CHAPTER 7 - BIOLOGY PART 1 - THE ORIGIN OF LIFE

The word biology comes from the Greek words "bios" and "logos." Bios has to do with life in general, and logos has to do with the essence of something. When Jesus is called the Word (logos) of God, it means that He expresses the essence of God.

The suffix -logy, derived from logos, is used to indicate the systematic study of something. Biology studies of life in general, zoology focuses on animal life, geology is the study of the earth, theology is the study of God, paleontology (paleo- + ontos + -logy) is the study of ancient life, and so on.

Visual #7-1

- *Empirical* (experimental or operational) biology has to do with how living things operate in the present. It is divided into major branches such as: botany, which focuses on plants; zoology on animal life; marine biology on sea life in general; ichthyology on fishes; ornithology on birds; microbiology and molecular biology on life at the cellular and molecular level; genetics on reproduction at the cellular level; physiology and pathology on normal and abnormal functioning of organisms; ecology on interactions of living things with the environment; and many others.
- So-called *historical* biology tries to explain how things got the way they are by appealing to hypothetical processes in the prehistoric past. Many dismiss the possibility that living things were designed by an intelligent Creator as superstition, and insist that they evolved from lifeless chemicals by natural processes (atheistic or *materialistic* evolution). Others believe life came into existence and developed under the direction of a God who chose to do things slowly and gradually over billions of years (*theistic* evolution).

I. OVERALL TRENDS IN THE UNIVERSE.

Ignoring the question of who or what might be responsible for bringing the universe into existence, there are two possibilities as to the conditions at the time. The universe was either *less* complex and organized than at present (Evolution), or else it was *more* complex and organized (Creation).

A. EVOLUTION.

Visual #7-2

When they hear the word Evolution, many think of fossils, ape-men, dinosaurs, Darwin, and other concepts that sound scientific. However, there are also religious aspects such as morality, the meaning and value of life, and so on.

Ignoring the religious aspects, evolution is the idea that the universe, earth, and life began in a disorganized condition and have displayed an overall trend toward increasing organization and complexity ever since. This is not to say that everything always increases in organization and complexity, but instead that there has been an overall trend. We could describe it as ***Initial Disorganization*** with increasing organization and complexity, or ***Simple to Complex***.

B. CREATION.

When they hear the word Creation, many think of Adam and Eve, original sin, the Garden of Eden, a snake, the forbidden fruit (which was NOT an apple) and other religious concepts. However, there are also scientific aspects such as the conditions at the beginning.

Visual #7-3

Ignoring the religious aspects, creation is the idea that the universe, earth, and life began in a highly organized condition and have displayed an overall trend toward decreasing organization and complexity ever since. This is not to say that everything always decreases in organization and complexity, but instead that there has been an overall trend. We could describe it as ***Initial Complexity*** with decreasing organization and complexity, or ***Complex to Simple***.

Those who say that God could have used evolution to create do not understand what creation

and evolution really mean. Simple to Complex and Complex to Simple are mutually exclusive.

II. THE ORIGIN OF LIFE.

Visual #7-4

Many biologists propose mechanisms to explain how life might have increased in organization and complexity since its beginning, but choose to ignore the problem of the origin of life. However, since evolution could not have started before life began, it is important to study whether that process could have occurred by natural processes alone.

In centuries past, many believed that living things could arise spontaneously from decaying vegetation, rotting meat and the like. As experimental techniques improved, scientists learned that organisms such as flies made their way into an environment through contamination and lack of sanitation. For instance, Pasteur did experiments in which he used a nutrient broth that would normally have rotted. He cut it off from contact with the air and found that no microorganisms or parasites grew in it. Others repeated his experiments, conclusively disproving the spontaneous generation of life (*abiogenesis*). Without contamination, no microorganisms appeared. Thus, the discussion about how life originated has shifted from decaying material to lifeless chemicals on the early earth.

As far as anyone has been able to determine, everything on earth is made up of elements form the periodic table. The same seems to be true of objects in space. Analysis of emission and absorption spectra (Chapter 6) shows that heavenly objects also seem to be made of the same elements.

> Cell theory says that the basic unit of life is the cell. It qualifies as a scientific theory because it has been repeatedly tested and has never failed a test. It is falsifiable because if anyone ever discovered a living thing not based on cells, we would have to admit that we are wrong.

The main structural components of cells are proteins, which in turn are made of amino acids. These are composed of carbon (C), hydrogen (H), nitrogen (N), oxygen(O), and sulfur (S). Also required for even the most basic types of life are nucleic acids such as DNA (deoxyribonucleic acid) and RNA (ribonucleic acid), which require an additional element, phosphorus (P). Though living things use dozens of other elements, at a bare minimum, life requires CHNOPS.

A. INITIAL COMPLEXITY.

Visual #7-5

The first living things are believed to have come into existence in a complex, fully functional condition. We would expect to find evidence that from the time these organisms first appeared, conditions on earth have been suitable to sustain life - probably not too different from the way things are now. We also expect to find life coming only from life.

B. INITIAL DISORGANIZATION.

Life is believed to have resulted from purely natural processes through chemical reactions. Since conditions on the earth at present would not allow this to happen, we should find evidence that the chemical conditions on the early earth were much different. We would also expect that, under the right conditions, life could again be produced from nonlife.

