CHAPTER SEVEN

The Origin of the Universe

We've seen that the creation/evolution controversy is not a battle of science versus religion but instead a battle of religion versus religion, with both sides claiming to have the support of science. We need not ask why we should argue about which is right. We've already seen that it matters very much what you believe. If we want to be as scientific as possible, we should ask instead how we should argue.

In order to make the issue of creation vs. evolution more manageable, this book breaks it down into four major areas:

Visual #7-1

(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 their present condition.

As we examine the scientific evidence we will see that natural processes by themselves are not sufficient to account for any of these four aspects of nature. Each requires something not explainable by known natural laws.

The Emperor's New Clothes.

Some say that creationists have no business attacking evolution unless we have a comprehensive model to offer in its place. This is ridiculous. Remember the old fable about the emperor's new clothes? When a child cried out, "The emperor has no clothes!" no one objected that the child had to furnish a complete outfit before he could speak. Likewise, it is perfectly valid to expose the weaknesses of an idea without offering an alternative.

Nevertheless, this book is more than a critique. It is an attempt to present creation and evolution side by side so students can compare them to what we find in nature, and thereby determine which is more reasonable.

I. SCIENTIFIC LAWS, THEORIES, AND MODELS.

Visual #7-2

Let's recall how the scientific method works. Someone comes up with a question, gathers information, formulates a hypothesis, devises a way to test it, performs the test multiple times, and reports his results so others can repeat the test. Now suppose we find that a hypothesis has been verified without exception for years or even centuries. Eventually it gains wide acceptance. If it attempts to explain *why* something happens in nature we call it a *theory* – e.g., the kinetic theory of matter and the germ theory of disease. On the other hand, if an idea summarizes *what* happens without attempting to give an explanation we recognize it as a *law* – e.g., the laws of gravity, planetary motion, thermodynamics, and so on. However, even if neither of the above is applicable, we can still use *models* to help in our studies.

A. SCIENTIFIC HYPOTHESES AND THEORIES.

Visual #7-3

You have probably heard critics of evolution say something like "Evolution is only a theory." Such a statement shows ignorance of the way science works. In ordinary conversation we often use the word theory as a synonym for "guess." When we use it in science, though, we mean something quite different. A scientific idea starts out as an educated guess (a hypothesis) about a possible cause-and-effect relationship, that is, **why** something happens. If the hypothesis is confirmed through repeated experimentation, scientists become more confident about it. After a while, if it has never failed a test, it gradually begins to be recognized as a scientific theory. Thus, rather than diminish the status of evolution, we pay it a high compliment if we incorrectly call it a theory.

In order to be called scientific, a theory must be falsifiable, that is, we must be able to imagine some test that, if failed, would prove the theory wrong. For instance, for thousands of years it was almost universally accepted that the apparent motion of the stars and planets across the night sky was because they were orbiting the earth. The idea had the potential to

be falsified at any time, but the equipment to falsify it did not exist. When the telescope was invented, Galileo observed phases of Venus, moons around other planets, etc., showing conclusively that everything did not revolve around the earth and thus falsifying the concept of a geocentric universe.

There may be several competing theories about the cause of some phenomenon. For instance, there are a number of theories attempting to explain why gravity exists. These involve particles called gravitons, distortions of space, gravity waves, Higgs bosons, and a number of other ideas. They qualify as theories because there are attempts underway to test and potentially falsify them. If a theory were to fail a test it would be *disproven*, but just because it has not yet done so we cannot say it is *proven*. In fact, nothing in science is absolutely proven because we can never be sure we have not overlooked something.

The word "theory" is often misapplied to ideas that sound scientific but cannot be tested.

- For instance, one might talk about the ancient Greek theory that all matter consisted of earth, air, fire, water, and the *quintessence* that they believed made up the heavenly bodies. Though this was considered state-of-the-art in its day, it did not qualify as a scientific theory because the Greeks never even attempted to test it. When modern atomic theory – a real scientific theory – came along and was found to hold up under repeated testing, we did not simply modify the Greeks' ideas. We threw them out entirely.
- Likewise, the "Big Bang Theory" is not truly a scientific theory because it cannot be tested by experimentation.
- Nor is the "theory of evolution" – the idea that humans came form apes – a theory because it, too, is beyond the reach of experimental testing.

If evolution is not a theory, then, what is it?

B. SCIENTIFIC LAWS.

Visual #7-4

A scientific law does not make anything happen, but simply describes **what** happens. For instance, the law of gravity does not make objects fall; it just describes how much of this mysterious force called gravity they experience. We can express this law according to the formula $F_{grav} = \frac{Gm_1m_2}{d^2}$ where F_{grav} is the force of gravitational attraction between two objects, G is a universal gravitational constant, m_1 is the mass of the first object, m_2 is the mass of the second object, and d is the distance between their centers.

This formula did not just appear out of nowhere. In following the scientific method, Newton carefully studied he work of Kepler and others who had come before him. He came up with a hypothesis and tested it over and over. He carefully analyzed his data and noticed a consistent pattern, expressed in the above equation. He published his work for others to critique and test. Though he never determined ***why*** gravity existed (a theory), in the equation above he clearly expressed how it operates. After many years of confirmation, this relationship became recognized as a scientific law.

Scientific laws have stood the test of time and enable us to accurately predict the future behavior of the objects or systems they describe. However, we should be honest enough to admit that the principles we call laws reflect the current state of our knowledge, and that we may find out later we were overlooking something. For example, for thousands of years the statement "What goes up must come down" was considered a law of nature because no one had ever seen an exception. This idea had the potential to be falsified at any time, but it had never failed a test until we sent up the first rocket that escaped the earth's gravity. Once this happened, scientists did not entirely discard the idea. Instead, they modified it to take into account the velocity needed to send an object up so that it would never come down.

