, the news that there was no fluctuation proved the big bang. Later reports (2003) have been just a rehash of the same old claims. The data have not changed.

Such a smooth background radiation would seem to indicate that the big bang, if there was one, was very uniform. It is difficult to understand how such a nonuniform universe could have evolved from such a uniform beginning. In their attempts to explain the discrepancy, theorists have had to come up with yet more exotic ideas.

i. The Inflationary Model.

Visual #8-48

This idea says that the singularity did not expand at a steady rate. Instead, it expanded exponentially between 10^{-43} and 10^{-34} seconds after the explosion, during which time "lumps" formed and space expanded at up to 10^{20} times the speed of light (Guth, 1981, 347-356). This would account for any discrepancies between the distribution of matter and the distribution of the CMB.

Visual #8-49

- The first problem with this model is its conflict with several laws of physics, such as the Law of Conservation of Momentum and Newton's Second Law of Motion. There is no known reason why the universe's rate of expansion would speed up and slow down without an outside force. Remember, though, that the Big Bang concept says there was no such thing as "outside."
- Second, galaxies cluster on a much larger scale than the inflation model predicted (Spergel & Turok, 1992, 52-59). Based on the amount of matter detected in the universe so far, astronomers calculate that galactic clusters could not come together in less than 60 billion years (Lerner, 1992, 124). This is 45 billion years more than the most extravagant estimates of the universe's age.

Nevertheless, a more recent Associated Press news article ("Astrophysicists Find Solid Evidence for Big Bang Inflation," Mar. 17, 2006) claims that there is now solid proof for inflation. If we read the article carefully, we find that this "solid evidence" is merely the fact that the amount of discrepancy between matter and the CMB fits nicely with the model. Of course it does! This is precisely the reason the model was invented. Saying that this proves inflation is the kind of erroneous logic discussed in Chapter Five: "If the inflationary story is true, there should be minor discrepancies in the CMB." So far, so good. However, it is an error in logic to turn the statement around to say "If there are minor discrepancies in the CMB then the inflationary story must be true," because inflation is not the only possible explanation.

Visual #8-50

Advocates of the inflation model must postulate initial conditions which we have no way to verify (Halliwell, 1991, 76-85). Of course, evolutionists criticize creationists for exactly the same thing.

ii. The Cold Dark Matter Model (CDM).

Visual #8-51

Because of the "missing mass" problem, the Cold Dark Matter model was proposed. It says that 90 to 99 percent of the matter in the universe is undetectable. If this much invisible matter really exists, it would allow sufficient gravitational pull to account for a limited amount of galaxy clustering. Yet the observed clustering is on so grand a scale that CDM is still inadequate (*Sky & Telescope* 1991a, 467). If the large-scale structures we see really contain as much cold dark matter as the theory predicts, the galaxies should be moving ten times faster than they are (Lerner, 1992, 124). Astronomer Will Saunders says that CDM can be ruled out with at least a 97 percent confidence level (Saunders, 1991, 32-38).

Visual #8-52

The CDM model postulates the existence of all this unobserved matter, as well as "dark energy," in order to explain what brought all the galaxies and galactic clusters together and why they haven't flown apart. It has to say that most of the matter is cold and dark because astronomers haven't been able to find it. Is this science? Remember, one of the key elements of the scientific method is observation. Cold dark matter is by definition unobservable. The CDM model may be a good story, but it has little to do with science.

iii. String and Texture Models.

In order to overcome these problems, some have proposed that cosmic "strings" during the Big Bang developed into the large-scale structures we see throughout the universe. Problems with string theory have led others such as Spergel and Turok to propose "textures" in the explosion, which evolved into galaxies, galactic clusters, etc. (Spergel & Turok, 1992, 52-59).

Texture theory requires hypothetical "Higgs fields," whose sole purpose is to explain the discrepancy between radiation density and matter distribution. In the texture model a Higgs field of appropriate strength appears whenever necessary, remains until the math works, then disappears. Belief in Higgs fields is not based on empirical evidence (Spergel & Turok, 1992, 52-59). The only reason anybody believes they ever existed is that they are the Big Bang's only hope.

