TEACHING ORIGINS IN SCIENCE CLASSES

CHAPTER 1 - INTRODUCTION

Visual # 1-2

The common view that the evolution/creation controversy is a matter of science versus religion is a misconception. There are aspects of science and religion to both creation and evolution. The purpose of this book is to help teachers teach the topic of creation versus evolution in science classes so as to emphasize science and only bring in religious topics when appropriate.

The creation/evolution controversy has to do with everything in the physical universe such as the origins of energy, matter, the stars, planets, earth, life, the human race, animals, plants, and so on.

Because many people hold very strongly to their beliefs about creation or evolution, this can be a very emotional issue. Let us be sure we understand exactly what the terms mean.

I. DEFINITIONS.

A. CREATION: Initial Complexity.

The religious aspects of creation are obvious: W*ho or what started everything, why, and what does it all mean?* In this book we will not emphasize the religious aspects such as Genesis, Adam and Eve, the Garden of Eden, and so forth. Instead, we will focus on the conditions in the beginning.

The scientific aspects to creation have to do with the question of *What were the conditions at the beginning?* From a scientific perspective, creation is the concept that the universe, earth, and life each began in a complex, mature state as a result of the action of an influence outside the realm of nature – a Creator. Later changes could produce diversification within limits (e.g. different breeds of dogs), but would not result in increased complexity or information content. In fact, since everything started at its best, change would not make things better but would probably tend toward deterioration. Thus, we could summarize the concept of creation as *Initial Complexity* with later diversification and deterioration, or, we could think of it as C*omplex to Simple.*

Visual # 1-3

Creation includes but is not limited to the creation of distinct "kinds" whose members can never evolve into a different kind no matter how much time is available. If we were to graph the development of living creatures through the earth's history, we would see what looks like a whole forest of trees, each representing a kind. Diversification through time might lead to the appearance of new branches on the trees, but no branch would ever grow away from its tree and become attached to a different one. Some branches might end as kinds become extinct. The members of each kind are genetically related to each other, but not to the members of other kinds.

TWO MAIN VARIATIONS.

Visual # 1-4

1. **Young-Earth Creation.** Biblical creation leads us to the conclusion that the age of the earth should be measured in thousands of years.
2. **Old-Earth Creation.** Some who accept the concept of creation believe that the process took place millions or billions of years ago.

B. EVOLUTION: Initial Disorganization.

Visual # 1-5

Evolution is the opposite concept. It says that the universe, earth, and life each began in a disorganized state. Ever since then, the changes that have taken place have led to a continual increase in complexity.

The idea of evolution includes but is not limited to the belief that life originally arose from nonliving chemicals by natural processes, and that variability of living organisms is unlimited - that is, given enough time, one kind of creature can evolve to a completely

different kind. Thus, we could summarize the concept of evolution as *Initial Disorganization* without any limits on the amount of diversification that occurred later. We could think of it as *Simple to Complex.*

If we were to graph the development of living things through the earth's history, we would see what looks like a single enormous tree. At its base is the first simple cell; each of the millions of branches represents new types of organisms. Because of their common ancestry, all living things are genetically related to each other.

MAIN VARIATIONS.

Visual # 1-6

1. THEISTIC EVOLUTION. A relatively small percent of evolutionists consider themselves atheists. Most believe instead that a supernatural God brought the universe, earth, and life into existence and has guided the process of increasing complexity ever since.

2. MATERIALISTIC (ATHEISTIC) EVOLUTION. Atheists believe that the universe, earth, and life came into existence by random chance and have steadily increased in complexity ever since, also by random chance. No supernatural explanations are allowed, but everything must be explainable by purely natural processes.

Both theistic and atheistic evolution include two contradictory sub-models:

3. NEO-DARWINISM says evolution occurred slowly and gradually over millions of years.

4. PUNCTUATED EQUILIBRIA says that living things stayed essentially unchanged through periods of equilibrium lasting millions of years, until the equilibrium was punctuated by a major disaster such as an asteroid impact, earthquake, or volcano. The sudden change in the environment made the animals and plants evolve very rapidly, perhaps in less than a hundred years.

Visual # 1-7

In summary: the basic idea of Creation is *Complex to Simple*. The basic idea of Evolution is *Simple to Complex*.

II. A NON-ISSUE: SCIENCE AND THE EXISTENCE OF AN INFLUENCE OUTSIDE NATURE.

Visual # 1-8

There is no known natural process that would cause matter and energy to come into existence in a complex, organized condition as creation requires. But neither is there a known natural process that would come into existence in a disorganized condition as evolution postulates. Whether we believe in initial complexity or initial disorganization, we have to look to some process that cannot be explained by our present understanding of nature.