Visual #7-5

How does this relate to the origins controversy? Those who call evolution a law of science are either ignorant or lying. Neither evolution nor creation qualifies as a law because:

- *Neither has ever been observed.*
- *Neither enables us to accurately predict specific future events.*
  While we can say that there is a general trend for things to get better or worse, we cannot predict specific events. By contrast, consider the law of gravity: not only are we confident that objects will fall, but we can use this law to predict the force on any specific falling object, and therefore its motion.
- *No successful experiments have been devised to test either.*
  Evolution says that for billions of years living things have been becoming more and more complex and organized. This has little to do with what is going on in the present. Since there is no way to test the past, those who insist it happened must depend on the circumstantial evidence of the fossil record. However, we will see in later chapters that the fossil record actually fits just as well with creation. Likewise, nobody has come up with a way to duplicate creation.
- *There is no way to prove either idea false.*
  Either can be modified to account for any possible observation. It may be philosophically satisfying, but at its heart it is not science.

Remember from Chapter 5 that at the heart, both creation and evolution are systems of deductive logic based on presuppositions. The most fundamental presupposition of evolution is that everything must be explainable by purely natural processes. What if evolutionists find something that can't be explained by natural processes? It doesn't matter: it *has to be*. They make up a story! Then they use faulty logic to decide that since they can make up a story, therefore their story must be true.

Visual #7-6

Evolutionists don't let facts stand in the way of their beliefs. At the Paluxy River in Texas, dozens of five-toed, obviously human footprints crisscross hundreds of three-toed dinosaur tracks. Since dinosaurs are supposed to have become extinct more than 60 million years before humans evolved, the presence of humans and dinosaurs at the same time and place would falsify evolution. Rather than admit that they are wrong, evolutionists ***reinterpret the evidence*** to fit their preconceptions. One evolutionist actually proposed that the reason some of the tracks looked human is that they were made by an unknown species of dinosaurs that had evolved five toes! Why, then, couldn't the three-toed tracks have been made by three-toed humans with big feet?

(In all fairness, creation is not falsifiable either. We creationists could always say, "That's just the way God did it.")

No matter how tenaciously anyone defends an idea on either side, if there is no possible way to falsify it, it is neither a scientific law or theory. However, it might still validly be called a **model**.

C. THE USE OF MODELS IN SCIENCE.

Visual #7-7

When scientists deal with phenomena that are difficult or impossible to observe directly, they often use an object, drawing, description, or mental image as a model to help visualize what's going on.

Visual #7-8

Perhaps you are familiar with John Saxe's poem about the blind men and the elephant. Six blind men approached an elephant from different directions. The one who touched the animal's broad side thought an elephant was like a wall, the one who touched a tusk thought it was like a spear, the one touching the trunk thought it was like a snake, the one touching the tail thought it was like a rope, and so on. Each used a familiar mental image to try to understand an elephant.

In a way, we are like the blind men. Just as they would benefit by sharing their observations with each other, we too can benefit by looking at many different areas of science to

try to understand the big picture. The more details we can fill in, the more reasonable our model becomes. In the rest of this book we will try to fill in many of the details on both sides as we examine specific types of evidence to see whether creation or evolution does a better job with those details.

Since both creation and evolution have to do with the unobservable past, we cannot "prove" either. However, whichever model requires the fewest made-up stories is much more likely to be right. We will see that the probability is very great for creation (initial complexity) and very small for evolution (initial disorganization). Nevertheless, many still choose to believe in what "could" happen instead of what probably did. They should be honest enough to admit that this choice is based on personal bias, not scientific evidence.

Visual #7-9

- There is not just one evolutionary model, but several. All are based on the belief that the universe was disorganized at the beginning and has steadily increased in organization (simple to complex).
- In contrast, creation models say the universe was complex and has steadily deteriorated (complex to simple).

Since we cannot transport ourselves back in time, we cannot perform experiments to test which of these might be correct.

D. USING OCCAM'S RAZOR TO EVALUATE MODELS.

How can we determine which model is more reasonable? Surprisingly, Hollywood may be able to help us. The 1997 science fiction film "Contact," based on the premise that intelligent life exists elsewhere in the universe, used a principle of logic known as "Occam's Razor" as one of its main themes. Though centuries ago William of Occam phrased the principle as "Entities should not be multiplied beyond necessity," we could paraphrase it as "The simplest explanation that fits all the facts is usually the best." (Or, "Keep it simple, stupid!") This is not a hard and fast rule, but most scientists would agree that it is a good guideline in deciding which of several alternatives is more reasonable.

Visual #7-10

Implicit in the movie was the belief that evolution is the simplest, and therefore the best, explanation for life. But is evolution really the simplest explanation *that fits all the facts*? Remember that the most fundamental assumption of evolution is that everything must be explainable by purely natural processes. How many non-barking dogs would it take to falsify the statement "All dogs bark?" Only one. Likewise, if even one phenomenon cannot be explained by natural processes, then evolution does not fit all the facts and is probably not the best explanation.

Visual #7-11

While we cannot do direct testing about the origin of the universe, earth, and life, we can look at circumstantial evidence. If the universe was disorganized at the beginning there should be some traces found in nature, whereas if it began in a complex condition there should be different traces. We can use these ideas of initial complexity vs. initial disorganization to make testable predictions in many areas (astronomy, physics, biology, biochemistry, paleontology, geology, etc.) Whichever fits better with the real world is much more likely to be correct.

Visual #7-12

- We will see that if we accept creation's assumption of initial complexity (**one** event unexplainable by natural laws), known natural law would be sufficient from that point to produce the present universe. Even if we started with no knowledge of thermodynamics, fossils, biology, and genetics, creation would lead us to predict many of the observations we actually find in nature.
- We will also see that if we start from evolution's assumption of initial disorganization, it would take **many** events unexplainable by natural law (whether done by God or Random Chance) to produce the present universe. If we started with no knowledge in the areas listed above, evolution would lead us to make a great many incorrect predictions about what we ought to find in nature. That is, things are very different from what evo-

lution leads us to expect.

As we examine the circumstantial evidence to determine whether creation or evolution is more reasonable, we will keep in mind the potential problems we saw in the last chapter: evidence may be incomplete, withheld, or falsified.

Let's start our investigation of which model is more reasonable by considering the origin of the universe.

II. CAN NATURAL LAW ACCOUNT FOR THE ORIGIN OF MATTER AND ENERGY?

Visual #7-13

At the root of evolutionary thought is the axiom that everything must be explainable by purely natural processes. Thus, natural and physical phenomena should be sufficient to produce the present universe.

For the purposes of our discussion, we will use the word "universe" the same way an atheist would. It includes all physical objects, forces, and influences - everything but what we ordinarily call "spiritual." We will assume for the sake of argument that if spirits exist, they do not interact with the physical universe.