Visual #7-6

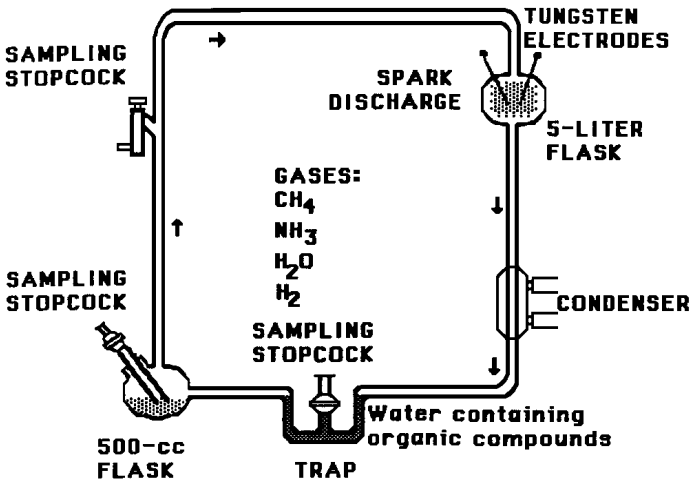
The Russian biologist A.I. Oparin (1924) and British biochemist J.B.S. Haldane (1929) independently proposed hypotheses (combined into the Oparin-Haldane Hypothesis) to try to explain how CHNOPS could have come together into cells by random processes. They said that the early atmosphere was much different than at present, consisting largely of hydrogen, methane, ammonia, and water vapor, commonly known as the "primordial soup." These gases would have furnished carbon, hydrogen, nitrogen, and oxygen (no phosphorus or sulfur, though), which mixed together and then were bombarded by energy sources such as lightning, ultraviolet, heat, or shock waves. They proposed that there would have been chemical reaction that formed amino acids, then proteins, and finally living cells. That is,

the first living cell evolved billions of years ago when the right mixture of chemicals happened to come together in the right place at the right time under exactly the right conditions.

C. ACTUAL OBSERVATION.

Visual #7-7

In the 1950s University of Chicago doctoral student Stanley Miller devised an experiment to test part of this hypothesis by finding out if some of the simplest components of cells, amino acids, could form under such conditions. Miller attempted to simulate the atmosphere proposed by Oparin and Haldane in an apparatus that brought together methane (CH_4), ammonia (NH_3), water vapor (H_2O), and hydrogen (H_2) in a spark chamber. (Others later used different energy sources such as heat, UV, or impact energy in their experiments.) The mixture of gases was struck periodically by electric sparks, and the compounds produced were removed every so often by a trapping mechanism. After a while he found that his apparatus had indeed produced some amino acids.



Basic design of Miller's apparatus.

The actual device on display at the Denver Museum, 2008. *(photo by author)*

As a result of experiments such as this, many people think that life has been produced in the lab. It has not. Dr. Miller said only that he had been able to produce some amino acids. Those who claim that scientists have produced life under laboratory conditions either do not know, or else deliberately ignore, the fact that a living cell is far more complex than just a few amino acids. Cells are made of hundreds or thousands of proteins, each of which are made of hundreds of amino acids of various types fastened together in a precise arrangement.

Visual #7-8

An amino acid is characterized by the presence of an *amine group*, which has the chemical formula NH_3^+, bonded to carbon. There are hundreds of possible types of amino acids. However, cells use only twenty specific kinds. Though experiments such as Miller's have produced at least fifteen of these twenty, the desired acids are only a tiny portion of what comes out of the experiments. Other products include at least twice as many kinds of amino acids *not* used in living things, various sugars, all the bases used in DNA and RNA, and many other miscellaneous organic (carbon-based) and inorganic compounds.

Following are some of the major problems with the Oparin-Halane hypothesis. An in-depth technical treatment can be found in *The Mystery of Life's Origin: Reassessing Current Theories* by Thaxton, Bradley, and Olsen, Philosophical Library, 200 W. 57th Street, New York, New York 10019, 1984.

1. THE PROBLEM OF ATMOSPHERIC OXYGEN.

Elements from the left end of the periodic table tend to release electrons in a chemical reaction, while those from the right tend to take them. The two most reactive elements form the right side are fluorine and oxygen.

Visual #7-9

There is not much fluorine in the atmosphere, but there is a great deal of oxygen. If oxygen were present in the earth's early atmosphere, the other gases proposed in the Oparin-Haldane hypothesis would react with it at least as rapidly as with each other, producing "garbage compounds" useless in forming living cells. As a result, free oxygen has been excluded from origin-of-life experiments (Miller & Orgel, 1974, 33). However, the very lowest Precambrian sediments contain "red beds," geologic formations that obtained their characteristic color through oxidation (Abelson, 1966, 1355). Oxidation requires oxygen. Thus, the evidence from geology indicates that from the time sediments began to accumulate (supposedly billions of years ago), the earth's atmosphere has always contained free oxygen (Henderson-Sellers et al., 1980, 74).

The distributions of carbon, sulfur, uranium, and ferric and ferrous iron in sedimentary layers are all influenced by the amount of free oxygen. These distributions are quite similar in all strata no matter what their supposed age. This indicates that the Precambrian atmosphere contained a great deal of oxygen (Dimroth & Kimberley, 1976, 1161). Australian sediments dated at 3.46 billion years point to the conclusion that the atmosphere contained about as much oxygen as it does at present (Hoashi et al., 2009). Thus, there are no indications that the conditions used in origin-of-life experiments have ever existed in nature.

Even the standard evolutionary scenario for the origin of the earth would lead us to conclude that there was oxygen present all along. The planet is supposed to have first come together as a swirling cloud of gases and dust, then eventually turned into a ball of molten rock, and finally arrived at its present condition. In such a case, the densest elements such as iron would sink to the center of the swirling cloud.

Oxygen is very light compared to most other elements. Its reactivity might have trapped a great deal of it in chemical compounds under the earth's newly forming crust, but there would be no reason for every bit of it to go underground. It would have been present in the atmosphere in significant amounts from the beginning.

Though the red beds and other sedimentary deposits are well known in the scientific community, textbooks and popular literature say that the earth's early atmosphere did not contain free oxygen. Textbook authors deliberately withhold the evidence of free oxygen.

a. Lack of evidence for a primordial soup.

The evidence for free oxygen is not the only problem. The primordial soup would have covered much of the earth's surface for millions of years until life began 3.5 to 4 billion years ago. However, we have no evidence that the soup ever existed (Brooks & Shaw, 1973, 359). The oldest sedimentary rocks known, the "Dawn Rocks" of Western Greenland, contain no traces of it (Denton, 1986, 261). They are dated about 3.9 billion years, only a few hundred million years younger than the earth itself. No other ancient rocks known contain traces of the soup either.

Once cannot argue that the sediments were incapable of trapping chemical compounds. The presence of oxidized deposits shows that they were. Those who choose to believe in either the primordial soup or a non-oxygen atmosphere must do so in spite of the evidence, not because of it.

b. How Living Things Deal With Oxygen.