Visual #8-53

Doesn't this sound a great deal like our fried egg story? In order to avoid the conclusion that somebody cooked it, we had to introduce "eggs fields" that appeared and disappeared as needed. In order to avoid the conclusion that somebody created the universe, theorists introduce "Higgs fields" that appeared and disappeared as needed. Their mathematics are very creative but have nothing to do with science. Occam's Razor leads us to conclude that the more "fudge factors" we have to throw in, the less persuasive are the arguments for a big bang.

c. *Location of the Radiation.*

Most people think of the universe as three dimensional and bounded because such a concept fits with our experience. If it is, there would be no radiation left from a big bang anyway.

This information is from Slusher, *The Origin of the Universe* (I.C.R. Technical Monograph #8), Appendix B, pp. 85-90

According to the Standard Big Bang Model, the primordial fireball expelled matter at velocities approaching the speed of light. The microwave radiation, however, would have been moving *at* the speed of light. The radiation which did not interact with particles of matter would have immediately escaped. That which did interact could have bounced back and forth within the expanding universe for no more than 300,000 years, after which matter and energy decoupled. From then on, radiation would no longer have interacted with matter but would have gone right through it. By this time the universe would have been no more than 300,000 light years across. Every bit of the remaining microwave radiation (still traveling at the speed of light) would have taken no longer than a few hundred thousand years to pass the outer boundary of the expanding universe. All the radiation should have disappeared billions of years ago.

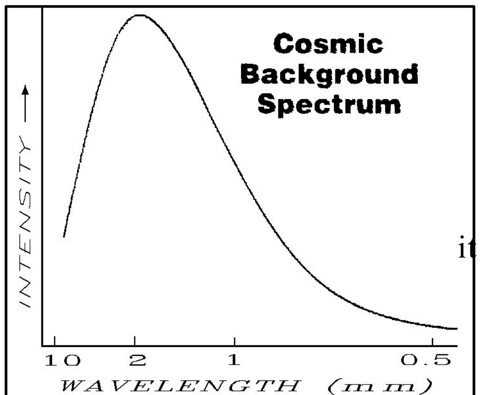
The only reason the Big Bang predicts any background radiation at all is that *the Standard Model is not used!* Instead, big bang advocates rely on an "Artificial Model" which says that the outermost edge of the expanding universe was perfectly reflective so that the background radiation could not escape. This is an imaginative mathematical concept, but it's not the way the universe works. There is no reason there should be a perfectly reflective coating on the outermost edge of the universe, especially if the radiation did not interact with matter. This is nothing but a sneaky attempt to salvage the Big Bang. The fact that the background radiation exists at all has nothing to do with a big bang and cannot be used as evidence in its favor.

Of course, this might not apply if space is four dimensional and unbounded. But remember, such a concept is purely mathematical, with no counterpart in observable reality.

d. Alternate Explanation for the Radiation.

Visual #8-54

An alternate explanation for the CMB has been proposed by creationists and some evolutionists who reject the idea of a big bang. The CMB is composed of microwaves with a spectrum of wavelengths typical of a 2.726 degree *blackbody*. "Blackbody radiation" occurs when an object is heated to the point that it emits energy at the same rate it absorbs it. When this occurs, the object radiates a characteristic spectrum of wavelengths we can analyze in order to determine its temperature. Since the CMB shows the characteristics of blackbody radiation, it may have been produced by some widely distributed material being heated to 2.726 degrees above absolute zero. It could be the result of something as simple as dust and gases throughout space reradiating the energy they absorbed from starlight.



Blackbody radiation curve of the CMB, 2.726 degrees above absolute zero. (Based on COBE data.)

Some creationists also believe that a portion of the radiation may be left over from the time God first said, "Let there be light."

e. The CMB as a Frame of Reference.

While the intensity of the CMB is almost perfectly uniform, its wavelength as viewed from earth shows a Doppler shift toward red or blue depending on the direction we look (*Science News* 1981a, 254; Alfven & Mendis, 1977, 698). This anisotropy (unevenness) is staggering to anyone trained to believe that there is no such thing as a preferred frame of reference.

Parts of the theory of relativity (such the effects of gravity on light and time) seem to be supported by observation. A great deal of the theory, though, is based on an untestable axiom, the aforementioned *cosmological principle*. This says that there is no absolute or "preferred" frame of reference in the universe, that any reference frame is as good as any other. However, it seems that the CMB itself may furnish a fixed frame of reference. The Doppler shift we observe from earth means that the earth and the entire Milky Way galaxy are moving through the CMB at more than 550 kilometers per second (Smoot, 1977, 898).