A. THE ORIGIN OF MATTER AND ENERGY.

Visual #7-14

Either the matter and energy that make up the universe existed forever or else they began to exist at a definite point in the past. If they had a beginning, an uncaused First Cause had to bring them into existence. Creation says the First Cause was God; evolution says it was some natural process. These ideas lead us to make the following predictions, which also have to do with whether everything was disorganized (evolution) or complex (creation) at the beginning.

1. ***CREATION SAYS:***
   - ***a. Need for Supernatural Intervention.***
     If a creator called the universe into existence from nothing, only that same creator should have the ability to call any more matter and energy into existence.
   - ***b. Tendency Toward Deterioration.***
     Since a creator would have established the universe in its best possible state, it would never get any better. We expect an overall trend in nature toward deterioration. There might be exceptions to this trend, but they should be temporary.
2. ***EVOLUTION SAYS:***
   - ***a. Sufficiency of Natural Processes.***
     Natural processes have either kept matter and energy functioning for an infinitely long time, or else they produced matter and energy from nothing. If those processes did it in the past they should be able to do it again at any time.
   - ***b. Tendency Toward Organization.***
     Since the universe is far more organized than it would have been at the beginning, we expect an overall trend in nature toward increasing order and organization. There might be exceptions to this trend, but they should be temporary.
3. ***WHAT WE OBSERVE: The Laws of Thermodynamics.***
   Several well-established laws of physics enable us to test these predictions. The First and Second Laws of Thermodynamics are particularly important to the study of origins and have stood the test of time. NO EXCEPTION to either has ever been observed.
   - ***a. The First Law of Thermodynamics.***

Visual #7-15

     The First Law has to do with the *quantity* of energy and matter. It states that energy and matter cannot be created or destroyed by any known natural processes. They may be converted from matter to energy as in nuclear fission, energy to matter (although no one has ever seen this happen), or from one form of energy to another such as from electricity to heat, but the total of matter and energy in the universe remains constant. This is exactly what creation led us to expect.

b. The Second Law of Thermodynamics.

The Second Law describes the tendency throughout nature for energy to flow from greater to lesser concentration. While the Second Law deals specifically with energy, its application also has to do with matter, for two reasons: (1) Matter and energy are interchangeable according to Einstein's equation $e = mc^2$, and (2) Matter is held together by chemical energy stored in the bonds between atoms. Thus, as energy flows from greater to lesser concentration, the matter which it was holding together tends to fall apart.

The Second Law has to do with the *quality* of energy and matter. It tells us that energy expended in a *closed* or *isolated system** goes in the direction of increasing entropy (a measure of randomness or disorganization of a system). That is, as energy is used, it spreads out randomly and becomes less and less useful. Nature tends to move toward equilibrium, not away from it.

> * Any collection of matter and energy can be considered a system. If we draw an imaginary box around a system and matter cannot get in or out, it is a *closed* system. If not even energy can get in or out, it is an *isolated* system. If things can get in and out, it is *open*.

Every physical or chemical process ever observed has demonstrated an inexorable trend toward increasing entropy. Though there may be delays in the process of randomization, as time passes more and more of the energy in a closed system becomes randomly distributed, and less and less is available to do useful work. Even if there is a temporary local decrease in entropy, it comes at a cost. The increase in entropy of the overall system more than offsets the local entropy decrease.

The phenomenon described by the Second Law is apparent throughout the universe. Everywhere we look we see a steady, inexorable trend toward deterioration. It can be temporarily delayed under the right conditions – for example, in living things – but it never stops. This is exactly what creation leads us to expect.

Many evolutionists object that the Second Law applies only to closed systems. Since living things are open systems they say that the Second Law is irrelevant to the creation/evolution controversy. They are wrong. Remember the evolutionary axiom that everything must be explain able by purely natural processes? Suppose for the sake of argument that we accept this axiom and allow only physical influences. We can then draw an imaginary box around the universe as a whole and consider it as a closed system. The Second Law applies quite nicely.

On a smaller scale, we will see in the next chapter how the tendency toward increasing entropy applies not only to closed systems, but to open and living ones as well. Even though the term "Second Law" specifically refers to closed systems, the universal trend toward entropy is applicable to open systems as well.

Keeping these two laws in mind, let's look at some of the more important evolutionary models for the origin of matter and energy.

B. EVOLUTIONARY MODELS FOR THE ORIGIN OF THE UNIVERSE.

Either the matter and energy that comprise the universe existed forever or else they began to exist at a definite point in the past.

- Creationists believe everything was brought into existence at the time of creation.
- Some evolutionists believe matter and energy are eternal, while others believe they had a definite beginning.

1. THE ETERNAL UNIVERSE MODEL.

Visual #7-16

Could matter and energy have existed forever? The laws of thermodynamics – derived from observation – show that the answer is no.

a. The 1st Law.

The First Law tells us that matter and energy could not have been brought into existence by any known natural process.

b. The 2nd Law.

The Second Law tells us that as a closed system, the universe is continually increasing in entropy. Whatever the percentage of entropy is now, it would have been less and less the farther back we look in the past. At some point the universe would have been at zero entropy. It could not have been less than zero before that; therefore, the natural laws we know were not in effect. Something had to start everything. There had to be a beginning.

Visual #7-17

Even an atheist must admit that known natural processes are insufficient to explain how matter and energy came into existence. How many phenomena not explainable by natural processes would it take to falsify the fundamental premise of evolution? Only one. *We just found one.*

Visual #7-18

If an evolutionist chooses to believe that matter and energy existed forever, he must discard the observations of science in favor of a made-up story. And the story is.....

2. THE QUANTUM UNIVERSE MODEL.

Most evolutionists believe that the universe began in a "Big Bang." Imagine all the matter and energy in the universe compressed into a *singularity*, an almost infinitely dense point the size of an atom, which exploded and began evolving into the present universe. The first question for evolutionists is: where did this hypothetical singularity come from? The First Law tells us that no known natural process could have produced it.