Some argue that since creation's premise of initial complexity requires a creator, it is automatically unscientific. It is true that we cannot do experiments to determine who or what this creator might be. However, most evolutionists believe in theistic evolution, which says that some sort of intelligent being outside the scope of nature guided the process of evolution. This belief depends upon a supernatural being as much as does creation. If we rule out creation, we should automatically rule out theistic evolution also.

Atheistic evolutionists are no better off. To see why, let us consider their reasons for rejecting as unscientific anything that depends on an entity outside the realm of nature.

A. NECESSARY CHARACTERISTICS OF A CREATOR.

No matter who or what the creator might be, he would have to have certain characteristics.

Visual # 1-9

1. INVISIBLE. Many atheists say that they won't believe in something they can't see. We can concede this point: there is no question that a creator would be **invisible**. His presence can only be detected by what he does.

2. SUPERNATURAL. If a creator brought the laws of nature into existence, then he is not subject to those laws. He is above nature, or **supernatural**.

3. ETERNAL. The creator would have had to exist before the universe began. He must be **eternal**.

4. OMNIPRESENT. The creator's influence would have to extend throughout the universe. He has been everywhere, or **omnipresent**.

5. OMNIPOTENT. If a creator brought matter and energy into existence and established laws of nature to govern their operation, then he is either directly or indirectly responsible for everything that has ever happened. He is all-powerful, or **omnipotent**.

6. SELF-EXISTENT. Who made the creator? Nobody. He is **self-existent**.

To summarize: atheistic evolutionists call creation and theistic evolution unscientific because both depend upon an entity who is **invisible, supernatural, eternal, omnipresent, omnipotent,** and **self-existent**.

B. NECESSARY CHARACTERISTICS OF RANDOM CHANCE.

Visual # 1-10

Let us use the same criteria to see if atheistic evolution is truly scientific. If there was no intelligent entity responsible, how did everything come into existence? An atheist might call it accident, quantum fluctuation, or some other term, but ultimately, he has to believe that the universe is the result of a long series of forces, processes, and events operating over billions of years without any particular purpose. Rather than continually repeating "a long series of forces, processes, and events operating over billions of years without any particular purpose," let us call the whole series "random chance" for the sake of brevity. Following are some of the characteristics that logic dictates random chance would have to possess.

Visual # 1-11

1. INVISIBLE. What does random chance look like? Random chance is **invisible**. Its presence can only be detected by what it does.

2. SUPERNATURAL. If random chance brought the laws of nature into existence, then it is not subject to those laws. It is above nature, or **supernatural**.

3. ETERNAL. How long has random chance been here? Forever! It is **eternal**.

4. OMNIPRESENT. Where has random chance been? Its influence extends throughout the universe. It is everywhere, or **omnipresent**.

5. OMNIPOTENT. If random chance brought matter and energy into existence and then established laws of nature to govern their operation, then it is either directly or indirectly responsible for everything that has ever happened. It is all-powerful, or **omnipotent**.

6. SELF-EXISTENT. Who made random chance? Nobody. It is **self-existent**.

Though atheistic evolution rejects any belief that relies on a creator, it relies just as much on Random Chance. Both have exactly the same characteristics. Either would have to be **invisible, supernatural, eternal, omnipresent, omnipotent,** and **self-existent**.

The point is that neither atheistic evolution, theistic evolution, nor creation has any scientific advantage or disadvantage over the others simply because of dependence on a higher power, whether an intelligent being or random chance. If we eliminate one from scientific consideration in the classroom, we should eliminate all; if we allow one, we should allow all.

III. THE NATURE OF KNOWLEDGE. *(Epistemology.)*

Visual # 1-12

Science is an attempt to gain new knowledge. However, few people have thought carefully about what it really means to know things. "Knowledge" can mean at least six things.

Visual # 1-13

A. EXPERIENCE THROUGH THE SENSES.

If you have ever been stung by a bee you know that it hurts. You may know how to drive a car, ride a bicycle, and so on.

We gain this type of knowledge through the five senses or through a measuring device which we then observe through one of the senses. Such sense knowledge has the potential to be duplicated so that anyone in the world with normally functioning senses could experience it in the same way.

B. RELIANCE ON AUTHORITY.

When we say we know something in this way, we mean that someone told us something and we decided to trust them. For instance, we know how far away the sun is because astronomers tell us. You know when you were born because your mother told me. You know she really is your mother because she told you that too. And as the old song says, "Jesus loves me, this I know, for the Bible tells me so."

C. LOGIC.

We say we know many things because we figured them out logically. For instance, you probably know that a trillion plus a trillion equals two trillion, even though you have never counted that high. You know that the measures of the angles in any triangle add up to 180°, even though you haven't measured every triangle that could possibly exist.