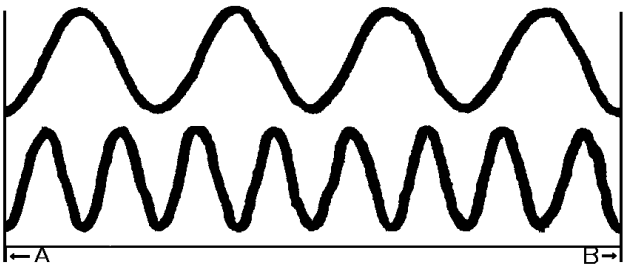
Visual #7-10

Oxygen interferes with the reactions needed to produce a cell. We live in an oxygen-rich atmosphere. Nevertheless, animals and plants need to put chemicals together into amino acids and cells. They are able to overcome the problem because of preexisting information in DNA, found in the cells of every living thing. Cells are able to perform the needed chemistry despite the presence of oxygen because DNA provides the blueprint to bring the right chemicals together in the proper order. It also guides the reproduction of all the parts of the cell including itself. Since there would have been no DNA present at the beginning, those who believe in Initial Disorganization must insist – despite the evidence – that there was no free oxygen present. Even if it a cell could have come together by accident, though, it could not have reproduced without some sort of information storage system. Life would have quickly become extinct.

2. THE OXYGEN-ULTRAVIOLET DILEMMA.

A brief reminder from Chapter 5:

Visual #7-11



WAVES, FREQUENCY, AND WAVELENGTH

Light is a form of electromagnetic radiation, which travels in waves. Shown are simplified graphs of two waves. Waves such as light are three-dimensional, but for purposes of illustration we can use two-dimensional drawings.

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

If the space between A and B represents distance instead of time, we measure *wavelength* rather than frequency. If A and B above are one centimeter apart the wavelength of the lower wave is 1/8 cm, while that of the upper is 1/4 cm. For extremely short wavelengths, we use nanometers. (One nm =10^{-9} meters.) A human hair is between 50,000 and 100,000 nm thick.

Visible light has a wavelength between about 380 nm (extreme violet) and 760 nm (extreme red). Its frequency is between about 10^{14} and 10^{15} Hz. Microwaves have a wavelength between a few millimeters and a few centimeters, and a frequency from about 10^{10} to 10^{12} Hz.

Visual #7-12

Some of the ultraviolet (UV) radiation coming from the sun is deadly to living things, some is not. The deadly variety would have been more prevalent on the early earth.

UV with a wavelength of less than 200 nm (short-wave UV) is sometimes used as an energy source in origin-of-life experiments. However, the sun produces far more long-wave (greater than 300 nm) than short. The 310 nm wavelength seems to have just the right frequency of vibration to cause maximum damage to organic compounds such as those in our skin cells, somewhat like the way certain sounds vibrate at the exact frequency to shatter glass. The reason the 310 nm UV does not kill us is that the atmosphere's ozone layer filters out most of it before it can reach the earth's surface. Even a small amount of this wavelength can cause skin damage (Abelson, 1966). It is therefore excluded from origin-of-life experiments.

As noted above, the Oparin-Haldane scenario is only plausible if there was no free oxygen present in the early atmosphere. However, ozone is a form of oxygen. If there

were no free oxygen, there would have been no ozone layer and the long-wave 310 nm UV would have reached the earth's surface at full strength. A typical modern organism would have absorbed a lethal dose in about three tenths of a second (Sagan, 1973, 195-200).

- The **presence** of free oxygen prevents the reactions needed to form the components of cells.
- The **absence** of free oxygen allows long-wave UV to destroy these components as fast as they can form.

This paradox is unresolved, despite the efforts of Sagan and others. Some authorities such as Dr. Francis Crick, Nobel laureate for his co-discovery of the structure of DNA, have recognized the chemical impossibility of living things first assembling themselves on earth. Since Crick does not allow for the possibility that life was created by a supernatural intelligence, he has proposed the "Directed Pan-Spermia" model which says that life had to begin in space rather than on earth.

3. THE TRAPPING MECHANISM.

Visual #7-13

Every origin-of-life experiment based on the Oparin-Haldane hypothesis uses some sort of energy source to produce amino acids from the mixture of gases present in the apparatus. A trapping mechanism then removes the amino acids before the energy source operates again, so as to prevent them from being destroyed by the same energy source that produced them.

The earth's natural energy sources (lightning, volcanic heat, etc.) are hundreds or thousands of times stronger than those used in the lab. It would be essential to remove organic compounds produced on the early earth from repeated contact with those sources. However, no one has identified any plausible trapping mechanism in nature. Despite a number of guesses as to how this hypothetical natural trap could have operated, there is no evidence that such a mechanism has ever existed (Thaxton et al., 1984, 102-104).

If there were such a trap, it would have to be far more complex than those used in the lab.

- First, it would it have to remove the amino acids from contact with the energy at the wrong time.
- Second, it would also have to bring them back into contact at the right time in order for them to link up into more and more complex molecules.
- Then, the trap would also have to repeatedly remove these molecules and then bring them back into contact with the energy at exactly the right times until a complete cell came together.

No such mechanism is known in nature.

4. NITROGEN FIXATION.

Visual #7-14

Amino acids center around an *amine* group, which is based on a nitrogen atom. Miller's experiment and others like it use ammonia to furnish the nitrogen for the amine groups. However, the source of the ammonia in the hypothetical primordial soup poses a problem.

A molecule of nitrogen in the atmosphere consists of two atoms (N_2) tightly bound together in a triple covalent bond, which is extremely hard to break. This renders nitrogen almost inert, to the point that it can be used to put out fires.

Because of the extreme unreactivity of nitrogen, it must be *fixated* in order to be used in the amino acids needed by living things. That is, the N_2 molecule must be split apart in order to produce the needed ammonium (NH_4^+) and nitrate (NO_3^-) ions.