This discovery may have breathtaking significance. If the CMB really furnishes a fixed frame of reference, then the cosmological principle must be discarded. The four-dimensional big bang models built on it have no more to do with reality than our fried egg story. However, the anisotropy is not the point here. What is most significant is that the CMB, supposed to be some of the strongest evidence for a big bang, is instead strong evidence against it.

3. SUMMARY OF BIG BANG EVIDENCE.

To review why we're discussing red shifts and microwave radiation: In Chapter Six we saw that known natural processes are insufficient to account for the initial appearance of matter and energy. In this chapter we've been dealing with the question of what happened since then. The creation and big bang models both say that after the universe's unexplainable beginning, natural law should be sufficient to explain how it developed to its present state.

- Creation rests on the belief that the universe was called into existence in a complex, mature state and has deteriorated ever since. We need merely to work backwards from the present state of the universe to find that if the initial condition was one of complexity, known natural law is indeed sufficient.
- All the evolutionary big bang models rest on the premise that a disorderly explosion, followed by perhaps 10 or 20 billion years of purely natural processes, produced the relatively orderly universe we see around us. This seems very unlikely in light of the Second Law of Thermodynamics.

We've seen that neither red shifts nor the cosmic microwave radiation furnish very convincing evidence for a big bang. But despite these problems, let's suppose such an explosion really did take place. Could known natural processes operating on an expanding cloud of matter have produced the present universe?

C. THE BIG BANG VS. THE LAWS OF PHYSICS.

Assuming that a singularity somehow came into existence, why should it explode? If the concentration of mass was so dense that not even light could escape its gravitational pull, nothing known to science could cause matter to escape either. Evolutionists must rely on some unknown process to trigger the big bang. What then?

1. THE LAW OF CONSERVATION OF MOMENTUM.

Visual #8-55

One of the most basic and obvious laws of physics is the Law of Conservation of Momentum, closely related to Newton's First Law of Motion. Any object possesses *inertia*, the property that causes resistance to change in the motion of the object. Because of inertia, a moving object possesses *momentum*. The Law of Conservation of Momentum says that the amount of momentum possessed by a moving object will not change unless it transfers momentum to another object or receives momentum from the other object. In terms of Newton's Second Law of Motion ($f = ma$), an object will not change its direction and speed unless acted upon by an outside force.

Imagine the conditions at the time of the big bang. Everything that will later comprise the universe is concentrated inside the singularity. What happens when it detonates? As in any explosion, the pieces act according to the law of conservation of momentum. They continue to move in the direction they were pushed by the explosion until they hit something or until some outside force such as gravity or friction makes them stop.

Since nothing existed outside the big bang itself, there would be nothing for the expanding parts to hit. They would continue to expand forever and would never come together. There would be no reason for them to change direction and form clusters that would later evolve into stars, galaxies, etc. The universe should consist of an eternally expanding cloud of matter (Patrusky, 1981, 96).

Could gravity have pulled the parts together? It "could" have happened, but our observations tell us that it almost certainly did not. First, we have detected only one-hundredth to one-tenth the amount of matter needed to cause clusters to develop. Second, remember that the Law of Gravity

$$F_{grav} = \frac{Gm_1m_2}{d^2}$$

shows that the force of attraction between two objects decreases by the square of the distance between their centers, e.g., if the distance doubles, the gravitational attraction is one-fourth as strong. Unless clusters formed in the initial instants of the big bang, it is doubtful that gravity would ever be able to pull them together.

Because of this, evolutionists have had to come up with elaborate ideas to explain why the universe is so lumpy. But this is not the only problem with the big bang.

2. ***SECOND LAW OF THERMODYNAMICS.***

The big bang concept says that the universe began in the most disorderly explosion of all time, then evolved over billions of years to its present relatively orderly state. The Second Law of Thermodynamics shows us that this is highly unlikely.

Remember, we assumed for the sake of argument that spiritual forces do not interact with the physical universe. Therefore, it must be a closed system. The Second Law tells us that any closed system experiences a continual increase in entropy. Under the right conditions a temporary entropy decrease may occur some place within the system, but there must be a corresponding entropy increase somewhere else. (Remember, ΔG for the universe must be negative.)

