

CHAPTER TEN

Can Known Natural Law Account for the Origin of Life?

Let's review what we've seen so far.

- The basic premise of creation is initial complexity -- that the universe, earth, and life were called into existence in a complex, mature state by an influence outside the physical universe.
- The basic premise of evolution is initial disorganization -- that the universe began in a disorganized state and has become more and more complex through eons of time, until the earth and life came into existence and developed to the condition in which they are today. Some believe this process happened by random chance; others believe that it was guided by an intelligent influence.

We've seen that neither basic concept, initial disorganization nor initial complexity, can be directly tested. However, each leads us to make specific predictions which can be tested. We've used these predictions to deal with two major questions so far:

(I) Can natural law explain the origin of matter and energy?

Visual #10-1 We've seen that the answer to this question is a resounding NO. Both creation and evolution require us to believe that something or someone not explainable by natural law brought everything into existence.

(II) Can natural law explain how matter and energy developed to their present condition?

We saw that if we accept creation's premise of initial complexity, the evidence from astronomy and physics shows us that natural law is sufficient from that point on. On the other hand, if we accept evolution's premise of initial disorganization we find that the known laws of science are unable to account for the universe's present condition. We must repeatedly appeal to unknown natural processes, whether driven by random chance or by an intelligent influence.

Now let's come down to earth and examine a third key question.

(III) Can natural law explain the origin of life, or does it too require the unknown?

I. SCIENCE AND THE SEARCH FOR DESIGN

Though we've touched on evidence of design a few times -- for example, in the production of heavy elements and the arrangement of planets in the solar system -- it will become a major consideration as we look at biological processes operating in the world today.

Visual #10-2 Some object that creation's need for a designer removes it from the realm of science. Those who make such a claim base it on nothing but bias, deliberately ignoring the fact that the search for design is a normal part of science.

- The government spends billions of dollars searching for extraterrestrial intelligence. What are they looking for? Evidence of design in radio signals from space.
- Every time a plane crashes, federal investigators search the wreckage for clues as to whether the incident was accidental or deliberate.
- Arson investigators search burned buildings to see if fires were accidental or happened by design.
- Medical examiners perform autopsies in case of suspicious deaths to see whether they were due to natural causes or design.
- Archaeologists look for design almost every time they dig something out of the ground. Is this an eroded rock or an arrowhead? A natural formation or a stone hut?

Visual #10-3 The reason materialistic evolutionists object to admitting that there might be evidence for design in nature is the same fundamental axiom of evolution that keeps popping up: Everything must be explainable by purely natural processes. This axiom would be falsified if even one thing were beyond explanation by natural processes. Since a designer would not be explainable by natural causes, design can never be allowed as an option. A professor of evolutionary biology who dared to admit that maybe God was responsible for the origin of life would soon be out of a job.

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Recommended Resource: *Darwin's Black Box* by Michael Behe, available at most major bookstores. This is an outstanding technical reference work showing that the structure of living things at the molecular level is clear evidence of design in nature. It is particularly powerful because Behe is a theistic evolutionist rather than a creationist.

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Despite the almost unanimous refusal of other evolutionists to acknowledge the evidence for design, biochemist Michael Behe is willing to accept the obvious. In his book *Darwin's Black Box* he likens much of modern biological research to a group of detectives investigating a flattened body. As they search for clues to the cause of death they have to keep stepping around the elephant in the room. However, because they have agreed in advance that there is no such thing as an elephant none of them is willing to say, "Maybe the elephant did it." Rather than go against the majority view and be labeled incompetent or superstitious, they keep searching for other explanations.

Though Behe rejects Biblical creation and believes all living things are descended from a common ancestor that appeared billions of years ago, his book is a brilliantly crafted argument to persuade his colleagues to quit ignoring the elephant. In Chapter Ten we will see some of the many detailed examples of molecular machinery he discusses that could not have come together apart from intelligent design. He also presents a tightly reasoned case for being open to the possibility of design. For example:

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A. ARGUMENTS AGAINST DESIGN, AND THE RESPONSE.