D. FEELING OR INTUITION.

Some things are unique to the individual. For instance, no one else can experience your emotions or intuition in exactly the same way you do. Perhaps you meet someone and just "know" that person is the one you want to spend the rest of my life with. Or you may feel that there is some sort of special calling on your life.

This is a different type of personal experience than that gained through the five senses. You cannot test it or prove it to anyone else, but it is still true.

E. FALSE KNOWLEDGE.

1. WISHFUL THINKING.

Some people say they know things that are nothing more than wishful thinking. For instance, people who "know" they are going to win the lottery do not buy tickets because they are eager to donate money to their government, but because they really think theirs will be the winning ticket. In this case it is possible that the ticket really is the winner, and the person really wants it to be true.

2. BLUFFING OR LYING.

People also try to persuade others to believe them for ulterior motives, for instance, in sports and games of chance such as poker. However, these are not the only times. Suppose a person received a two year government grant to find the bones of "ape-men." If he has not found any after 22 months, there would be a strong incentive to exaggerate the human-like characteristics of any bones he finds as the time nears its end.

IV. POTENTIAL PROBLEMS WITH LOGIC.

Visual # 1-14

There are two main types of logic involved in science, Inductive and Deductive. Inductive logic works by looking at specific examples of a particular type of phenomenon, then trying to determine the most reasonable pattern or explanation. Because conclusions are reached after the examination of evidence, it is called *a posteriori* logic. This sort of logic is the key to interpreting data when following the scientific method.

Deductive logic, on the other hand, starts with general principles accepted as absolute truth, then applies them to specific cases so as to force us to conclusions that must be true. The starting

principles of deduction (*a priori* assumptions) may come from inductive logic, they may be a guess, or they may be something we accept simply because an authority told us to.

An example that illustrates both types of logic: You are probably confident that you have a brain. But how do you know?

- It is very unlikely that you have sense experience, because almost no one is ever awake during surgery to see or feel his or her own brain.
- If you have had brain surgery or a test such as an MRI or CAT scan, you still did not see your brain yourself. You must trust the authority of the surgeon or technician who told you that there was a brain inside your head or that the image you were seeing on a screen was really your brain and not a computer simulation.
- The rest of us have to rely on deductive logic. Our thought process goes something like, "All humans have a brain. I am a human. Therefore, I have a brain."

Visual # 1-15

But how do we "know" that the starting point of our deductive logic, that all humans have brains, is correct? Through inductive logic. There have probably been at least tens of thousands of people who have had either autopsies or brain surgery or brain scans. If even one of them did not have a brain, it would have been headline news. Since we have never heard of a single such case, we reach the reasonable conclusion that all humans have brains. Even people with half a brain are sometimes the subject of news reports.

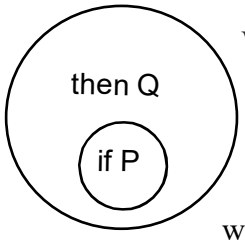
Imagine the headlines if a living person were ever discovered with no brain at all. If a single such person were found, none of the rest of us could be sure we had a brain either. We could no longer trust our deductive logic because it would be starting with a false assumption.

A. SYLLOGISMS.

Visual # 1-16

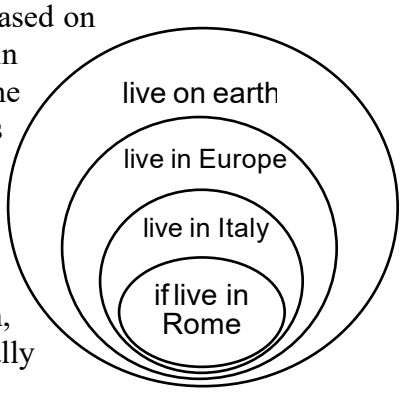
Most examples of deductive logic can be put in a conditional form known as a *syllogism,* which is arranged as "if something, then something else." The most common structure of a syllogism would look something like this:

If statement P is true, then statement Q is also. (This is called the *major premise*.)
P is true. (The minor *premise*)
Therefore, Q is true. (The *conclusion*)



We could diagram the flow of logic as shown on the left, where the inner circle represents the "if" part and the outer one represents the "then" part. Anything inside the inner circle is automatically inside the outer circle, but not vice versa.

We could also have a chain of syllogisms (*transitive logic*). This starts with a series of major premises, each based on on the previous, such as, "If a person lives in Rome then he lives in Italy. If a person lives in Italy then he lives in Europe. If a person lives in Europe then he lives on earth." Then, we would have the minor premise, e.g., "John lives in Rome." Therefore, we reach the conclusion that "John lives on earth." We could represent a chain of syllogisms by nested circles as shown, with the "if" part in a smaller circle and the "then" part in a larger one. Again, anything inside one of the smaller circles is automatically inside the larger circles, but not vice versa.