If the universe began in a big bang, it started as an intense concentration of energy and matter but immediately began to move in the direction of increasing entropy. So far, so good. However, the present universe is made up of a relatively orderly arrangement in which clusters of matter (stars, galaxies, galactic clusters, etc.) are separated by vast stretches of practically empty space. The only way the expanding cloud of matter in a big bang could have produced such an orderly arrangement would be if there were many local decreases in entropy as parts of the cloud came together. There would have to be correspondingly large increases in entropy elsewhere. This is impossible. If the universe started in the most disorderly event of all time, there would be no way for parts of it to increase in entropy and then reverse the trend.

Because of momentum and thermodynamics problems, some theorists believe that the big bang did *not* immediately begin to proceed toward higher entropy. They have proposed "lumpy" models such as strings, textures, and cold dark matter. These postulate that from the beginning the matter that makes up the universe was not distributed randomly but in clusters. We've already seen that there is no empirical evidence to support such models. And even though they attempt to deal with the universe's lumpiness, they have other problems.

3. ***CONSERVATION OF ANGULAR MOMENTUM.***

Visual #8-56

Have you ever watched figure skaters on television? Many of them include a dramatic spin in their act. They begin slowly with arms extended, then gradually draw the arms in toward the body. As they do, the speed of rotation increases. This happens because of a law of physics concerning *angular momentum*. Just as every object possesses inertia which causes it to resist changes in its straight-line motion, every object possesses angular momentum which causes it to resist changes in its rotational motion. The Law of Conservation of Angular Momentum tells us that the total quantity of angular momentum of an object not subject to outside influences remains constant. As a consequence, the larger the diameter of the object, the slower it spins; the smaller its diameter, the faster it spins.

Many objects in the universe rotate: stars, planets, our solar system, even entire galaxies. How did they begin to rotate? According to the "lumpy big bang" concept, matter must have come out of the big bang in clusters. Though these clusters expanded greatly and then contracted back to their present size, from the very beginning they contained all the mass and angular momentum they do today. They were spinning from the beginning.

This has interesting implications for the big bang. Imagine a rotating galaxy only ten billion miles in diameter (a ridiculously small size) whose outermost parts are turning at only one mile per hour (an absurdly slow speed). Since the only influence that could have imparted angular momentum to it was the big bang, any angular momentum it has now it must have had from the very beginning. Think back toward the time of this "lumpy big bang." As the galaxy's diameter gets smaller, it spins faster. When it is one mile in diameter its outermost parts are spinning at billions of miles per hour, faster than the speed of light!

We need not think back to the time when the galaxy was only a fraction of an inch in diameter, spinning faster still, to see that the idea violates the observed laws of science. The "lumpy big bang" is no better than the smooth variety.

D. STEADY-STATE AND "LITTLE BIG BANG" MODELS.

Visual #8-56

Because of such problems as these, several lesser-known models have been proposed. (More made-up stories!) These include the *Little Big Bang* concept, which tries to solve the problems by saying that instead of one all-inclusive explosion there were many smaller ones at various places throughout space. Closely akin to this is the *steady-state* model which says that matter and energy are continually evolving from nothing in non-observable space. Both are based not on evidence but on a desire to find any possible alternative to creation. They deal with the above problems by allowing the possibility that several exploding singularities interacted with each other or that matter and energy spontaneously appeared in many places throughout the universe, but they have troubles of their own.

Visual #8-57

1. RANDOMNESS VS. CONSISTENCY.

If random chance were responsible for producing matter and energy from nothing, we should find random types of matter and energy throughout the universe. This is not the case. Everywhere we turn our instruments we see the same basic structure of matter (protons, neutrons, electrons, etc.), the same elements, and the same types of energy. Randomness should produce random results, not consistent patterns throughout the universe.

A theistic evolutionist might invoke God to deal with this problem. If he does, we can ask him why an all-powerful God had to take billions of years. Couldn't He have created everything as quickly as He wanted? Maybe even in six days!

2. NEED FOR 3-DIMENSIONAL SPACE.

Remember that one of the main reasons for the big bang is to explain away the earth's apparent position near the center of the universe. Evolutionists say that no matter where you are in space, things look pretty much the same in any direction because space is 4-dimensional and curves back on itself. According to this concept, the universe did not expand through space at the Big Bang; the universe *was* space.