Evolutionists have two basic reasons for ruling out the possibility of design: (1) Things in nature just *can't* be designed because that would bring God into science, and (2) Many structures in living things are put together differently than the way they would have done it, so there can't be a designer.

1. REJECTION OF THE SUPERNATURAL.

It's easy to show that the first argument is ridiculous. Suppose you were walking through the woods and saw a lump of mud. Even though it seemed to be a purely natural lump, you couldn't be sure that it was *not* the work of an artist who happened to like mud. Unlikely though it might be, if you insisted that it could not have been made on purpose the burden of proof would be on you. Likewise, those who say that living things could not have been designed are arguing from a position of weakness. The only way they could prove life was not designed -- a universal negative -- would be to have observed it since the beginning.

Some scientists fear that allowing the possibility of design will bring religion into their domain. Such fear is groundless. Design or no, Behe points out that no biology professor would accept the excuse that an experiment failed because the angel of death killed the student's bacterial culture. Besides, the evidence for design tells us nothing about the character or motives of the designer. Such a study is in the realm of theology, not science.

2. THE ARGUMENT FROM IMPERFECTION.

Evolutionists often point to structures that seem imperfect as illustrations of randomness in nature. One example is the panda's "thumb," which is not a real thumb but a bony protrusion that the panda uses to strip leaves off bamboo shoots. Evolutionists make much of the fact that the animal does not have an opposable thumb, saying that a designer would have given it one. Such an argument is not scientific but philosophical, and ridiculous besides. Suppose we don't like the way a certain automobile looks. Does that mean there was no design engineer? Of course not. It just means that we have a different sense of style, or that we don't know his reasons for making it that way. Likewise, our disagreement with the way a living thing is put together may simply mean that we have a different sense of style from the designer of life, or that we don't understand his motives.

The same principle applies to structures that have no apparent function such as “vestigial organs.” Our ignorance of a function doesn’t mean there is none; it just means we are ignorant.

B. HOW TO RECOGNIZE DESIGN.

On the other hand, an evolutionist’s inability to disprove design doesn’t entitle creationists to claim that it is thereby proven. We need to present our case in a logical manner. Behe gives us some good guidelines, starting by defining design as *purposeful arrangement of parts*. He divides the arguments for it into three categories:

1. **WEAK ARGUMENTS: MATTERS OF OPINION.**

Some say that the beauty of nature is evidence for design. Since beauty is in the eye of the beholder, someone who thinks the sunset is ugly would not find this argument very persuasive. Likewise, we could point to the precision of the earth’s orbit as evidence for design. If it were just a little closer to the sun or a little farther away, life as we know it would be impossible. Evolutionists are not impressed. They believe the only reason we notice this arrangement is that the earth just happened to be in the right orbit to allow us to evolve. Who needs God when you have Random Chance?

2. **STRONGER ARGUMENTS: SPECIFIED IMPROBABILITY.**

No matter how improbable it seems that a complex structure -- for instance, the eye -- might have evolved one step at a time, evolutionists can always make up a story. For instance, they visualize some wormlike creature that acquired a light-sensitive spot through mutations in its DNA. Over many generations the spot deepened into a pit, which gradually filled with mucus and acquired a primitive lens as the outermost layer hardened. After a great while and a great many mutations, the eye had evolved.

Though stories such as these require a number of very improbable steps, evolutionists argue that they still *could* happen. After all, there are many possible outcomes to a series of random events, and no one outcome is any more or less likely than any other. For instance, though no one person’s odds of winning the lottery are very good, we still expect that *somebody* is probably going to win. Thus, no matter how improbable any particular structure may seem, it just happens to be the one that evolved.

Such an argument has nothing to do with the search for design. We are not looking for improbability alone, but rather, improbability in a specific direction.

- Anyone can recognize that the arrangement of rocks at Mount Rushmore is designed, not random.
- If the same person wins the lottery three weeks in a row, we recognize that something besides randomness is going on.
- We might think that no particular arrangement of the grains of sand on a beach is any more probable than any other, but an airplane pilot flying over a deserted island and seeing “HELP” in large letters on the sand would recognize that the particular arrangement was anything but random.