B. INCORRECT STRUCTURE.

Reversing the "if" and "then" parts of a major premise results in a *converse.* The converse of "if an animal is an dog then it has a tail" would be "if an animal has a tail then it is a dog." We can immediately recognize that this is not true -- but why?

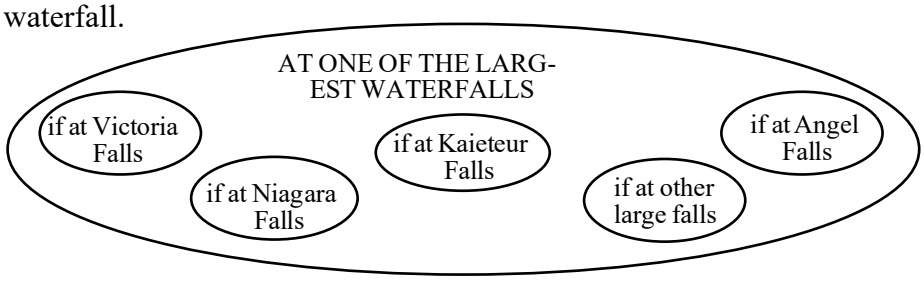
Visual # 1-17

Let us consider an example where a statement and its converse are both true. We could say correctly, "If I am at Mount Everest, then I am at the highest mountain in the world." Since there is only one highest mountain, it is equally correct to reverse the "if" and "then" parts to say, "If I am at the highest mountain in the world, then I am at Mount Everest." (Such a statement in which there is a one-to-one match is called a *biconditional*.)

Visual # 1-18

One of the most common errors in logic occurs when someone tries to apply a converse in a case in which there is ***not*** an exact one-to-one match between the "if" and "then" parts of the statement. For instance, it is correct to say, "If I am at Victoria Falls, then I am at one of the largest waterfalls in the world." However, there are many large waterfalls. If we change the above statement to say, "If I am at one of the largest waterfalls in the world, then I am at Victoria Falls," it is no longer reliable. We could just as easily be at any other large waterfall.

Visual # 1-19

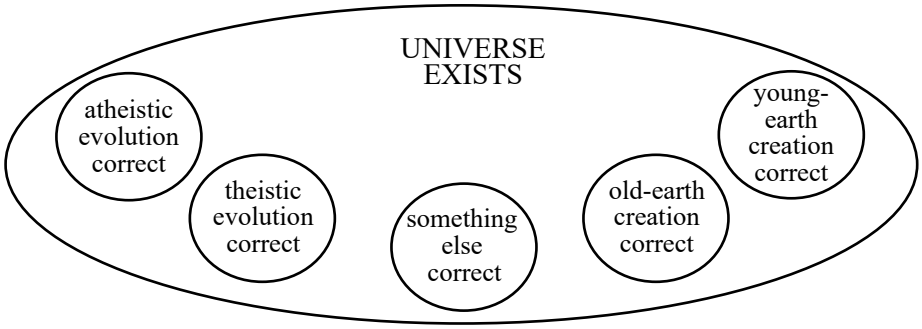


The reason we cannot trust the converse in this case is that the opposite is not true. Except in the case of a biconditional, not everything inside the outer circle is inside any given inner circle.

Visual # 1-20

This type of error is common. Many textbooks present the idea that if the story of evolution is true, then it would explain the universe. This is true. However, sometimes the idea is reversed, giving the conclusion "If the universe exists, then the story of evolution must be true." This is false for the same reason that the statement about high waterfalls was. While evolution is one possible explanation, there are others as well. We could diagram the logical flow as shown below:

Visual # 1-21



Once again, the error occurs because things inside the outer circle are not necessarily inside the inner circle. The fact that the universe exists tells us nothing about which explanation is true.

C. FALSE PREMISES.

The other main problem with logic comes not from invalid structure but from false premises.

Visual # 1-22

For example, Suppose we say, "All dogs bark," which we could paraphrase to say, "If an animal is a dog, then it barks." [Major premise.] We then say, "Snoopy is a dog." [Minor premise.] Therefore, we conclude, "Snoopy barks." The logic is perfectly fine. But is it true? Not if Snoopy happens to belong to the Basenji breed of Africa. Basenjis do not bark. Or perhaps Snoopy could have laryngitis, or just never feels like barking.

The incorrect conclusion in these two examples did not happen because the structure of the logic was faulty. We could easily represent it as circles similar to those shown previously. Rather, we reached a wrong conclusion because one of the premises was false.

V. BASIC PREMISES OF CREATION AND EVOLUTION.

Because the subject of origins deals with the distant past, the amount of testing we can do is limited. Thus, we have to depend much more on deductive logic than we usually do in science.