Visual #7-19

Some try to get around the First Law by appealing to quantum physics. This deals with particles that are smaller than atoms and have very little mass, such as protons, neutrons, and electrons. Large groups of them behave in an entirely predictable way. However, the behavior of individual particles can only be predicted in terms of probability, e.g., there is a 70% chance that a specific electron will have a particular energy or be in a specific location. Sometimes these tiny particles do not do what we think they are most likely to. They can behave in ways that seem bizarre.

Some physicists such as Hans Dehmelt and Stephen Hawking believe the universe began in a bizarre quantum event. They say that the singularity popped into existence by an unknown natural process, a quantum fluctuation from nothing that produced the "positive" universe in which we live and a "negative" one we cannot detect (Freeman, 1991, 56). Positive plus negative equals zero, so our universe is half of nothing!

This idea appeals to the infinitesimal *size* of the hypothetical singularity to try to apply quantum principles. However, it requires us to ignore its unimaginably large *mass*, consisting of all the matter in the universe. We can only ignore this mass if we discard all the observations of physics so far. Every experiment ever performed has shown that quantum unpredictability vanishes for objects consisting of large numbers of atoms. Dehmelt, Hawking, and the others must overlook the singularity's tremendous mass to try to make it obey the rules of quantum physics.

Visual #7-20

The quantum fluctuation hypothesis is a fascinating piece of storytelling, but it is not part of science. There is no way to test it. It goes against almost everything we've learned about physics. So what do we do? We make up another story.

3. THE STEADY-STATE UNIVERSE MODEL.

Visual #7-21

Recognizing that an infinitely old universe would have long since reached 100% entropy and lost all its useful energy (the Second Law), some have speculated that new matter and energy must be continually coming into existence from nothing. Since we have never seen such a thing happen it is supposed to take place out in deep space where we can't observe it.

Those who believe this do so not for scientific reasons but because they want to do

away with the need for a creator. They must *discard the observations* – the First Law of Thermodynamics – in favor of an unobservable theory. Good science, no?

The steady-state model has largely fallen out of favor. Even its former champion, astronomer Sir Fred Hoyle, has abandoned it in favor of a big bang operating under some sort of cosmic intelligence. He now calls himself a "non-Biblical creationist."

4. THE OSCILLATING UNIVERSE MODEL.

Visual #7-22

Since the steady-state model has fallen into disfavor, what can evolutionists do? Make up another story! Some try to get around the First and Second Laws by saying that matter and energy have existed forever and have oscillated through an infinite number of big bangs. The Oscillating Universe model says that each big bang is followed by an eventual "big crunch" as it collapses into another singularity. This explodes again, evolves into another universe, collapses again, and so on. Once again the laws of science tell us that this is impossible.

Visual #7-23

a. The Law of Gravity.

Gravity would have to pull the whole universe back together. The law of gravity can be written as $F_{grav} = \frac{Gm_1m_2}{d^2}$ where G is the universal gravitational constant, m_1 and m_2 are the masses of the objects, and d is the distance between their centers. The attraction between two objects decreases by the square of the distances between their centers. For example, if the distance doubles, the gravitational attraction is only one-fourth as strong.

Most astronomers believe the universe is between 7.5 and 15 billion light years across. It would take a tremendous amount of matter to produce enough gravity to pull it all back together. Try though they might, scientists have been able to detect only a tiny percentage of the matter needed (Gott & Rees, 1975, 365-376; also, see any astronomy or physics text). There is nowhere near enough matter for the universe to collapse back on itself once, let alone an infinite number of times.

b. Impossible in 4-Dimensional Space.

In the next chapter we will discuss the "big bang," the idea that the universe is the result of an incredibly violent natural explosion rather than the work of a supernatural being. We will see that a big bang requires space to be four-dimensional rather than the three dimensions (length, width, height) which we experience. If such were the case, there would be no center for gravity to pull toward.

c . 2nd Law of Thermodynamics.

Even if there were enough matter to make the universe come back together, the Second Law tells us that the process could happen only a finite number of times, because a certain amount of heat energy would escape and be forever lost every time the universe went through a bang/crunch oscillation.

Though the amount of energy in the present universe is enormous, it is a finite quantity. Since the sum of any two finite numbers is always a finite number, no matter how many times we add the energy lost in an oscillation to the present amount of energy in the universe we still get a finite quantity. Yet if the universe had gone through an infinite number of oscillations it would have lost an infinite amount of energy. This is a physical and mathematical impossibility.

Visual #7-24

Once again, evolution fails in its quest to explain everything by purely natural processes. The universe had to have a beginning. The Oscillating Universe model may push it farther into the past, but it cannot avoid it.

Recent reports in the media say that scientists believe the universe is expanding faster and faster and thus will never collapse on itself. We will examine the question of expansion in the next chapter, but the reports show that few scientists believe in an oscillating universe any more.

C. UNAVOIDABILITY OF THE SUPERNATURAL.

Remember that the most fundamental axiom of evolution is that everything must be explainable by purely natural processes. Unfortunately for evolutionists, this axiom is simply **wrong**.

Visual #7-25

The Second Law forces us to conclude that the universe had a beginning; the First Law rules out the possibility that this beginning happened by known natural processes. Thus, both creationists and evolutionists must admit that the universe's origin cannot be explained by known natural law. Creationists look to a God who is not part of the universe, while evolutionists rely on unknown physical laws. It doesn't do them any good.

Webster's dictionary defines "supernatural" as "not explainable by known natural forces or laws." Evolutionists cannot explain the origin of the universe by known natural forces or laws. Unless they can demonstrate some natural process that can make matter and energy come into existence and become steadily more organized, they too must acknowledge that, according to the dictionary definition, the universe had a supernatural origin.

Even if someone could demonstrate such a process, evolutionists would not be off the hook. They would still be faced with the question of where the process itself came from. Either God created it or else it exists because of random chance.

This is where the atheist's pretense of scientific objectivity falls apart. A creationist must believe that a supernatural being not subject to known natural laws established those laws. An atheist must believe that random chance, also not subject to known natural laws, set them into effect. He has no scientific advantage. Belief in God and belief in Random Chance are exactly parallel.

Each person must decide for himself which is more reasonable. Either way, known natural law CANNOT account for the origin of matter and energy. This fits perfectly with the predictions of creation, but it destroys the evolutionary axiom that everything must be explainable by purely natural processes. Theistic evolutionists are in as much trouble as atheists.