Likewise, matter could be arranged in countless ways in nature, almost all of which would be biologically meaningless. Only a very tiny percentage of the possible arrangements would lead to any type of life at all, even fewer to complex life, and fewer yet to a form of life (us!) able to investigate whether the whole thing is just an accident. The question is, *how probable is it that the specific structures required for life could evolve by chance?*

Let’s see how we can use this principle of specific improbability to examine evolutionary claims about the origin of life and the specific structures it entails. Behe suggests we imagine a thousand lane highway with traffic whizzing by in both directions. Though it is a fearful place, a groundhog wants to get across to see his girlfriend. (In the South, we would talk about armadillos instead.) What are his chances? Not very

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good. He may make it across one lane or perhaps even two or three, but there is no way he is going to get all the way across. It's not that there is any theoretical barrier that says he can't make it - he just doesn't because the obstacles are too great.

Those who believe in gradual evolution might reject this illustration because evolution is supposed to depend on species, not individuals. (Punctuated Equilibria, on the other hand, *does* depend on just a few individuals.) Let's use more groundhogs, then. Suppose we turn loose a million, and give each one a very generous 10% chance of making it across any one lane. Even if only 10% make it across lane one, there are still 100,000 at lane two that have the potential to go farther. If 10% make it across there, we're down to 10,000 at lane three. At 10% probability, 1,000 make it to lane four, then 100 to lane five, then ten to lane six, and one to lane seven. Even if he makes it across a few more lanes, sooner or later - splat - the experiment ends with over 990 lanes to go.

It doesn't help much to use more groundhogs or increase their chances of getting across each lane. If we start with a billion at 50% probability, we can expect that roughly half will be killed in any given lane. About 500 million will make it to lane 2. By the time some of them get to lane 11 only about a million will be left. By the time they get to lane 21 only about a thousand will still be alive. About 500 will make it to lane 22, 250 to lane 23, 125 to lane 24, 63 to lane 25, 32 to lane 26, 16 to lane 27, eight to lane 28, four to lane 29, two to lane 30, and one to lane 31. Even if this last survivor makes it a bit farther - splat. There are still over 960 lanes to go. Once again, it's not that there is any theoretical barrier that says groundhogs can't make across the highway, it's just that extremely improbable, highly specific events simply don't happen in reality.

Evolutionary stories are a lot like Behe's groundhog story. As long as we don't look at them too closely, we don't see any theoretical barriers that would prevent complex structures from evolving. However, in reality there would have to be so many steps, each with much less than a 50/50 chance of succeeding, that it just wouldn't happen.

To extend the metaphor, evolutionists sometimes cheat and bring their groundhogs most of the way across the highway in helicopters. For instance, we will see later in this chapter that in origin-of-life experiments they buy purified amino acids at a chemical supply house instead of manufacturing them in the kind of apparatus we will discuss in Section II-A. It doesn't do much good. Even if they start their metaphorical groundhogs at lane 760, they only get across a few lanes before the experiments fail in a figurative splat. In trying to prove that intelligent design is not necessary, they succeed only in showing that intelligent design *is* necessary to get across more than a few lanes of the highway.

3. STRONGEST ARGUMENT: IRREDUCIBLE COMPLEXITY.

Some might still not be convinced by arguments from probability. If we find one of our metaphorical groundhogs on the other side of the highway, few evolutionists will admit that somebody might have brought him there. Instead, he or an ancestor must have made it across no matter how great the odds.

In response, Behe says: *look at the details!* Darwin and his contemporaries knew nothing of the molecular structure of cells so they treated them as the "black boxes" after which Behe's book is named -- that is, nobody knew what went on inside a cell; they just knew what came out of it. Under such circumstances it was easy to make up stories about how a structure consisting of billions of cells might have evolved step by step. Nobody could prove you wrong. However, we now know that living things contain many structures and mechanisms that are actually microscopic biological machines.

Most man-made machines are more complex than they need to be to accomplish their purpose. For instance, a car without air conditioning, a horn, lights, a radio and so

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forth, would still get us from one place to another. However, if we remove enough parts there comes a point when it no longer works. Behe describes the minimum operating condition below which the machine stops working as *irreducible complexity*.