Visual #7-15

The great majority of nitrogen fixation in nature is done by bacteria. Since it takes fixated nitrogen to make any living thing (including bacteria) and it takes bacteria to make fixated nitrogen, a problem arises. Before life began, no bacteria would have been present to furnish the fixated nitrogen needed for life (such as bacteria) to begin.

There is only one known naturally occurring non-biological mechanism for nitrogen fixation: lightning. Since the other proposed energy sources such as UV, impacts, and heat do not produce fixated nitrogen, we must rule them out as energy sources and rely on lightning only. This means that the trapping mechanism referred to above must be far more sophisticated than anything found in nature. It must (1) allow lightning to strike atmospheric nitrogen in order to fixate it, then (2) allow the ammonia produced to spread around but still stay in the vicinity of the other necessary chemicals nearby (despite the tendency of ammonia to dissipate quickly), then (3) hold all the components in place until needed, then (4) allow the lightning to strike **exactly the same place** again, at a greatly reduced strength, so as to combine the ingredients without destroying them. This would have to be a far more complex trap than anything proposed so far.

5. THE PROBLEM OF OPTICAL ISOMERS (Enantiomers).

The simplest known living cell is composed of about 600 proteins, each consisting of about 400 amino acids - a total of about 24,000 amino acids. Most cells are far more complex than this.

Initial Disorganization leads us to believe that the first cell and all its descendants are the product of purely natural processes, so they should be made up of the kind of components which occur by natural chemical action. Initial Complexity, on the other hand, leads us to expect evidence of design. Cell structure should be far too complex to be the result of random chemical processes.

a. Chirality of amino acids and sugars.

Visual #7-16

Cells are made up of proteins, which in turn are made up of amino acids. The DNA within the cells is made up of deoxyribose sugars linked by bases. Nineteen of the twenty amino acids used in cells, as well as the sugars used in DNA, can exist in at least two *enantiomers* or *optical isomers*. These are mirror images of each other, labeled right-handed (dextrorotary, abbreviated as "D-") or left-handed (laevorotary or "L-"), according to the direction light reflecting from them is polarized. Unless the right-handed acids are continually removed, those produced by the experiments previously mentioned are a *racemic* mix, or about 50/50 (White et al., 1964).

If amino acids and cells were the result of random chemical action, we should find about a 50/50 mix of L- and D- forms in living cells. We do not. Every one of the proteins in our bodies, as well as those of every other known living thing, contain **one hundred percent** left-handed amino acids (Lewin, 1982, 93; Watson, 1965, 123). (A few organisms use D- acids in hard structures such as shells, but not in any of their proteins.) Of the millions or billions of sugars in each strand of DNA, every one known is the D- form (Asimov, 1960, 29).

Only with sophisticated equipment and careful supervision can we increase the percentage of L- acids in origin-of-life experiments. Even then, scientists have been unable to obtain 100% L- acids under such conditions. Even if we start with only the L- form, we still have a problem: L- amino acids isolated anywhere except in living organisms undergo a process called *racemization* (randomization -- remember the tendency toward increasing entropy throughout nature) by which some become right-handed. They are only stable in living organisms (Wysong, 1976, 73-76).

b. Optical Isomers and Probability.

Visual #7-17

The number of possible combinations of L- and D- amino acids and L- and D- sugars is unimaginably large, yet living cells use only L- amino acids in their proteins and D- sugars in their DNA.

As noted above, the simplest known living cell contains about 600 proteins, each of which contains about 400 amino acids. But suppose the first cell was far simpler, consisting of only 125 proteins of 100 amino acids each. To simplify calculations even more, let us assume that instead of being composed of 20 different kinds of amino acids, the hypothetical cell was made up of only one kind. Thus, there need to be 12,500 L- amino acids in a row.

If the L- and D- forms were equally available, the probability that only the L-acids would be used would be about the same as the probability of flipping heads 12,500 times in a row - one in $2^{12,500}$, or less than one in 10^{3760}. This is a "1" with 3,760 zeroes after it. To put it another way, it is about as likely as flipping 12,500 coins at the same time and having every one come up heads.

It is difficult to grasp the size of this number. The total number of atoms in the known universe is commonly estimated at about 10^{80}. Imagine that you have this many machines designed to flip 12,500 coins at once. The goal is to have any one of the machines flip all heads just one time. How long would it take?

The most extravagant claim for the age of the universe is about twenty billion ($2x10^9$) years. We will be generous and give it thirty billion, or about 10^{17} seconds. If each of the 10^{80} machines had been flipping a billion times per second for this long (assuming they didn't wear out), each would have tried about 10^{27} times so far. There would have been a total of about 10^{107} tries. Remember, though, there need to be about 10^{3760} to be reasonably sure to get all heads even once. The machines need to keep working about 10^{3653} times as long as they already have.

The probability of finding only left-handed amino acids in even such a simple cell is so small that it's a virtual impossibility. (Mathematicians usually consider an event with a probability of less than one in 10^{50} impossible.) In the real world there are many types of chemicals trying to react with each other, not just one type of amino acid. The only reason anyone would believe such a thing is that they refuse to believe in the possibility that God is responsible for life.

Those who believe in Initial Disorganization must make up a story about how this 100% left-handedness could have arisen by chance. The latest term for such a made up story is the "pathway." Some proposed pathways are that perhaps the left-handed amino acids gathered on rare metals such as platinum, or maybe they gathered on clay, or maybe they came from meteorites. None of these is based on observation. Rather, they are an attempt to explain how the living universe could have gone from simple to complex rather than being brought into existence in a complex condition from the start.

6. THE PROBLEM OF CHEMISTRY.

Some believe chemistry is the answer to the problem of how a cell could have formed by accident. This is incorrect. Chemistry *is* the problem.

Visual #7-18

A cell consists of much more than a few amino acids strung together. There have to be thousands of the correct ones, in the correct sequence. Even if the early earth had the right chemicals and environmental conditions to form the amino acids and other components of cells, at least four more stages would be necessary to produce a cell by random chemical action.

- These components would have to overcome the natural attraction between positive and negative in order to work their way through any useless compounds present and join together into longer segments (polymers) such as starches, proteins, and partial or complete strands of DNA and RNA.