III. ORIGIN OF HEAVY ELEMENTS.

Visual #7-26

Any model that tries to explain the origin of the universe must try to explain the origin of all its parts. We've seen that evolution fails to provide a natural explanation for the origin of the universe on the largest scale. But how about the smallest scale, the level of the atom?

Visual #7-27

All the types of matter that we know of are made up of elements. About 90 (hydrogen, carbon, oxygen, uranium, etc.) are known to occur naturally on this planet, and over 24 (atomic numbers 43, 61, and 93 and above) have been manufactured artificially. Any comprehensive model of origins must attempt to explain how the 90 naturally occurring elements came to exist. Creation says that they were formed during the creation week, and that the earth came before the stars. Evolution says that they were formed either during or after the Big Bang, billions of years before the earth came into existence.

Visual #7-28

We will see later that Big Bang theory can account for only a few elements. The rest are supposed to have formed much later, in the explosions of supernovae. Some of these elements came together billions of years later under the influence of gravity to form the earth. As a 1960s song put it, "We are stardust."

A. PRESENT UNDERSTANDING OF THE ATOM.

Before you go farther in comparing these two beliefs, you should make sure your students understand some basic chemistry terms.

1. ELEMENTS.

An *element* is a substance (carbon, hydrogen, oxygen, etc.) which cannot be decomposed by ordinary chemical means. It takes something extremely energetic, such as a nuclear reaction, to break it down into simpler components.

2. ATOMS.

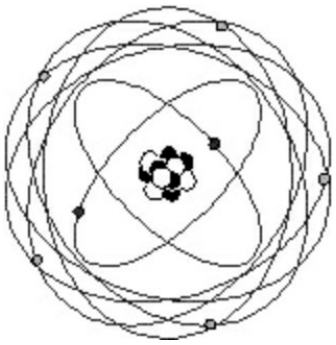
An *atom* of any element is the smallest particle that has all the properties of that ele-

ment. Though we can see the blurred image of an atom with scanning tunneling electron microscopes, the atom's inner workings are too small to be seen in detail with any known technology. Nevertheless, we often use a "planetary model" to help visualize its structure.

3. NUCLEI.

Visual #7-29

The *nucleus* is the central part of an atom. The nucleus contains one or more positively charged particles known as *protons*, and (except for hydrogen) also includes electrically neutral particles called *neutrons*. According to the present model of the atom, negatively charged particles known as *electrons* follow paths called *orbitals* around the nucleus.



Planetary model of the atom. Electrons are in *orbitals* around the nucleus, which is composed of protons and neutrons. *Serif clipart*

Atoms are so small that we cannot see the details of what goes on inside them. Though we imagine them as a few little electrons orbiting a nucleus, the real situation is more complex in that the electrons act more like a cloud than like balls in orbit. Nevertheless, we use the *planetary model* to help convey an approximate idea of the way atoms operate.

4. ATOMIC NUMBER.

The *atomic number* of an element is equal to the number of protons in the nucleus of its atoms. Each element has a unique atomic number. Hydrogen, atomic number one, has one proton; helium, atomic number two, has two protons, and so on.

5. ISOTOPES.

All elements are able to exist in various states of stability, or *isotopes*. Different isotopes of the same element have the same number of protons, but each has a different number of neutrons in the nucleus. Some are extremely stable, others decay slowly into atoms of other elements (those with a higher or lower atomic number), and others decay very rapidly.

Here's something to consider: since positive repels positive, every atom in the universe with more than one proton should fly apart. They would have a serious problem coming together in the first place, yet once they do, some unknown force keeps them together. Though neutrons are involved somehow, scientists have no idea why all the multi-proton atoms are able to stay together. They call whatever holds them together the "strong nuclear force," but they don't know what it is. Perhaps Colossians 1:17 tells us: "He [Jesus] is before all things, and in Him all things hold together." (RSV)

6. MASS NUMBER.

The *mass number* of an atom is determined by adding the number of protons and neutrons in the nucleus. Each isotope of a given element has a different mass number. It is possible for isotopes of more than one element to have the same mass number: for example, hydrogen-3 (one proton and two neutrons), and helium-3 (two protons and one neutron) both have a mass of 3.

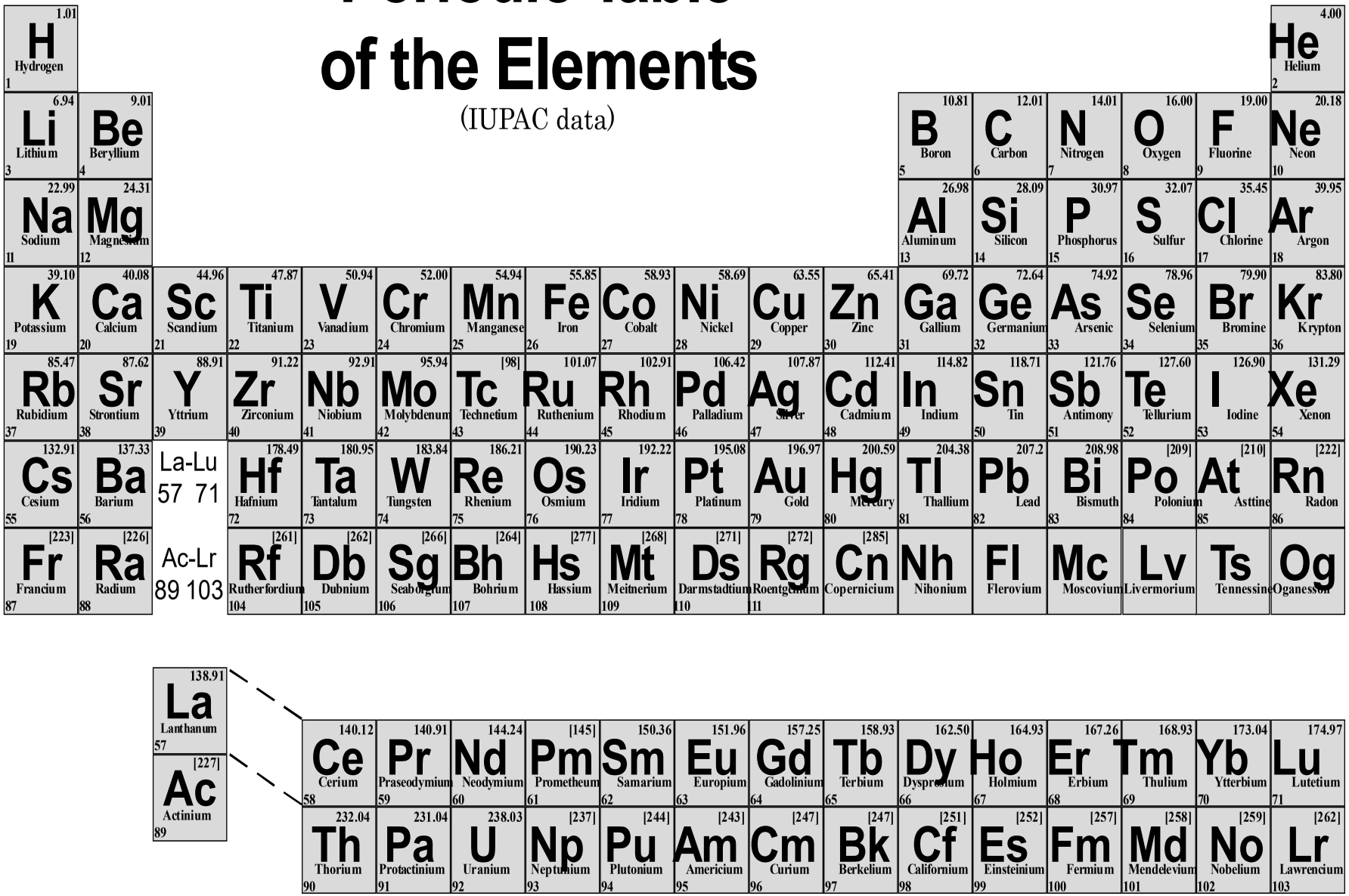
B. SPECTROSCOPIC ANALYSIS.