A mousetrap is a good example of an irreducibly complex machine. At the minimum it must contain five parts: (1) a base to support the trapping mechanism; (2) a hammer to catch the mouse; (3) a spring to operate the hammer; (4) a latch to keep it in a state of readiness; and (5) a trigger to release the latch. (We'll assume that the parts fit together so that separate fasteners are unnecessary.) If we leave out any one of the parts, the trap no longer works. Instead of a useful machine, it is a pile of junk just wasting resources that could have been better used elsewhere.

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A machine needs at least the minimum number of parts in order to be useful, but that's not all it needs. Any worthwhile apparatus must have at least *minimal function*, that is, it must function at least well enough to justify the trouble of making it. Behe asks, for example, what good is an outboard motor that turns a propeller only once a day? It would only take up needed space on the back of the boat so we couldn't put a useful motor in its place. Or what good is a mousetrap with a flimsy base that breaks before a mouse has the chance to step on it? What use is the trap if the latch is too short to set it? Why buy it if it has a weak spring that takes five minutes to snap the hammer against the base? The mouse would see it coming and run away! If any one of the parts is the wrong size or strength, the trap no longer works. It is no more than a wasteful pile of junk that happens to have the right number of parts.

Here's the problem for evolution. Because of the need to maintain at least minimal function every step along the way, an irreducibly complex machine could not come together by gradual changes in the parts of a different type of machine. We might make a mouse trap by gradually reducing the size of the parts in a rat trap, but if we tried to make one by modifying a can opener we would quickly have a device that could neither open cans nor catch mice.

This principle applies equally well to the irreducibly complex molecular machines found in living things. Those that are essential to life could not develop step by step. There would be many steps where they could not perform the minimum functions necessary to sustain life. They had to come into existence all at once.

How about other cellular machines that seem to be conveniences rather than necessities? In order for such a machine to evolve by natural selection, it would have to convey some sort of survival advantage to the host cell. However, until it was at least minimally functional the cell would be better off with no machine at all than with a non-functional part of one. Until the partially formed machine mutated enough to work, it would do nothing more than take up precious resources and interfere with essential processes and structures. Natural selection would work to eliminate partly formed machinery, not encourage it.

Let's consider how these principles apply to the origin of life. We will see that assembling even the simplest living things would require a great many extremely improbable steps. In many cases, the mechanisms involve multiple parts and are irreducibly complex. It requires a tremendous amount of faith to believe that they could not have come together one piece at a time. To anyone open to the possibility of intelligent design, it makes much more sense to believe that they were created.

II. "LIFE IN THE LAB"

How did life begin? In centuries past people thought that living things developed spontaneously from nonliving matter. For example, at one time most people believed that maggots came into being spontaneously on rotting meat and mice appeared spontaneously in piles of garbage -- until scientists such as Louis Pasteur showed conclusively that life comes only from

life. As a result, the argument about the origin of life has shifted. No longer does anyone believe that complex organisms could suddenly come into existence by purely natural processes. Instead, evolutionists are trying to find a way that an extremely simple cell could develop from lifeless chemicals by natural processes. This first cell, they believe, became the ancestor of ever more complex living things.

The question before us is: *Does the evidence show that a purely natural process could produce a simple cell, or does it point instead to some influence outside the realm of nature?*

A. PREDICTIONS OF EVOLUTION.

- If life resulted from purely natural processes, we should find that under the right conditions it could again be produced from nonlife.
- Since conditions on the earth today would not allow lifeless chemicals to come together spontaneously to form the necessary components of a cell, we also expect to find evidence that conditions on the early earth were vastly different from the way things are now.

B. PREDICTIONS OF CREATION.

- If the first living things were created by something or someone outside nature, we would expect cells to be far too complex to occur by chance. Life should come only from life.
- We should also expect to find evidence that since life first appeared, conditions on the earth have been suitable to sustain modern-type organisms - probably not too different from the way things are now.