Visual # 1-23

The subject of geometry is one of the best illustrations of deductive logic. The subject depends on *postulates*, statements which are accepted as self-evident without proof. In establishing his system of geometry over 2,000 years ago Euclid identified twenty-three postulates. Once we accept them the rest of his ideas about geometry follow logically.

One of the twenty-three is not universally accepted, though. Euclid's "Parallel Line Postulate" stated that given a line and a point not on the line, there can be only one line through that point that is parallel to that first line. However, the mathematicians Riemann and Lobachevski concluded that this postulate was *not* self-evident to them. Both believed that space is curved in some way, which means there is no such thing as a straight line in the sense that we understand "straight." Depending on which way space is curved, there would either be an infinite number of parallel lines through the point, or no parallel lines at all. As a result, they came up with two contradictory non-Euclidean versions of geometry. No one can absolutely prove if Euclidean, Lobachevskian, or Riemannian geometry is right, because all three are based on unprovable postulates.

Likewise, what we believe about the origin of everything depends largely on statements we accept as true. (These are often called *axioms* or *presuppositions*.) None of them can be proven. They must simply be accepted as the most reasonable explanation. However, what seems reasonable to one person may seem unreasonable to another.

EVOLUTION	CREATION
1. NATURAL PROCESSES ONLY. Every natural phenomenon must have a natural cause. As Darwin wrote in *The Origin of Species*, "If it could be demonstrated that any complex organ existed, which could not possibly have been formed by numerous, successive, slight modifications, my theory would absolutely break down."	***1. POSSIBILITY OF NON-NATURAL PROCESSES.*** Though most physical phenomena have a physical cause, some (e.g., the origin of matter and energy, consciousness, and others) may not. There could possibly be explanations outside the realm of nature. Creation says the ultimate explanation is God.
2. ONLY ONE POSSIBLE EXPLANATION. Since evolution is the only explanation for the universe that does not require processes outside nature, it is the only possibility.	***2. MULTIPLE POSSIBILITIES.*** A supernatural creator would not be limited to natural processes. He could have used evolution if He wanted to, or he could have used some other method such as described in the Bible.

Visual # 1-24

Visual # 1-25

Visual # 1-26

EVOLUTION	CREATION
3. EXTREMELY SLOW. Since animals and plants have never been seen to evolve from one major type to a different type within recorded human history, evolution must be an extremely slow process taking millions or billions of years.	***3. NO SPECIFIC AMOUNT OF TIME REQUIRED.*** A supernatural creator could have created over billions of years or He could have done it very rapidly. The universe does not necessarily need to be extremely old. Biblical creation implies that its age should be measured in thousands of years instead.
4. THE PRESENT IS THE KEY TO THE PAST - UNIFORMITARIANISM. Since the earth has to be billions of years old, there cannot have been any events that would explain its history in thousands of years instead. Geologic processes occur as slow, steady, gradual rates over millions of years. In particular, there can never have been a worldwide flood.	***4. CATASTROPHISM - THE PRESENT MAY NOT BE THE KEY TO THE PAST.*** Since it may not have required billions of years for the earth to reach its present condition, it could be much younger. There may have been a worldwide flood.

Visual # 1-27

According to the Bible, number four above is definitely wrong. Peter wrote 2,000 years ago:

> "Knowing this first, that there shall come in the last days scoffers, walking after their own lusts, And saying, Where is the promise of his coming? for since the fathers fell asleep, **all things continue as they were from the beginning of the creation.** For this they willingly are ignorant of, that by the word of God the heavens were of old, and the earth standing out of the water and in the water: Whereby the world that then was, **being overflowed with water, perished**…" 2 Peter 3:3-6 (KJV)

The prediction has come true. The widespread belief that the earth is billions of years old depends on uniformitarianism, the untestable geological statement of faith that "the present is the key to the past." This belief says that (1) geologic processes always operate at slow, steady, gradual rates and (2) there has never been a worldwide flood. Those who hold to it must overlook both the evidence of catastrophic events in nature and the records of many civilizations indicating that the world was once covered by a global Flood.

Visual # 1-28

EVOLUTION	CREATION
5. SOURCE OF SIMILARITIES - PARALLEL EVOLUTION OR COMMON ANCESTRY. Similarities between animals and plants that are not considered closely related must be the result of common ancestry or random mutations that happened to produce similar results.	***5. SOURCE OF SIMILARITIES - COMMON DESIGN.*** Similarities between animals and plants that are not considered closely related may be the result of common design.

If any of the presuppositions of either evolution or creation are wrong, then the whole system of belief is unreliable.