Visual #7-30

How can we tell which elements are out in space? The technique is actually rather simple. Scientists have discovered that any atom when heated up emits light of various colors. This occurs because its electrons absorb heat then emit energy in a different form, light. The light is emitted with discrete energy levels. A few of these show up as colors within the range of light visible to the human eye, and many others are detectable with appropriate equipment. By heating up a sample of a particular element and viewing the resulting light

Periodic Table of the Elements

(IUPAC data)



with a prism or diffraction grating, we obtain a pattern of colored lines called an *emission spectrum*. Each element has a unique spectrum which allows us to identify its presence even in the light from a distant star.

Of course, a star is far hotter than our labs. Stars are believed to be so energetic that, at least in the interior regions, electrons are knocked completely loose from their atoms. (This is called a *plasma*, a fourth state of matter besides solids, liquids, and gases.) As a result, the light coming from the interior of a star is not produced by discrete electron jumps but is a continuous spectrum of all visible colors and many invisible ones. This makes it impossible to observe individual spectral lines from inside the star. Thus, we cannot directly observe what elements are inside the star.

Visual #7-31

The outer edge of a star is different than the interior. As the superheated atoms of a star circulate, some reach the outer regions and cool down enough to recapture a few electrons. These electrons are then able to absorb some of the light energy coming from the interior of the star. The photons absorbed are missing from the light that reaches us here on earth. The result is that we see something like a photographic negative of what we observe in a lab. Instead of an emission spectrum of bright lines against a black background, we see an *absorption* spectrum of dark lines against a white background. This absorption spectrum allows us to tell what elements are present in the outer layers of the star.

C. WHAT ARE WE LOOKING FOR?

Remember that there are 92 known naturally occurring elements (90 on earth and two more in the stars). We are trying to determine if it is reasonable to believe that they were formed in a big bang, stars, or supernovae.

Visual #7-32

Based on the absorption spectra of stars, almost all of them seem to be made up of about 90% hydrogen atoms and just under 10% helium atoms. If we consider them by mass instead, they seem to be about 70% hydrogen and almost 30% helium. (The difference is because the average helium atom is about four times as massive as hydrogen.) A tiny fraction of a percent of the masses is made up of other elements, which astronomers collectively call metals. (Note that this use of the word metal is different from the terminology chemists use.) An Internet search reveals that up to 71 elements have been identified in the sun or stars through spectroscopic analysis. Interestingly, technetium, atomic number 43, is included (Armstrong, 2003). This element is not known to occur naturally on earth; in fact, it received its name because the only known samples were produced by technology. Its isotopes are believed to decay within a few million years – so what is it doing in stars supposed to be billions of years old? But the larger question is, *where did the naturally occurring elements come from?*

1. ***CREATION EXPLANATION.***
   Creation says that all the elements found in nature, from hydrogen to uranium, came into existence within a very short time of each other. The Bible hints at the possibility that God used two elements as building blocks for all the others in 2 Peter 3:5, which says that the earth was formed out of water and by means of water. God may have used hydrogen and oxygen as the starting point; then again, He may have created all the elements from nothing. We have no way to be sure. Either way, we have to believe in ***one*** unexplainable creation event.
2. ***EVOLUTION EXPLANATION.***
   Evolution says that matter first appeared in its simplest form, hydrogen, and that the heavier elements were put together (*synthesized*) later as hydrogen atoms combined with each other to form more massive atoms which combined with each other, and so on. This implies that there must be a naturalistic explanation for the origin of the heavier elements. We will see that this requires a ***tremendous number*** of unexplainable events.

D. PROBLEMS WITH SYNTHESIZING HEAVY ELEMENTS.

Electrons can be removed and replaced in an atom without changing which element it is, but protons cannot. The number of neutrons may also have a drastic effect on an atom and determine whether it is stable or not. When we talk about how elements might have been synthesized, what we really mean is how their nuclei -- protons and neutrons -- might have been put together.

Just what are protons and neutrons? Since they are too small to see with even our most powerful instruments, all we can do is set up models of how we think they work. We treat a proton as a tiny spherical particle with an electric charge of +1. We also treat a neutron as a sphere, but with zero charge. Three observations lead us to conclude that a neutron is produced when a proton and electron combine in some little-understood process.