Since we can't be certain what happened in the past without an eyewitness account, the best we can do is look at the available evidence to see which belief is more reasonable. However, many evolutionists start from the presupposition that creation can't possibly be true. All the scientific evidence in the world won't convince them. Their belief is based on personal prejudice. Their minds are made up, don't confuse them with the facts!

If you encounter someone like this, you might as well stop trying to persuade them. Don't cast your pearls before swine. But if you meet someone open-minded enough to admit that perhaps some things may not be explainable by natural processes, you have a golden opportunity to share with them things they've never heard before - things that point unmistakably toward creation and the Creator.

C. THE OPARIN-HALDANE HYPOTHESIS.

Almost all evolutionists accept an origin-of-life scenario similar to the one proposed in 1924 by Russian biochemist A.I. Oparin and developed further by British biologist J.B.S. Haldane in 1928. As atheists they began with the presupposition that creation was not an acceptable option, so they looked for a purely natural explanation. Since the present atmosphere would not allow the correct combination of elements needed to produce life (mainly carbon, hydrogen, nitrogen, and oxygen) to come together spontaneously, they said that conditions on the early earth must have been much different. The atmosphere had to be composed of a different mix of gases that dissolved in oceans or other bodies of water in a mixture of chemicals known as a "primordial soup." This was then bombarded by some sort of energy source which enabled living cells to come together. In other words, 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.

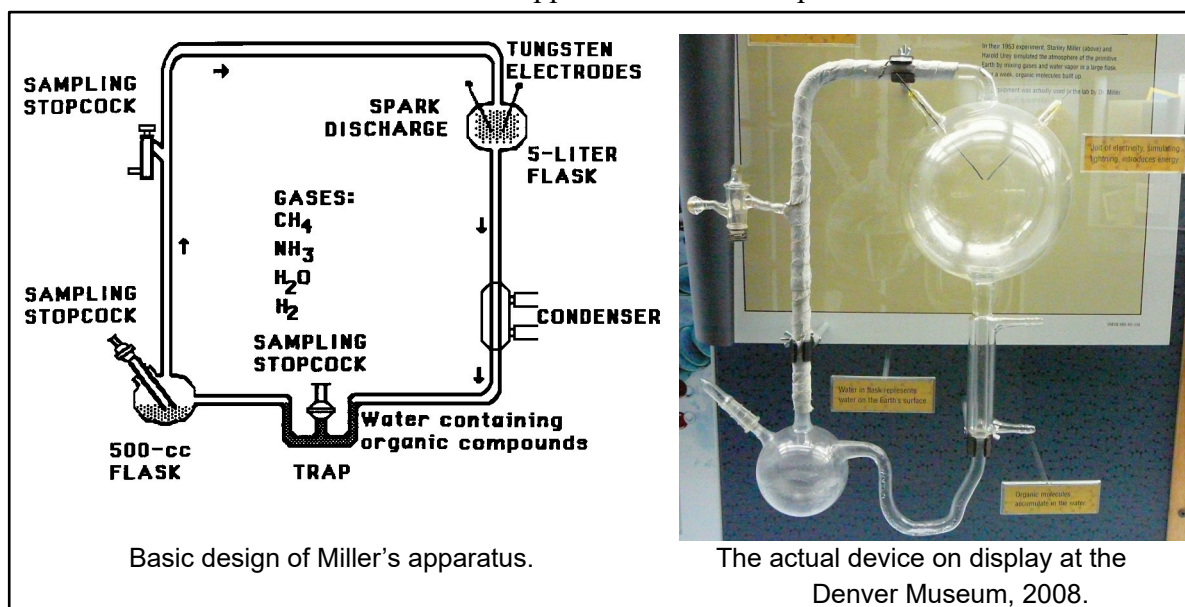
In the 1950s a University of Chicago doctoral student named Stanley Miller devised an experiment to test part of this hypothesis by finding out if some of the simplest components of cells, *amino acids*, could form under such conditions. Since Oparin and Haldane believed that life began in a primordial soup consisting of various gases dissolved in the early oceans, Miller attempted to simulate the atmosphere they suggested. He made an apparatus which brought together methane (CH₄), ammonia (NH₃), water vapor (H₂O), and hydro-

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gen (H_2) in a spark chamber. 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.