Here's the problem. If we try to take care of the big bang's angular momentum and thermodynamics troubles by introducing the "little big bang" concept, there would have been no "big" singularity that *was* space as postulated by the big bang idea. Each of the "little" singularities would have to have appeared at a definite position *in* space. That is, the little big bang concept requires 3-dimensional space rather than 4-dimensional. This puts us right back where we started, with the earth seeming to be fairly close to the center of the universe. Since this implies some sort of direct divine intervention, the basic axiom of evolution that everything must be explainable by purely natural processes must be wrong. The prospect is horrifying to evolutionists.

3. *1ST LAW OF THERMODYNAMICS.*

Remember, no exception to the First Law of Thermodynamics has ever been observed. However, both the Steady State and Lumpy Big Bang models postulate that this law has been violated not once but countless times. Anyone who chooses to believe that either a steady-state or "little big bang" model describes what really happened, whether by chance or by the intervention of God, should not try to persuade others that his faith is based on scientific evidence. It is not. One must *discard the observations* of science if he wishes to believe either.

E. THE "EVOLUTION" OF STARS.

Evolutionists believe that stars form out of collapsing clouds of gas in space and evolve from one type to another. Their position on the Hertzsprung- Russell diagram should gradually change over billions of years.

Visual #8-59

Despite what evolutionists claim, the H-R diagram shows us no such thing about stellar evolution. Stars are supposed to form over millions of years and age over billions - far too slowly for human history to record. The equipment needed to analyze the spectral class has existed for only a few decades, much too short a time for the diagram to record a gradual change even if it did occur. The changes we occasionally do see such as novae and supernovae are rapid, not slow. They show deterioration, not increasing complexity.

1. *RATE OF STAR FORMATION.*

You may have heard statements in the media that there are at least a hundred billion galaxies, each containing at least a hundred billion stars. Let's work with these numbers and see how fast the stars would have had to form. We could express the hundred billion galaxies as 10^{11}, and the hundred billion stars in each as 10^{11} also. Multiplying these two numbers, we see that there would be at least 10^{22} stars in the universe.

Let's use the 15 billion year age of the universe cited by many evolutionists. This would be a total of about 4.7 x 10^{17} seconds. Dividing the number of stars by the number of seconds, we see that there would have had to be an average of 21,000 stars forming *per second* for *fifteen billion years* -- an average of about 660 billion brand new stars each year. If they were spread throughout the universe, we should see new stars blinking on all the time everywhere we look! Yet even with the Hubble Space Telescope, supposed to let us look at galaxies as they were only a few hundred million years after the universe began, we simply do not see them.

Despite the occasional claim of a new star forming, those few that we see for the first time are in the vicinity of nebulae. We can't even be sure that the star just began to shine. Its light may have previously blocked by the nebula or some sort of space debris. Neither side can prove anything.

Our technology is not sufficient to verify or falsify the claim that new stars are still forming. Nevertheless, even if astronomers were right about the few we see for the first time being brand new stars, the rate at which they appear is many orders of magnitude too slow to satisfy the average of 21,000 per second demanded by evolution.

2. *DIFFERING LIFE SPANS OF STARS.*

Visual #8-60

As far as we can tell, all the stars are powered by nuclear fusion. Smaller stars could theoretically burn for billions of years, but larger ones should burn out in a few million because of their tremendous gravity. Why, then, do we see stars of all different sizes and "ages" throughout the visible universe? Could it be that all the stars are young?

Visual #8-61

Advocates of evolution deny this, of course, and say that the massive stars blow up in supernovae, then the expanding remnants come together into new stars, evolve, blow up again, and repeat the cycle over and over. This is faith, not science. First, the most ancient stars visible by means of the Hubble or Webb Space Telescopes should not have had time to go through a supernova. They should consist only of hydrogen and helium.

Yet there is not a single known metal-free star! Second, there is no reason a star should blow up and then come back together. The reassembly would be in exactly the opposite direction from what thermodynamics allow.