- A proton has about 1836 times as much mass as an electron, and a neutron 1837 times as much. Thus, the mass of a neutron is almost exactly equal to the mass of a proton and electron together.
- Neutrons are stable inside the nucleus of atoms, but outside of an atom they decay quickly into a proton and an electron.
- In a process called "beta decay," an electron comes shooting out of the nucleus of an atom, leaving behind a different element than before the decay took place. In such cases, the nucleus has one more proton and one less neutron than it started with. The atomic number increases by one but the mass is unchanged.

Visual #7-33

Simplified model of the nuclei of the three isotopes of hydrogen (atomic number 1). Plus sign represents a proton, zero represents a neutron. Protium (left) has a mass number of 1, deuterium (middle) has mass 2, and tritium (right) has mass 3.

Hydrogen can have zero, one, or two neutrons. Its isotopes thus have mass numbers 1, 2, and 3 and can be identified as H-1, H-2, and H-3.

1. LIMITATIONS OF BIG BANG SYNTHESIS.

Evolutionary theory says that all the material in the big bang was in the form of unconnected protons and electrons. This means that hydrogen (one proton) would have been the only element present. It had to be the raw material from which all other elements were formed. Either during or after the big bang, protons are supposed to have captured electrons to become neutrons, then H-1 atoms are supposed to have captured neutrons to form H-2 and H-3. The three isotopes in turn are believed to have combined with each other to form heavier elements, which combined and recombined and re-re-combined, etc., finally producing all the elements that occur in nature.

Scientists have been able to perform a similar process on an extremely limited scale. Hydrogen bombs work by smashing together two hydrogen-2 atoms (atomic number 1, mass number 2) to form helium (atomic number 2, mass number 4). However, that's as far as they've been able to go. A look at any chemistry book shows the problem. If this is how heavier elements originated, we should find a smooth sequence of atoms going from mass number 1, 2, 3, 4, 5, etc., all the way up to the heaviest elements. We do not. As shown below, there are two critical gaps, at mass numbers 5 and 8. No known stable nuclei have either of these masses, which would be needed to form heavier elements in a big bang.

Visual #7-34

NATURALLY OCCURRING ISOTOPES

Name of Isotope	Atomic Number	Mass Number	Protons	Neutrons
hydrogen-1	1	1	1	0
hydrogen-2	1	2	1	1
hydrogen-3	1	3	1	2
helium-3	2	3	2	1
helium-4	2	4	2	2
NONEXISTENT		***5***	1	4
NONEXISTENT		***5***	2	3
NONEXISTENT		***5***	3	2
NONEXISTENT		***5***	4	1
lithium-6	3	6	3	3
lithium-7	3	7	3	4
NONEXISTENT		8	1	7
NONEXISTENT		8	2	6
NONEXISTENT		8	3	5
NONEXISTENT		8	4	4
NONEXISTENT		8	5	3
NONEXISTENT		8	6	2
NONEXISTENT		8	7	1
beryllium-9	4	9	4	5
boron-10	5	10	5	5
boron-11	5	11	5	6
carbon-12	6	12	6	6
carbon-13	6	13	6	7
carbon-14	6	14	6	8
nitrogen-14	7	14	7	7
nitrogen-15	7	15	7	8
oxygen-16	8	16	8	8
oxygen-17	8	17	8	9
oxygen-18	8	18	8	10

etc.

(Note: scientists using particle accelerators have been able to synthesize very heavy radioactive elements such as Lawrencium, Nobelium, and the like. This has nothing to do with the missing mass problem. They *start* with a heavy element such as Uranium, so they don't have to worry about the gaps at masses five and eight.)

Physicists using particle accelerators have tried every possible combination of protons and neutrons, only to find that any nucleus with either of these masses falls apart almost instantaneously. Thus, there is no known process by which a big bang could use hydrogen to produce elements heavier than helium-4. Even if an unknown process could somehow get past mass number 5 to produce lithium-6 or lithium-7, it would stop again at mass number 8 (Fowler, 1956, 85).

Visual #7-35

This is no trivial problem. No less an authority than Dr. George Gamow, who persuaded much of the scientific community to believe in the big bang, admitted that it is an unsolved problem for all the big bang models (Gamow, 1956, 154). Even if a big bang could temporarily smash together atoms with mass number 5 or 8, they disintegrate so fast that the rapidly expanding explosion couldn't hold them together long enough to use them as building blocks for heavier elements.

Why make such a big deal out of these two numbers? Because our observation in-

dicates that perhaps 99% of the matter in the universe consists of two isotopes, H-1 and He-4. In order to make all the rest of the elements in a Big Bang, we need to find ways to combine these two. So what happens if we put together two H-1 atoms? Nothing. Two protons do not stick together unless there is at least one neutron present. Even then, He-3 is extraordinarily rare, comprising only about 0.000138% of all the known helium (Gammel, 1998). Then how about one H-1 and one He-4? Oops, that has mass 5, which falls apart instantly. Okay, then, how about two He-4? Sorry, mass 8, which also refuses to stay together. There are no other possible ways to combine two of these nuclei. Using the raw material available throughout the universe, we are blocked at every turn from putting together any of the heavier elements.

Visual #7-36

To be sure, lithium-6 and lithium-7 have been observed in the spectra of stars. However, their relative abundances are inconsistent with the predictions of current big bang models (Anders, 2014).

2. ALTERNATE EVOLUTIONARY MODEL: SYNTHESIS IN STARS.

Visual #7-37

So where did the other 90 natural elements besides hydrogen and helium come from? If we reject the possibility that they were created by an all-powerful God, we must once again make up a story. Present theory says that they must have formed later, perhaps in the interior of stars or perhaps during the violent processes that occur as massive stars explode in supernovae.

a. Problems with Synthesis in Ordinary Stars.

Visual #7-38

If you take a course in astronomy you will be told that a star spends most of its life performing nuclear fusion, thereby turning hydrogen into helium. At the end of a star's hydrogen-burning phase, it is supposed to go into a "helium flash." During this hypothetical process, one of two things is supposed to happen:

- Either two helium-4 nuclei (alpha particles) combine to form the unstable beryllium-8, which for some unknown reason does not fall apart instantly but instead stays together long enough to combine with another helium-4 to form carbon-12,
- Otherwise, three helium nuclei are supposed to fuse directly in a "triple-alpha" process to form the carbon-12.
- Somewhere in the process, some of the carbon-12 nuclei are supposed to capture yet another helium nucleus, resulting in oxygen-16.