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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 don't 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.

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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. However, cells use only twenty specific kinds. Though experiments such as Miller's have produced at least fifteen of these twenty, that's not all they've produced. 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 eight major reasons to reject the belief that life began on the primitive earth by such chemical processes as these. 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. By all means, encourage your students who are seriously interested in biology to get this book.

D. ACTUAL OBSERVATIONS.

1. OXYGEN IN THE ATMOSPHERE.

Oxygen is one of the most highly reactive substances in nature, second only to fluorine. If it were present in the earth's early atmosphere, the other gases mentioned above 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, 1365). 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 con-

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tained free oxygen (Henderson-Sellers et al., 1980, 74).

Distributions of carbon, sulfur, uranium, and ferric and ferrous iron sediments 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, we have no indications that the conditions used in origin-of-life experiments have ever existed in nature. The geologic record argues against such a belief.

Even the standard evolutionary scenario for the origin of the earth would lead us to conclude that there was oxygen present all along. Our 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, though, is very light compared to most other elements. Its reactivity might have caused a great deal of it to be trapped underground in chemical compounds, but there would be no reason for every bit of the oxygen in the newly accreting earth to go underground. It would have been present in the atmosphere in significant amounts from the beginning.

We saw earlier that evidence may be incomplete, withheld, or falsified. This is a clear case of withheld evidence. 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. They state that the oxygen was released from inside its crust long after life appeared. The textbook authors withhold the evidence of free oxygen because of personal prejudice against the possibility of creation, not because of scientific reasons. Few students know this. Most think their textbooks are telling them the truth about how life began. It's up to us to tell them the real truth.

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.

Evolutionists 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.

Since oxygen interferes with the reactions needed to produce a cell and since we live in an oxygen-rich atmosphere, how can animals and plants put chemicals together into amino acids and cells? The answer lies in DNA (deoxyribonucleic acid), 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, we can certainly see why evolutionists 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 couldn't have reproduced without some sort of information storage system. Life would have quickly become extinct.

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2. THE OXYGEN-ULTRAVIOLET DILEMMA.

Despite this evidence to the contrary, let's suppose for the sake of argument that the earth once had a *reducing* atmosphere, that is, there was no free oxygen available for chemical reactions. Under the right circumstances amino acid production is thermodynamically favorable, so it is possible that some amino acids might come together by random chemical processes. (Complex substances such as protein and cells, on the other hand, are thermodynamically unfavorable.) What then? The amino acids would be quickly destroyed.

Carbon-based compounds such as amino acids are highly vulnerable to damage by long-wave ultraviolet light, which has a wavelength greater than 300 nanometers (nm). The greatest destruction occurs at just under 310 nm. This particular wavelength constantly pours down on the earth from the sun. Were it not for the presence of the ozone layer in the atmosphere, amino acids and other organic compounds would be destroyed as soon as they came together. Fortunately, ozone filters out most of the UV before it can reach us. It does this by absorbing the long-wave energy and re-emitting it at wavelengths safe for the living things on the earth below. Without the ozone layer the UV radiation would soon kill us. (Hence the concern about spray cans and the ozone layer.)

Just how destructive is this long-wave UV? Carl Sagan, an outspoken anti-creationist, tells us that a typical modern organism subjected to the intensity of UV that would have reached the early earth's surface in an oxygen-free atmosphere would absorb a lethal dose in an average of 0.3 seconds! (Sagan, 1973, 195-200)

Ozone is a form of free oxygen. If we insist that life began by random chemical action, then, we are faced with a dilemma:

a. Oxygen = Wrong Reactions.

Either there was free oxygen in the atmosphere, in which case the compounds needed to form cells would not have come together in the first place, or

b. No Oxygen = Destruction.

There was no free oxygen (no ozone layer) in the atmosphere, in which case the sun's ultraviolet radiation would have broken down the methane and ammonia in the primordial soup. It would have destroyed any amino acids or other organic compounds as fast as they could form.