3. BEHAVIOR OF GAS CLOUDS.

Nobody has ever seen stars form from collapsing clouds anyway. Astronomers have seen many clouds (e.g. the Crab Nebula) form in deep space as the result of supernova explosions through the centuries. These remnants do not contract but instead expand. Other clouds (sometimes called *planetary disks*, though there is no evidence that they have anything to do with planets) are of uncertain origin. We haven't been watching long enough to tell if they are coming together or flying apart. However, there is no reason to believe that clouds in deep space behave differently than those we observe on or near earth. They are much more likely to be expanding than collapsing. This loss of organization would be compatible with creation and thermodynamics rather than evolution.

4. CHEMICAL COMPOSITION OF GAS CLOUDS.

Spectroscopic analysis of faraway dust and gas clouds show that they could not be raw material left over from the big bang. As we saw in the last chapter, a big bang could not have produced any element heavier than helium-4. Yet it is common knowledge that the spectra of these clouds indicate the presence of many heavier elements. How did these elements get there?

- Most evolutionists believe that the heavier elements were formed in the interior of stars or in supernovae. If they were, the clouds must be leftovers from stars that exploded long ago rather than being brand new material waiting to be used in future stars.
- This brings up another problem for evolution. Since stars are supposed to produce heavier and heavier elements by nuclear fusion, young stars should contain mostly light elements. The older they get the more heavy elements they should contain. However, it is also common knowledge that spectroscopic analysis shows all stars to have basically the same chemical composition, within a percent or so, no matter how old or hot they are supposed to be. This implies that they are all roughly the same age!

Creationists believe some of the heavy elements in the clouds are left over from exploded stars and others from the original creation. Either way, they have nothing to do with the formation of new stars.

F. PROBLEMS IN THE SOLAR SYSTEM.

Since our ability to observe objects in deep space is very limited, many of the claims about them are based on little or no evidence. However, we are able to do a great deal of direct observation in our own solar system. The more we observe, the more problems we find with evolution.

> The next three items are from Dr. John Whitcomb's *The Origin of the Solar System*, Presbyterian and Reformed Publishing Co., Phillipsburg, NJ 1963.

1. COMPOSITION OF THE PLANETS.

Visual #8-62

Where did the planets come from? The creation model says that they were created in much the same condition in which we see them today. All the evolutionary models say that they were either formed by the same "planetary nebula" that produced the sun or else formed elsewhere and were later captured by the sun's gravity.

If the planets and moons came from the same source as the sun, then they should all be composed of similar materials. NASA space flights tell us, though, that the planets and moons studied so far are made up of different mixes of elements. In addition, the percentage of various elements that compose the planets is very different from the percentage of those elements in the sun. It is highly unlikely that the planets came from the same source. It is evident that none of them came from the sun.

2. ***ANGULAR MOMENTUM.***

The sun possesses over 99% of the mass in the solar system. However, the planets possess over 98% of the angular momentum. Though several ideas have been proposed to explain how the sun could have transferred so much of its angular momentum to them, there is no empirical evidence to support any of them. There is no way known by which such a transfer could have taken place (Whitcomb, 1963, 14-15).

The situation is reversed in the planetary systems. With the exception of the earth, each of the planets carries the bulk of the angular momentum in its system instead of its moons (Whitcomb, 1963, 18). If the sun was able to transfer its angular momentum, why couldn't the planets?

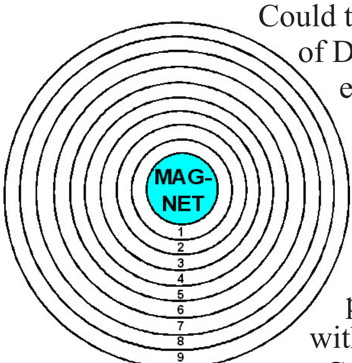
3. RETROGRADE ROTATION OF PLANETS AND MOONS.

Visual #8-63 Eight major planets (plus dwarf planets sch as Pluto) orbit the sun, with over five dozen moons orbiting them.

- All the planets orbit in the same direction. However, two of them rotate on their axes in different directions from the other seven. Venus rotates backward from the rest, while Uranus is a real oddity. All the others have axes almost perpendicular to their orbits around the sun. Uranus has an axis inclined 98 degrees from perpendicular, almost parallel to its orbit. Its plane of rotation is nearly perpendicular to those of the rest of the planets. No evolutionary model has yet explained how it got that way.
- In addition, at least eleven of the moons observed by telescopes and space probes orbit their mother planet in the direction opposite the planet's rotation (Whitcomb, 1963, 15-18).