  These are lifeless chemicals that don't know what they are supposed to do.
- These polymers would have to join together into gelatinous blobs called coacervates or microspheres, which would then be capable of attracting other molecules to themselves. At least one of these microspheres would have to absorb the necessary molecules to be able to reproduce in order for evolution to begin. This would require at least a minimally functional strand of DNA or something like it.
- The first such successful microsphere/cell would then have to form a membrane around itself to protect itself from the environment.
- Finally, it would have to experience some unknown process and come alive.

Could it happen?

a. Interfering Cross-Reactions.

Visual #7-19

Even under tightly controlled conditions, origin-of-life experiments produce mostly useless material. Products have included not only 15 of the 20 types of L- amino acids used by living cells but also the useless D- form of these types, at least 40 other useless kinds of both L- and D- amino acids, many types of L- and D- sugars, at least 5 kinds of bases, and numerous other biologically useless compounds.

Because these can combine in myriads of ways, there would be constant *interfering cross-reactions.* Any molecule with a positively charged end would react indiscriminately with the nearest negatively charged one, rendering great quantities of potentially useful material useless or even harmful. The proper amino acids would be physically prevented from linking up into proteins by all the other chemicals in their way.

These are lifeless chemicals. The amino acids do not know where they are supposed to go and what other amino acids they are supposed to link up with. They simply react with whatever comes along first.

b. Oversimplification of the Oparin-Haldane Hypothesis.

Some of the reactions needed to put together a mixture of gases to produce amino acids and other simple organic compounds are thermodynamically favorable. They can happen spontaneously because they release enough energy to increase the entropy of the universe. However, joining these products into polymers and coacervates is a different story.

Because even the most sophisticated experiments produce mostly the wrong types of chemicals, biochemists do not start with the kind of chemical soup that comes out of an apparatus like Miller's. Instead, they buy the desired compounds in purified form from a chemical supplier. Only then do they have any hope of assembling more complex biological substances.

This is not enough, though, because Miller's primordial soup of methane, ammonia, hydrogen, and water vapor is too simple. The only elements available in this soup are carbon, hydrogen, nitrogen, and oxygen. However, at least two other elements would be needed to form even the simplest cell. The amino acids cysteine and methionine require sulfur. The nucleotides in DNA/RNA require phosphorous. Besides these, even the "simplest" photosynthetic plants require magnesium. Many other elements are crucial to life too: calcium, iron, and so on. When we add all of these into the mix the chemistry gets so complicated that biochemists trying to prove

life was an accident don't even try to make the substances they need. They buy them from a very non-accidental source, a chemical manufacturing company.

c. Probability of Forming a Cell.

Visual #7-20

The simplest known cell is far more complex than the hypothetical one mentioned previously. It contains about 600 proteins, each composed of about 400 L- amino acids. The proteins consist not of one type of amino acid as in the previous illustration, but twenty different types, which must be arranged in correct sequence in order for life to occur. Nevertheless, let us suppose the first living cell was far simpler than any known. Wysong tells us that the simplest one theoretically possible would contain about a hundred twenty-four proteins, averaging about four hundred amino acids each. Assuming that we somehow exclude D- amino acids from the system, he calculates the probability that even such a simple cell could form by chance at less than one in 1064,480 (Wysong, 1976, 73-76).

For the sake of argument, let us make a fantastically generous assumption: each time the chemicals fail to link up properly they separate and try again. Even so, when we allow D- amino acids into the system as they would be in nature, the probability becomes about one in $10^{78,436}$. This number is so large that to write it you would have to put a "1" with enough zeroes to fill over 1307 lines at sixty zeroes per line, or about twenty-two single-spaced pages.

Since there are millions of different types of cells, the first one could have been any one of the possible types. Let us assume there could have been as many types of cells as there are electrons in the whole universe, about 10^{80}. It doesn't help. The probability that any one of these 10^{80} could form by chance is still only one in $10^{78,356}$. This is still more than 78,000 orders of magnitude beyond what is normally accepted as impossible. The only reason to believe it is the desire to get rid of God.

d. Inability to Reproduce.

Suppose the correct amino acids could overcome these fantastic odds and link together exactly the right way into proteins, which then joined properly to form a living cell. This still does not solve the problem of the origin of life.

In addition to the proteins, there would have to be some sort of information storage system to enable it to reproduce, or else life would end as soon as the first cell died. Some sort of at least minimally functional information storage system would have had to come together at exactly the same time and place as the first cell, then merge with it and develop a protective cell membrane. If the storage system was DNA, it would have had to use only the correct D- sugars in proper order, bonded by the correct bases. If it was something else, it would later have had to mutate into DNA by millions of copying mistakes while maintaining at least minimal function every step of the way.

We should take all the above factors into account as we contrast three points of view: (1) Despite the improbability, life began by random chemical processes on the early earth. (2) Life could not have begun on earth, but arose some other place where chemical conditions were more favorable, then arrived here later. (3) Life began by design.

7. THE DNA/ENZYME DILEMMA.

Visual #7-21

Every organism's DNA is made up of the same four compounds known as *bases* or *nucleotides* called Adenine, Cytosine, Guanine, and Thymine, abbreviated A, C, G, and T. The nucleotides work in *base pairs*, in which A matches with T and C matches with G. This digital information storage system enables DNA to work in a fashion similar

to Morse code, which uses dots, dashes, and pauses to convey any desired message.

The structure of the DNA strand is a double helix - the geometric shape followed by the threads on a screw - made up of millions or billions of *base pairs* of nucleotides in precise sequence. The strand is divided into chromosomes, which are in turn divided into genes. (Normal human DNA contains 46 chromosomes and tens of thousands of genes.) Finally, the genes consist of many nucleotide triplets (groups of three). During cell reproduction many of the triplets specify the placement of one amino acid in the new cell, though others have different functions such as marking the end of a gene.

The arrangement of nucleotides in a DNA strand conveys the information to produce a specific kind of organism. Even cells considered simple contain a vast amount of information. For example, the DNA of the single-celled bacterium *Escherichia coli* is made up of over four million nucleotides (Wysong, 1976, 73-76), all in correct sequence. If we were to represent each of them by a letter, we would need over six volumes of three hundred pages each just to write down the instructions to put together this one supposedly simple cell.