VI. SCIENCE AND DESIGN.

Presupposition number five for Creation above depends on the possibility of design in nature, which some skeptics claim is a religious concept. They do not seem to realize that the search for design is also a normal part of many branches of science. A few examples:

Visual # 1-29

- Ecologists perform tests such as *chi-square* probability to try to determine whether populations are distributed randomly. If they seem to be non-random, it does not necessarily point to the cause of the non-randomness.
- Archaeologists look for evidence of design in order to distinguish whether an item is a human artifact (arrowhead, stone hut, etc.) or a natural result of erosion.
- Scientists who believe life exists in outer space have been working diligently for years on the SETI program (Search for ExtraTerrestrial Life) searching for nonrandom radio signals indicating intelligent origin.
- Airplane crash investigators search through the rubble of plane crashes to determine if they were the result of accident or sabotage.
- Arson investigators sift through evidence to see if a fire was accidental or deliberately set.
- In the event of a suspicious death, a medical examiner looks for subtle clues to determine if the person died naturally or was murdered.

Even if we find indications of design in nature, it does not necessarily point to who the designer might be. Some skeptics have sarcastically suggested that perhaps the designer is a "Flying Spaghetti Monster." Their sarcasm helps illustrate the point that the study of design is not exclusively religious, but can be done from a purely scientific perspective

Visual # 1-30

VII. HOW SCIENCE WORKS.

Since science depends upon using inductive logic to reach the most reasonable conclusion, we cannot say that anything in science is absolutely proven (except, perhaps, that nothing in science is absolutely proven). Students need to be able to tell the difference between science and storytelling so that they can know when someone is trying to deceive them.

A. SCIENTIFIC METHODS.

Visual # 1-31

The word "science" as used in this book refers to such disciplines as physics, chemistry, and biology, in which we can do repeatable experiments to test our ideas. That is, when this book refers to science it means those areas of study in which we can use *scientific methods*.

Different authors express scientific methods in different numbers of steps. No matter which description we use, all share certain key elements.

1. ***ASK A QUESTION.*** You become curious because you have used your ***SENSES*** to observe something in nature. Then, you ask a question about it. For instance, you might ask, "Does music affect how plants grow?"
2. ***GATHER INFORMATION*** on the subject from ***AUTHORITIES.*** In our example, we might read books about what a plant is, what music is, which kinds of plants might be good subjects for an experiment, and which kinds of music we want to use. We could also search the scientific literature to see if others have already studied the subject.
3. ***FORMULATE A HYPOTHESIS.*** Make a reasonable prediction about what you think might happen based on ***LOGIC***. That is, you need to know what you're looking for so that you can see if you are right. In our example, you might predict that soft classical music will encourage plant growth while loud rock and roll will discourage it.
4. ***DEVISE A WAY TO TEST THE HYPOTHESIS.*** Design an experiment using ***LOGIC***. You might put two groups of the same type plants in different rooms with the same environmental conditions - except that one room has Mozart playing over a loudspeaker, and the other has "heavy metal" music.

5. ***PERFORM THE TEST AND OBSERVE THE RESULTS***. (Again, you use your ***SENSES***.)
6. ***ANALYZE THE DATA.*** **(*LOGIC*.)**
7. ***REPORT YOUR RESULTS AND CONCLUSIONS*** so that others can repeat your work. You become the ***AUTHORITY*** for others.

Though science cannot lead us to absolute truth, it is a very good system because it relies not on just one type of knowledge but on three.

B. LAWS, THEORIES, AND MODELS.

The scientific method starts when we become curious about something we observe in nature and formulate a HYPOTHESIS, a tentative explanation for why it happens. The hypothesis can lead in two directions: it may try to describe **what** happens in nature, or it may try to explain **why** it happens.

1. ***LAWS.*** Suppose we observe that every time we throw something up it comes back down. Eventually, we conclude that "What goes up must come down." If it happens enough times with no exceptions, we recognize this principle as a scientific **law**.

Visual # 1-32

Scientific laws reflect the current state of our knowledge. If a major exception to an accepted scientific law ever occurs, we throw it out. If a minor exception law occurs, we usually modify it. For example, when we sent up the first rocket that did not come back down, we could modify our statement to "What goes up must come down unless it is traveling with sufficient velocity to escape the earth's gravity."

A scientific law can often be expressed in the form of an equation, such as Newton's Law of Gravity:

$$F_{grav} = \frac{G\, m_1\, m_2}{d^2}$$

Even if it is not in the form of an equation, a law enables us to make accurate predictions about the future behavior of the phenomenon it describes. In short, a law tells us WHAT happens in nature without attempting to explain why it happens.

2. ***THEORIES.*** A theory is a proposed explanation for WHY something happens. In ordinary conversation, the word is sometimes used as a synonym for "guess." However, it means something very different in science. A scientific theory is an explanation that has been tested by many experiments and has never yet failed a test. Calling an idea a scientific theory in no way diminishes our confidence in it, but is instead a high compliment.