Taken together, these factors show us that it is highly unlikely that the planets and their moons could have come from the sun, or from the same source outside the solar system.

Visual #8-64



Could the sun's gravity have captured them? A "thought experiment" (courtesy of Dave Jenkins) shows how difficult such a process would be. If you're old enough to remember record players, imagine one with a turntable divided into nine rings. Each has an adjustable speed control. Now imagine that at the center of the turntable there is a strong magnet.

You roll a steel ball bearing onto the turntable. Try to adjust the speed of the turntable and the aim of the bearing to make it go into orbit around the magnet. You can use computers if you want, but it probably won't help much.) You must exactly balance the magnetic pull with the outward momentum resulting from the turntable's rotation.

Got your first ball in orbit? Now do the same thing with bearings of different sizes eight more times, once for each planet, making sure that none of them throws any of the others out of orbit. When you get done with that, magnetize each of the nine orbiting ball bearings. Now roll in three dozen smaller ones of various sizes and make them orbit the first nine, some in one direction, some in the opposite.

Sounds impossible, doesn't it? Yet it would be vastly more difficult for the sun to have captured the nine planets and their more than three dozen moons because the problem would not be limited to a two-dimensional turntable. The moons of Uranus, for example, orbit in its equatorial plane - almost perpendicular to our imaginary turntable.

Visual #8-65 It is highly improbable that an arrangement of parts as complex as the solar system developed by random chance from an explosion. The evidence indicates a high probability of non-randomness, i.e., design. Of course, one may choose to believe that the solar system "could" be the product of a fantastic series of accidents; however, such a choice is not based on evidence but on a desire to rule out the possibility of creation.

Lest we become overwhelmed by technical details, let's recall the reason for this study. We wanted to find out if natural law by itself is sufficient to explain how matter and energy came into existence, and if it is sufficient to explain how the universe developed to its present condition. Our original predictions were:

I. Origin of Matter and Energy.
   A. Creation led us to believe that natural law should not be sufficient to explain how matter and energy came into existence.
   B. Evolution said that it should.
   C. Observation shows that natural law is not sufficient. Creation is clearly correct in its prediction.

II. Development of the Universe.
   A. Creation led us to believe that the universe was already complex when it came into existence, and that subsequent deterioration led to its present condition.
   B. Evolution required us to believe that it was disorganized at the beginning, and that natural processes have brought about more and more order.
   C. Observation shows that if we accept one unexplainable event (the act of creation) natural law is sufficient from that point on. If we reject this one event in favor of evolution, we must believe in an extraordinary number of unexplainable events. Each time anything became more organized, the Second Law of Thermodynamics was violated. Regardless whether God or Random Chance did it, this is not explainable by natural law. If we believe in evolution, we must throw out many of the observed laws of nature.

Despite the evidence, some insist that given enough time anything is possible. In the next chapter we will examine the question of how much time is available. If the universe is very old, evolutionists and progressive creationists have the advantage. If it is young, recent creation is the only possible explanation.

VI. SUMMARY OF THE UNIVERSE'S ORIGIN AND DEVELOPMENT

The universe could have come into existence and developed to its present condition in one of three ways.

1. CREATION (initial complexity).

The universe was called into existence in a mature, complex state from which it has deteriorated ever since. The natural laws we observe were established at the time. The creation process itself is not explainable by known natural law, but the subsequent development of the universe has followed natural law.

2. MATERIALISTIC EVOLUTION (initial disorganization).

Matter and energy appeared by random chance in a disorganized state. They have become more complex ever since. Random chance established the laws of nature. However, since a subsequent increase in complexity of the universe would violate a number of known natural laws (especially the Second Law of Thermodynamics), Random Chance has violated those same laws on innumerable occasions.

3. THEISTIC EVOLUTION (initial disorganization).

An intelligent being outside the physical universe called matter and energy into existence in a disorganized state. Ever since, he has caused them to increase in complexity. He established the laws of nature. Since increasing complexity of the universe goes against known natural law, he must have chosen to intervene in nature and violate those same laws innumerable times. However, he erased the evidence showing how he did it.