DNA is not only the most complex information storage system known, but it also reproduces itself. In addition, it keeps all the other parts of the cell operating.

Visual #7-22

A cell's day-to-day operation requires a great many chemical reactions that take place much too slowly on their own to be biologically useful. These processes occur quickly enough only because they are speeded up by thousands of different types of special protein molecules known as *enzymes*. An enzyme's precise shape enables it to hold specific molecules in place so they can react with other molecules. The enzyme is not changed, but it makes the process happen much faster than normal, in some cases, billions of times faster. Without enzymes the chemical reactions would be too slow and life would be impossible. (This is why a high fever is dangerous: it stops your enzymes from operating, and you die.)

Visual #7-23

Living cells use thousands of types of enzymes. One of most important things the enzymes do is perform the chemistry to manufacture DNA, but the cell needs DNA to perform the chemistry to manufacture them (Horgan, 2011). If the first living cell did not have DNA it could not have made enzymes, but if it did not have enzymes it could not have made DNA. Neither DNA nor enzymes could have evolved by gradual changes in dissimilar mechanisms. Both had to be present from the very beginning.

DNA is extremely low in entropy and high in information. Though scientists can intervene to produce a temporary decrease in entropy on a small scale, we have never seen random chemical processes do the same thing. Indeed, the Second Law of Thermodynamics tells us that they cannot. The interrelationship between DNA and enzymes is a strong argument for Initial Complexity.

8. THE CELL MEMBRANE.

The concept of Initial Disorganization leads us to expect that cells should be made up of components that occur naturally, whereas Initial Complexity leads us to expect evidence of processes not seen to occur spontaneously in nature.

Visual #7-24

One of the essential parts of a cell is the protective double-walled membrane which encloses it. Initial Disorganization leads us to believe that the first cell was composed of amino acids which came together into proteins which then came together into a complete structure that somehow attracted DNA to itself. A protective membrane composed of fatty substances known as phospholipids then formed around the whole collection. Soon, the cell began to reproduce.

Phospholipid membranes like those that enclose cells can occur naturally. However,

a serious problem arises. A cell in the process of reproducing needs a ready supply of many chemicals including ***phosphates***, crucial components of DNA. However, phospholipid membranes are almost completely impermeable to phosphates and many other important components of cells. Thus the first cell, surrounded by its impermeable membrane, could not have taken in the raw material it needed to reproduce. It would quickly have become extinct.

Living cells are unaffected by the impermeability problem because of a number of microscopic gateways called *permeases* or *ion channels*. Each ion channel is composed of three or four highly specialized protein molecules that function together to allow only specific molecules or ions in or out of the cell. These are placed at strategic locations around the perimeter of the cell. They allow only the correct components to enter at only the right places. The reason they appear at all, at exactly the right places, is because DNA contains the information used to construct the cell membrane and place the gateways where they need to be.

DNA's specification of how to construct permeases and where to place them would be an n argument for design. On the other hand, we should carefully study known and hypothetical chemical processes to look for ways random chemical action could have produced permeases simultaneously with the membrane and the rest of the cell. None are known. If any are found, it would be a significant discovery.

D. ORIGIN OF LIFE SUMMARY.

Visual #7-25

There are at least eight major problems with the Oparin-Haldane Hypothesis for the origin of life by chemical processes:

1. Non-Oxygen atmosphere required.
2. The Oxygen-Ultraviolet dilemma.
3. The need for a sophisticated trapping mechanism.
4. Nitrogen fixation.
5. Optical isomers.
6. The problem of chemistry.
7. The DNA/Enzyme dilemma.
8. Impermeability of the cell membrane.

Is it more reasonable to believe that the evidence points more strongly to Initial Complexity (creation) or Initial Disorganization (evolution)?

III. IS THERE LIFE IN OUTER SPACE?

In recent years astronomers have reported the discovery of hundreds of planets around other stars. Later we will examine the arguments used to support the existence of planets around other stars. For now, let us assume these reports are correct. This raises the question: Is there life on other planets?

Visual #7-26

- Anyone who expresses doubt is labeled a religious fanatic who either doesn't know or doesn't care about science.

  Certainly, rejection of the possibility of life in outer space is based on a belief that the Bible is right in this area, which is beyond the reach of human testing. This is religious.
- However, those who say there is life out there base their assertions on a belief that the Bible is wrong in this area, which is beyond the reach of human testing. This is every bit as religious.

Visual #7-27

In an attempt to explain the existence of life without God, Nobel Prize winner Dr. Francis Crick (co-discoverer of the structure of DNA) proposed a model known as "Directed Panspermia." This scenario holds that life began elsewhere in the universe, then was sent

to earth by an advanced civilization somewhere out in space. He proposed this idea because he concluded that conditions on the earth have never been favorable to produce life from nonliving chemicals. Rather than accept the possibility that life was the result of an unknown *non-natural* process performed by a being outside of nature, he proposed that it is the result of unknown *natural* processes performed by unknown beings who are themselves part of nature. This is religion, not science.

A. BASIC REQUIREMENTS FOR LIFE.

In a later chapter we will examine the arguments used to support the existence of planets around other stars. For now, let us assume these reports are correct. Based on the data made public so far, these planets would have to be extremely massive to cause enough motion to be detectable from earth. They would also have to be orbiting very close to their parent stars in order for the period of the motion (e.g., a complete orbit in just a few days or weeks) to be recognizable. In such a case, they would have to be too large and too close to their respective stars to support carbon-based life.

Visual #7-28

Why is carbon so important? Of all the naturally occurring elements (atomic numbers 1 through 92), carbon is the only one capable of forming the very long chains necessary for life. The artificially manufactured radioactive elements with atomic numbers 93 through 118 are also incapable of forming chains. Even if numbers 93 and higher exist in space, they would also be far too unstable to be used as building blocks for anything. Thus, if life exists anywhere in the universe, it has to be based on carbon. The problem is that all the hypothetical planets reported so far would be too massive and too close to their stars for carbon-based compounds to exist. These compounds break down at the temperatures which would exist on any such planets.