To illustrate the difference between a law and a theory, consider the phenomenon of gravity. There is only one law of gravity. It lets us predict the force of gravitational attraction between two objects, but does not tell us why gravity exists.

Several theories attempt to answer that question. Perhaps space is distorted by the presence of mass, perhaps there are gravity waves, perhaps there is an exchange of particles called gravitons, perhaps Higgs bosons give rise to gravity, and so on. Though we could not say any of these has been proven, at least there are attempts to test them by experimentation. None has failed a test yet, so they are all considered scientific theories.

Visual # 1-33

It is a mistake to say that evolution is "only a theory." What we call the theory of evolution is not a theory at all, because there is no way to perform experiments to test either the idea that all life came from one common ancestor, or parts of it such as the idea that humans came from apes. Rather than a well-tested theory, there are several contradictory hypotheses or models of evolution such as Neo-Darwinism and Punctuated

Equilibria. Likewise, the term "big bang theory" is incorrect because the idea of a "big bang" is not testable. It relies on many contradictory computer models (Hot Big Bang, Cold Big Bang, Inflation, Texture, Steady-State, et al.) rather than experimentation. It, too, is a hypothesis or model rather than a theory.

3. MODELS. When it comes to trying to be sure what happened in the prehistoric past, we can never be sure we have enough evidence to draw a correct conclusion. Our situation is somewhat like an old John Saxe poem entitled "The Six Blind Men of Hindostan," in which six blind men encountered an elephant. Depending on which part they touched, each had a different idea what an elephant was like. One thought it was like a spear, one like a rope, one like a wall, one like a tree, one like a snake, and one like a fan. Each was only partially right. Had they pooled their insight, they would have been better able to understand elephants.

Visual # 1-34

Like the blind men, we sometimes run into a situation we cannot directly observe (too fast or too slow, too big or too small, too far away, past, future, etc.). When this happens, we should still put together as much information as we can. Instead of a theory or law, we put together a model. It may not be perfect -- it may not even be testable -- but it is still useful because it helps us to better "wrap our minds around the idea." For instance, nobody believes the Planetary Model of the Atom is correct, but it helps us visualize what atoms are like.

Visual # 1-35

To summarize: A LAW has also been tested by many experiments (usually for many years). It describes WHAT happens, without trying to say WHY it happens.

Visual # 1-36

A THEORY is a hypothesis that has been thoroughly tested by many experiments. It is an attempt to explain WHY something happens.

A MODEL is a description, object, drawing, set of equations, etc. that helps us get a mental picture of something we cannot directly observe.

Just as evolution is not a scientific theory, neither is creation. Both are models.

C. LIMITATIONS OF SCIENCE.

There are some aspects of creation and evolution we cannot test: who made everything, what the reason was, what it all means, what were the names of the first humans, and so on. Nor can we directly test whether the universe was complex or disorganized when it came into existence. All we can do is make observations about present events and processes, then try to draw logical conclusions about the past.

Visual # 1-37

As we will see in the next chapter, one way to do this is to use the ideas of initial complexity vs. disorganization to make specific predictions about what we expect to find in areas such as astronomy, chemistry, biology, the fossil record, etc. We can then see which model fits better with the evidence we find in nature. This will be the focus of most of this book.

D. POTENTIAL PROBLEMS WITH EVIDENCE.

Scientists need evidence on which to base their conclusions. If there is something wrong with what the evidence they use, it may lead to false conclusions.

1. EVIDENCE MAY BE INCOMPLETE.

Anyone who has ever read a mystery story or seen one on TV has experienced the frustration of drawing the wrong conclusion. As you get closer to the end you are confident that you know who committed the crime. Just before the end, though, you suddenly learn one more crucial piece of information and find out you were wrong. You drew the wrong conclusion because you did not have enough evidence.

Scientists are sometimes faced with the same problem. A hundred years ago,

physicists thought they knew all the laws of the universe to within a few decimal places. Then, quantum mechanics was discovered and physics had to be rewritten. Crucial new evidence forced them to reinterpret everything they thought they knew.

Visual # 1-38

The same principle applies to the study of origins. A prime example would be "Nebraska Man**."** In 1922 scientists used a single tooth found in the state of Nebraska in the U.S. as the basis for describing an entire genus of ape-human intermediates known as *Hesperopithecus*. The *Illustrated London Daily* (June 24, 1922) even printed a double-page artist's conception of an adult male and female *Hesperopithecus* in their natural habitat.