Each person must decide how he believes the universe came to be. Was it random chance? Was it a creator who consistently violates his own laws and erases the evidence? Or was it a creator who establishes and maintains order and tells the truth about it?

In any event, if matter and energy appeared in a disorganized state, known natural law by itself CANNOT account for their development into the present state. If the universe was called into existence in a mature state, it CAN. You must decide for yourself which step of faith is more reasonable.

CHAPTER 8 REVIEW

Known natural law is sufficient to explain the origin of the present universe only if we start with the presupposition of initial complexity.

I. Creation leads us to expect deterioration in nature; evolution leads us to expect increasing complexity. Throughout nature we see a universal tendency toward deterioration. We call this the Second Law of Thermodynamics.
   A. This law always applies in a closed system (no outside influences).
   B. We can temporarily override this tendency in an open system, but only under certain conditions:
      1. Supply of usable energy. It must be the right kind of energy.
      2. Conversion mechanism to enable the system to use the energy.
      3. Preexisting information to direct how the energy will be used.
      4. As entropy decreases in the open system, there must be at least as great an increase in entropy at the energy source.

II. Belief in a Big Bang depends upon presuppositions. The Big Bang is supported only by indirect evidence.
   A. Every big bang model is based on the theory of general relativity. This requires believers to accept some unproven and unprovable assumptions, though few are aware of them.
      1. The exploding cloud of matter would not have expanded through space; it was space. There was nothing outside, since "outside" refers to a place in space, which did not exist past the edge of the cloud.
      2. There have to be four dimensions of space. (Time is a fifth dimension.)
      3. Space could have expanded faster than the speed of light.
      4. Four dimensional space would have no center and no edges. It would be unbounded.
      5. There is no absolute frame of reference. Any one is as good as any other.
   B. There are only two pieces of indirect evidence used to support a big bang.
      1. Red shift of starlight is taken to indicate that the universe is expanding rapidly. However, other factors besides expansion may contribute to red shifts.
         a. Rotation of the universe around two centers.
         b. Gravitational red shifts.
         c. Interstellar dust.
         d. Relativistic red shift - if general relativity is correct, the expansion of space would induce a red shift. This would make red shifts useless as distance and age indicators.
         e. Red shift may be proportional to the square of the velocity.

      1a. Size of the universe is calculated based upon a series of assumptions. These all depend upon Euclidean (straight-line) geometry. If relativity is correct, space is curved and they are inaccurate.

      There is no observational evidence for either "dark energy" or "cold dark matter." Both were invented to try to solve problems with the mathematics required for evolution to be plausible.

      Quasars and quantized red shifts show how much uncertainty there is in calculating the size of the universe. It is vast, but we do not know how vast.

      2. Cosmic Microwave Background (CMB) is interpreted to be a remnant of the big bang explosion. Some problems with this interpretation:
         a. The temperature was originally expected to be about 3000 degrees. The big bang theory was modified after it was discovered that the temperature is only 2.73 degrees.
         b. The CMB is almost perfectly uniform in every direction. The distribution of matter is not. Big Bang theorists have been unable to explain the discrepancy.

c. There is no reason for radiation from a big bang to still be found in our area of space. It should have disappeared within a few hundred thousand years after the big bang.

d. The CMB shows the wavelength distribution characteristic of blackbody radiation. It may be the result of absorption and reradiation of energy by interstellar debris.

e. The CMB furnishes a fixed frame of reference through which our galaxy and perhaps the entire universe moves.

C. A Big Bang would violate several known laws of physics.

1. Conservation of Momentum.
2. 2nd Law of Thermodynamics.
3. Conservation of Angular Momentum.

D. Steady-state and "little big bang" models violate the 1st Law of Thermodynamics. The "little big bang" concept is incompatible with 4-dimensional space required by the "big" big bang.

E. Astronomers have not been observing stars long enough to see them evolve over billions of years. Those that do change (novae, supernovae, etc.) do so in a few centuries at most. Rather than becoming more organized, they deteriorate. Though there should have been over 21,000 stars per second developing for 15 billion years, the number of reports of new stars is extremely small.

F. The solar system cannot be explained by a big bang.

1. Composition of the planets is too different to be from one source.
2. *Planets possess 98% of the angular momentum but only 1% of the mass.*
3. Many planets and moons rotate or orbit in different directions from the majority.

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