Besides carbon, two other elements necessary for the chemistry of life are hydrogen and oxygen. These have to be available somewhere from the environment. However, hydrogen is the lightest element and in its gaseous form would quickly escape from almost any planet's atmosphere, especially if the planet is hot. In order for it to be available to form carbon-based compounds, it must first be bound to one or more other elements. The simplest and most plentiful compound containing both hydrogen and oxygen is water, H_2O. Scientists have discovered that anaerobic bacteria can exist without oxygen in its gaseous form (O_2), but no known living things can exist without liquid water. Without it, it is practically impossible to bring nutrients and remove wastes.

This leads to another problem. There is only a narrow range of distances from a star in which water can exist as a liquid (the "Goldilocks zone" – not too hot, not too cold, but just right). If a planet is too close to a star, any water would turn to steam; if it is too far, the water would freeze. The amount of red and blue shift calculated for every alleged planet so far indicates that if they really exist, only a handful could possibly have liquid water.

B. WHAT THE BIBLE IMPLIES ABOUT LIFE IN SPACE.

Since the question of whether there is life in space is ultimately religious, it is appropriate to discuss what the Bible has to say. The Bible implies that the only place in the universe there is flesh-and-blood life is right here on earth. (Angels and demons do not count because they are not made of flesh and blood.)

- Genesis 1:14-18 says that the heavenly bodies are to furnish light, serve as signs, and mark off seasons, days, and years. It doesn't say anything about them being anybody's dwelling place.

Visual #7-29

- Romans 5:12 tells us that through one man sin entered the world (Greek *kosmos*, which includes not just the earth but the whole universe) and with sin came death. Romans 8:19-22 tells us that all of creation groans in travail because of what happened right

here on earth. If there were other beings out in space who never sinned, it would be unjust of God to subject them to decay because of something we humans did here. Yet the Bible and science (the 2nd Law of Thermodynamics) both say that death and decay extend throughout the cosmos.

- The effects of Adam's sin go still farther. The Bible tells us that his sin affected not only the earth but heaven itself. Jesus had to take his blood into the Holy of Holies in heaven to purify it (Heb. 9:22-24). What happened in the Garden of Eden was so significant that the Son of God had to die to undo its effects.
- Deuteronomy 4:32 says that from one end of the heavens to the other, God has never dealt with anyone the way He did with Israel. If extraterrestrials sinned, God did not give them the same chance for redemption He gave us. Is this fair?
- If beings on other planets sinned too, then the devil must have been hopping from planet to planet tempting them since the beginning of the universe. Were we the first, or just part of a long series?
- 1 Corinthians 15, often called the Resurrection Chapter, tells us that the first Adam brought sin and death, but the Last Adam, Jesus, brought righteousness and resurrection. If somebody on another planet (let's call him Zorblatt) sinned, would Jesus have to be the Last Zorblatt on that planet? And if all of creation groans because of what happened here on earth, then Zorblatt's sin out in space didn't have much of an effect anyway. Would Jesus have to die on each planet where somebody sinned?
- The Bible says Jesus died once and for all (Heb. 7:27, 9:26-28). If He needed to die someplace else for somebody else, then the Bible is wrong.
- 2 Peter 3:10 says that when Jesus comes back to judge the earth, not only will the elements here melt with fervent heat, but even the heavens (the rest of the universe) will pass away with a great noise. The Big Bang is a future event, not past.

Size means nothing to God. The earth may be just a tiny speck in the physical universe, but it is the center of His spiritual plans. We who have been saved by the blood of Jesus are trophies of grace. Ephesians 6:12 tells us that we wrestle not against flesh and blood, but against principalities and powers and spiritual wickedness in high places. The principalities are the demonic forces who rebelled against God soon after the beginning of the world.

Ephesians 3:10 tells us why the church exists: God is using us, sinners redeemed by the blood of Jesus and saved by grace, to display his wisdom and goodness to those same principalities and powers (Eph. 3:10). How many planets does He need to show them that they made the wrong choice, and to show the angels who did not rebel against Him that they made the right choice? Only one. This is where the action is.

Could God have created microbes on other planets? Genesis shows us that everything he did on the earth was to prepare it for human habitation. He could have created microbes out in space if He wanted to, but why would He?

C. WHAT ABOUT REPORTS OF UFOs?

Visual #7-30

As long as UFOs (Unidentified Flying Objects) remain unidentified they are nothing more than an intellectual curiosity. The problem comes when we try to identify them. Cults have sprung up around the idea that extraterrestrials are hovering nearby with the answers to all our problems.

Most UFO's turn out to be ordinary physical phenomena such as classified military aircraft, reflected light, or a burning ball of swamp gas. There have also been cases of fraud such as a publicity-seeking farmer in the United Kingdom flattening the crops in his field

to make it look like a UFO landing site. But what about those few reports that have no known scientific explanation? What about the eyewitness accounts of people who claim they were abducted by aliens?

Christians have an advantage over the rest of the world because we know who our enemy is and what his tactics are. Satan's most effective tool has always been deception. He is so good at it that he can make people think that he, the very embodiment of evil, is an angel of light (2 Cor. 11:14). When God allows it, he and his fallen angels are able to interact with the physical world to some extent (Job 1:16, 19), even to the point of being able to do things to people's bodies (Job 2:6-7). In the last days he will be allowed to deceive many for a short time (2 Thess. 2:9-12, Mt. 24:24). There have been experiments where hypnotists planted memories of events that never really happened, yet seemed real to the subjects. Why should we doubt that Satan can do the same, even throwing in a few punctures and bruises for good measure? He is very good at deception; he's had thousands of years to practice.

Anyone who doubts that alien encounters are a demonic deception should compare the drawings and descriptions from decades ago with those of the present. Most of the earlier reports described little green men in flying saucers. Now they tell of beings with disproportionately large heads and catlike eyes who travel in sophisticated machines capable of incredible maneuvers. Either the aliens and their ships have evolved tremendously in the last few decades, or else Satan knows what we expect to see and makes sure we get it.