There are at least three problems with this scenario: (1) the process goes against what we've discovered about the instantaneous decay of nuclei with atomic mass 8, (2) it has never been observed – indeed, even if it did happen it could not be seen from outside the star (Seeds, 1999, 251), and (3) atomic nuclei are so small (less than 1/100 of a picometer, or less than 10^{-13} m in diameter) that the chance of getting two to collide is extraordinarily small, let alone three at the same time. There is no evidence that it ever actually happens. It's another made-up story, invented to try to explain how to get past the mass-8 problem.

b. Problems with Supernova Synthesis.

Visual #7-39

Many other hypothetical steps fill the textbooks – carbon atoms combining into heavier elements which then decompose, and so forth – leading up to elements as heavy as iron (atomic number 26). Such processes would require temperatures measured in the hundreds of millions of degrees, hundreds or thousands of times hotter than what a star's normal conditions appear to be. As a result, present theory says that most of the heavier elements, especially those heavier than iron, must have been formed when massive stars exploded in *supernovae*. These elements were scattered throughout space by the explosions, then recycled as gravity pulled the same clouds that had just exploded back together into new stars. The cycle has continued for billions of years, eventually producing all the elements found in nature.

Some of the problems with this scenario:

i. Presence of metals in all stars.

Visual #7-40

According to evolution, the very earliest stars formed in the aftermath of the Big Bang but before the first supernovae took place. These should have been metal-free, consisting of nothing but hydrogen and helium. If the most distant stars and galaxies were formed just a few hundred million years after the Big Bang, the light we now see from them should have been sent in our direction before any supernovae had time to take place. These should be the metal-free stars we are looking for. Yet it is common knowledge that while there are metal-poor stars, there is not a single one known to be completely metal-free.

ii. Problems with recycling elements.

The force of gravity drops off by the square of the distance between the center of two objects, as seen in the formula for the Law of Gravity where *d* represents the distance.

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

Stars contain a great deal of matter in a relatively small area, resulting in strong gravitational attraction and keeping the star together despite the outward force due to heat. However, as the distance from the center of the star doubles the gravitational force is only one-fourth as strong; a distance five times as great results in one-twenty-fifth the force; a hundred times farther results in one ten-thousandth the force, and so on. Now imagine that a star that was previously a few million miles across blows up in a supernova. In a short time its mass is spread over hundreds of billions of miles. The force of gravity between the atoms would be so weak that they would never come together to form a new star, but would just keep spreading through space.

It is obvious that a supernova would not lead to new stars. But remember, evolutionists are determined that everything must be explainable by purely natural processes. What if it can't? Yes it can! They just make up another story, then say "Because we can make up a story, therefore our story must be true."

Visual #7-41

The story is that thousands or millions of years after the first supernova, another one takes place relatively close by, maybe only a few light-years away. The shock wave from the second collides with the material from the first, pushing it back together. Later, a third supernova creates a shock wave that pushes the second back together, and so on. Eventually, new stars appear that contain the heavier elements produced by the earlier supernovae.

This makes perfect sense if you believe that hitting an expanding cloud with a shock wave coming from trillions of miles away will make the cloud condense into a ball, and that the process has happened to every single star we have ever observed. If you have a problem believing that, then you will have a problem believing the evolutionary scenario of how the heavier elements got into the stars.

3. SUMMARY.

Visual #7-42

We are trying to determine whether the chemical elements could have come from known natural processes. Astronomers have ideas about the origin of the elements found on earth and in space, but all these scenarios are purely theoretical. There is no direct observation to support them, only a refusal to admit that creation could possibly be true. Evolution says that some unknown natural process, operating by random chance, was able to accomplish throughout the universe what our most brilliant scientists have failed to achieve under ideal laboratory conditions.

This is not science, it's faith. So why bother? Because of the fundamental evolu-

Visual #7-43

tionary axiom that everything must be explainable by purely natural processes. All the elaborate stories about how the heavier elements might have come together are an attempt to push God out of the universe. They are based on wishful thinking, not on any observable or verifiable data.

> A quick overview of exponential notation: a "10" with a raised number after it indicates some power of ten, that is, a "1" followed by that many zeroes. For example, 10^{3} is ten times itself three times, or 1000. 10^{12} is ten times itself twelve times, or 1,000,000,000,000 -- a trillion. 10^{50} is ten times itself fifty times, or 100,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000 – a hundred trillion trillion trillion trillion.

Visual #7-44

The number of atoms in the known universe is estimated at about 10^{80}, or a "1" with eighty zeroes behind it. (By comparison, a billion is 10^{9} and a trillion is 10^{12}.) If only 1/1000 of 1% of them were heavier than helium-4 (the percentage is actually much higher), this would be about 10^{75} atoms. Evolutionists must believe that an unexplainable event took place every time one of these atoms was formed – at least 10^{75} times. Creationists believe that one unexplainable event occurred when matter and energy, including the heavier elements, were called into existence by a direct creative act. According to Occam's Razor, which belief is more reasonable, one miracle or 10^{75} ?

Either way, known natural law is completely inadequate to account for the origin of matter and energy. Something outside the realm of known natural processes has to be responsible. This is exactly what creation predicted.

CHAPTER 7 REVIEW

The First Law of Thermodynamics tells us that matter and energy could not have come into existence by any known natural process.

The Second Law tells us that they cannot have existed forever: at some time in the past they would have been at zero entropy. Known natural laws could not apply before then. There had to be a starting point.

The Quantum Universe model was proposed to try to get around this problem. It has no basis in experimental science.

The Steady State Universe model must deny the First Law.

The Oscillating Universe model requires many times more matter than has been observed in the universe. It does not eliminate the problem of the origin of the universe; it just pushes it farther back into the past.

There is no known mechanism able to produce any element heavier than helium-4 from the protons and neutrons that would have been present in a big bang. There are 88 such heavier elements known to occur naturally on earth. About 16 of these heavier elements have been detected in distant stars. Evolutionists have put forth theories about a few, but do not even have a made-up story to account for most of them.

Both creationists and evolutionists must believe that some process outside the realm of known natural law brought the universe into existence. Creationists believe in one unexplainable event; evolutionists must believe in at least 10^{75}.