A few years later an identical tooth turned up still embedded in the jaw it belonged to. The tooth and jaw were not from an ape-man but from an extinct pig. Why the mistake? Because the scientists drew their conclusion based on incomplete evidence.

We can only be sure of drawing the correct conclusion if we have all the evidence, but we have no detailed scientific reports of what happened in the distant past. Since we have no idea how much evidence exists, we don't know how much we don't know.

2. EVIDENCE MAY BE WITHHELD.

There have been a number of cases in which evidence has been deliberately withheld when it contradicted someone's belief systems. A few examples:

Visual # 1-39

- ***Java Man.***
  In 1891 Dr. Eugene Dubois, who believed that human evolution took place somewhere around Indonesia, reported discovering fossils of a creature he called *Pithecanthropus alalus* ("speechless ape-man") by the banks of the Solo River on the island of Java. Many believed his claim that it was a transition between apes and man. However, for 30 years he concealed the fact that he had also found indisputably human fossils nearby. (He even hid some of them under the floor of his house.) These human fossils, of course, meant that *Pithecanthropus* was not man's ancestor but his neighbor. Nevertheless, until his death Dubois continued to maintain that Java Man was an ape-human intermediate similar to a large gibbon. (It is now classified as *Homo erectus*.) Dubois found what he wanted to find and tried to conceal anything that disagreed with it.
- ***Origin of Life.***
  Many biology books tell students that life began by random chemical action in a "primordial soup." Since free oxygen interferes with the chemical reactions needed to form the components of a cell, the books say that there was no free oxygen in the early atmosphere. Instead, all the oxygen was supposedly trapped in rocks or chemically bound to other substances. The authors deliberately withhold the fact that every layer of sediment all the way down to "basement rock" contains traces of free oxygen (Abelson, 1966, 1365; Dimroth et al., 1976, 1161; Hoashi et al., 2009). Geology shows that the conditions described in biology textbooks have never existed in nature, but because this information is deliberately withheld from students, they can easily be deceived into drawing incorrect conclusions.
- ***Peppered Moth.***
  The "peppered moth" is supposed to be the best example of evolution in action in the world today. However, though it is a good example of natural selection, it has nothing to do with evolution. Nothing new evolved.
- ***The Giraffe's Neck.***
  Many people have been told that giraffes acquired their long necks through many

generations of stretching them. This story omits many important details, such as the intricate internal structures the neck contains.

- ***Big Bang.***
  Many non-scientists who believe in a "big bang" do not realize that the concept is impossible in a three-dimensional universe. Instead, it requires that space must have a fourth dimension which we are unable to perceive.

3. EVIDENCE MAY BE FALSIFIED.

Visual
1-40

Evidence might perhaps be withheld through an oversight, but there is no excuse for deliberately falsifying it. Nevertheless, this has happened a number of times. Two examples:

- ***Embryonic Recapitulation.***
  Ernst Haeckel was a medical doctor and zoology professor at Jena University in Germany in the second half of the 19th century. He wrote over 40 books trying to turn people away from God and was willing to lie to accomplish this purpose.

  In the decades before *The Origin of Species*, some biologists believed that embryos of different creatures at different stages of development should illustrate their evolutionary history. When Haeckel read Darwin's book, he combined Darwin's ideas with this belief and in 1866 reported that his dissection of various types of embryos confirmed their evolutionary history - that is, that "Ontogeny recapitulates phylogeny." He wrote and gave lectures on the subject all over Europe for over 40 years.

  It was a lie. Haeckel was convicted of fraud by a Jena University court of his peers in the early 1900's (Meldau, 1974, 217). However, most people have never heard about his disgrace. His fraudulent drawings are still shown in some biology books well over a century later.

- ***Piltdown Man.***
  "Piltdown Man" was supposed to be a transition between ape and man. The fossil evidence consisted of an apelike jaw and a human-type skullcap found in a gravel pit in Piltdown, England during the period from 1908 to 1912. From the beginning some who saw the bones said Piltdown Man was a fake, but they were silenced by the majority who were eager for evolutionary transitions. For 40 years the collection of bones was presented in textbooks as belonging to a missing link called *Eoanthropus dawsoni* ("Dawson's Dawn Man"). In 1953 it was reexamined by a team of scientists who conclusively found it to be a hoax. The skull was a human skull stained to look old; the jaw was an ape jaw with obvious gouges where it had been filed to fit the skull.

  People believed in Piltdown Man for over 40 years because many scientists wanted to find an ape-man. When a candidate appeared, they were easy to persuade.

Recall that the basic idea of creation is Initial Complexity (Complex to Simple), while the basic idea of Evolution is Initial Disorganization (Simple to Complex). Starting in Chapter Two we will begin to use these concepts to make predictions about what we should find in nature. We will then compare our predictions to what we actually find to see which is more reasonable.