People are eager to believe in UFOs because we are buffeted with problems: suffering, death, war, uncertainty about the future, and so on. We have no answers and things keep getting worse and worse. Those who believe UFOs are from advanced civilizations believe that when the aliens show up they will have all the answers, none of which will require us to make any sort of spiritual change. The Bible says that God has the answers, but He requires you to repent. UFOs, on the other hand, let you live any way you want to.

1. PROBLEMS WITH THE PHYSICS OF ALIEN VISITATION.

Visual #7-31

- Even if they could somehow accelerate to the speed of light, it would take aliens about 4.4 years to reach earth from the very nearest star, Proxima Centauri. Traveling from stars farther away would take much longer.
- Science has to do with things that can be observed. Despite imaginative tales of "wormholes" in space that would allow faster-than-light travel, no such thing has been observed. Wormholes are part of science fiction, not fact.
- The aliens would need an unimaginable amount of energy to accelerate to the speed of light, then would need to expel the same amount of energy into space to slow down again.

  The formula for kinetic energy is $KE = \frac{1}{2} m v^2$. A small car with a mass of 1,000 kg traveling at 30 m/s (about 60 mph) has about 450,000 joules of kinetic energy. In order for it to stop, the energy has to be converted to heat by the brakes. Each of the four brakes has to radiate about 112,500 joules of energy to bring the car to a stop. If it takes 5 seconds, the brakes have to put out 22,500 joules of heat per second (22,500 watts) for that long. This is enough for each of the four wheels to operate about 20 microwave ovens for the entire 5 seconds. (Don't touch hot brakes!)

  Now consider how aliens might get here from even the nearest star. Even if they had a tiny spaceship with only the mass of a small SUV (about 2000 kg including passengers), such a ship traveling at the speed of light (3×10^8 m/sec) would have

a kinetic energy of about ½ (1000)((3 x 10^8)^2), or 4.5 x 10^{19} joules of kinetic energy. (According to general relativity, it would actually take far more.) Once they got to the earth, they would have to radiate that much energy out into space in order to stop.

Compare this to the total amount of energy the earth receives from the sun every second, estimated by the U.S. government (energy.gov) at about 1.7 x 10^{17} joules. This is only about 1/300 of the kinetic energy the spaceship would have. The spaceship would radiate about 300 times the total energy the earth receives from the sun in order to come to a stop. Doesn't it seem likely that someone would notice the sudden appearance of all the extra energy near us as the aliens stopped? Or, if they took longer to stop it would take them much longer to get here.

Of course, if the aliens wanted to get back home again, they would need some sort of fuel with the same amount of energy to get there.

If someone says that aliens "might" have the technology to travel faster than light, it is a statement of faith, not science.

2. SETI (Search for ExtraTerrestrial Intelligence).

Visual #7-32

One of the best arguments against aliens having arrived on this planet comes from an unlikely source: the Search for Extra Terrestrial Life, or SETI. This organization consists of many highly trained professionals who have dedicated their lives to finding signs of intelligent life coming from other stars. They look for nonrandom radio signals that might come from aliens unintentionally transmitting their communications into space, in much the same way that earthly TV and radio signals radiate outward from this planet. The search has been going on nonstop without success since the mid 1960's. Nevertheless, supporters believe in their cause so strongly that there are plans to put up more and more radio telescopes costing many millions of dollars.

We might ask those who believe UFOs are already here: *if aliens have arrived on earth, why spend money looking for them in space?*

IV. CHAPTER SUMMARY:

1. The biochemical problems with trying to assemble even the simplest imaginable cell are insurmountable by natural processes alone. A reasonable person would conclude that something (or someone) outside of nature may be responsible.
2. Belief in extraterrestrial life is an issue of religion and is not supported by scientific evidence.
3. The Bible makes it plain that God is responsible for life, and that it exists only where He wants it to.
4. Encounters with supposed alien beings on UFOs are actually demonic deceptions.

CHAPTER 7 REVIEW QUESTIONS

1. What is the difference between "empirical" and "historical" science?
   Empirical: _____
   Historical: _____
2. What would have been the initial conditions of the earth and life according to evolution?
   _____
3. What would be a brief way of summarizing the trends in nature according to evolution?
   _____
4. What would have been the initial conditions of the earth and life according to creation?
   _____
5. What would be a brief way of summarizing the trends in nature according to creation?
   _____
6. What are the six elements used in even the simplest living things? (You can use their chemical symbols.) _____
7. The basic unit of life is the _____.
8. Instead of complete cells, what kind of materials did Miller's experiment produce?
   _____
9. Why is free oxygen eliminated from origin-of-life experiments? _____
   _____
10. What evidence does geology furnish regarding oxygen in the early atmosphere?
    _____
11. If there were no free oxygen, what layer of the atmosphere would be missing?
    _____
12. If there were no ozone layer, how would it affect living things? _____
    _____
13. What evidence is there for a primordial soup? _____
14. What is present in living things that enables them to deal with atmospheric oxygen? _____
    _____
15. What would be needed to protect amino acids form being destroyed shortly after they were formed? _____
16. What sort of trapping mechanisms are known in nature? _____

17. What orientation are all the amino acids in all the proteins of every known living thing?
_____
18. What orientation are all the sugars in all the DNA of every known living thing?
_____
19. What two elements were missing from the "primordial soup" used in Miller's experiments?
_____ and _____
20. If a living thing had been able to come together from amino acids and proteins, what would be required in order for it to reproduce? _____
21. What are enzymes? _____
22. What is is the relationship between DNA and enzymes? _____
_____
23. Why do there need to be gateways through the cell membrane in order for a cell to reproduce?
_____
24. Why does Directed Pan-Spermia say that life must have been sent to earth from an advanced civilization in space? _____
_____
25. Explain why Jesus' sacrificial death for our sins is incompatible with intelligent life (capable of moral choices) in outer space. _____
_____
_____
_____
26. The Bible would imply that people who believe they were taken on board UFOs were actually deceived by _____.
27. Even at the speed of light, it would take aliens at least 4.4 years to reach us from the very nearest star. According to our present understanding of physics, there is no way to accelerate a space ship or any other object made of matter to the speed of light. Belief that aliens could accomplish this is a matter of _____, not science.

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