Many evolutionists choose the only other alternative: to ignore the evidence.

Some of the experiments based on Miller's have actually used a form of ultraviolet light to furnish the energy the chemicals need in order to come together into amino acids. However, they all use *short* wavelength (200 nm) UV. Long wavelengths are far more prevalent in nature. Long-wave UV has been unnaturally excluded from the experiments (Abelson, 1966, 1365), because it destroys organic compounds as fast as they can form.

3. THE TRAPPING MECHANISM.

Even in a laboratory setting, organic compounds produced in experiments such as Miller's must be removed from the system before the energy source that formed them (sparks, UV, heat, etc.) operates again. Because a second burst of energy would quickly destroy them, experimenters use a trapping mechanism to get them out of the system.

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 from repeated contact with the natural sources. The problem? 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, none has been demonstrated (Thaxton et al., 1984, 102-104). There is no evidence that such a mechanism has ever existed.

If there was such a trap, it would have to be far more complex than those used in

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the lab. Not only would it have to remove the amino acids from contact with the energy at the wrong time, 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. These would also have to be removed and brought back into contact with the energy repeatedly, at exactly the right times, until a complete cell came together.

4. NITROGEN FIXATION.

As noted previously, amino acids center around an amine group, which in turn is centered around 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 atmospheric nitrogen consists of two atoms tightly bound together (N_2) in something called 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, living things require that it be *fixated* first, that is, split apart in order to produce the ammonium (NH_4^+) and nitrate (NO_3^-) ions that they need.

The great majority of nitrogen fixation in nature is done by bacteria. Since it takes bacteria to make fixated nitrogen and it takes fixated nitrogen to make bacteria, we have a problem. Before life began, no bacteria would have been present to furnish the nitrogen needed for life to begin!

Though evolutionists usually ignore this problem, they could point out that there is one 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 our trapping mechanism 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 (though ammonia tends 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 frying them.

That would be a rather sophisticated trap, wouldn't it?

5. OPTICAL ISOMERS: LEFT-HANDED AMINO ACIDS.

Cells are made up of proteins, which in turn are made up of the amino acids mentioned above. They also contain DNA, made up of deoxyribose sugars linked by bases. Most of these amino acids and sugars can exist in at least two *enantiomers* or *optical isomers*: they can be mirror images of each other, either 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, 11-100).

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. Your body contains **one hundred percent** left-handed amino acids (Lewin, 1982, 93; J. Watson, 1965, 123). Every known living thing uses only L- amino acids in its proteins, while the sugars in DNA are all D- forms (Asimov, 1960, 29). (A few organisms use D- acids in hard structures such as shells, but not in any of their proteins.)

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 (Wysong, 1976, 74-76). Even if we start with only the L- form, we still have a problem: L- amino acids isolated anywhere except in living organ-

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isms 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).

Optical Isomers and Probability.

The number of possible combinations of L- and D- amino acids and L- and D- sugars is unimaginably vast. Yet living cells use only L- amino acids in their proteins and D- sugars in their DNA. Let's see if this could happen by random chance.

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. Let's say that it had only 125 proteins of 100 amino acids each. We'll also assume that instead of being composed of 20 different kinds of amino acids, our hypothetical cell was made up of only one kind. Thus, we need 12,500 L- amino acids in a row. If the L- and D- forms were equally available, what would be the probability that only the L- acids would be used? It would be about the same as the probability of flipping 12,500 coins at the same time and having every one come up heads - 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's about as likely as a groundhog with a 50/50 chance of making it across any one lane getting across 12,500 lanes on a superhighway.

Let's try 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 (2×10^9) years. We'll be generous and give it thirty billion, or about 10^{17} seconds. If each of your 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, you need 10^{3760} to be reasonably sure to get all heads even once. Your machines need to keep working about 10^{3653} times as long as they already have. (Hope the warranty doesn't run out!)

This is ridiculous, of course. 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. Nevertheless, this is not a problem to evolutionists. They just make up a story, then another after the first is disproved, then another, then another.

The latest buzz word for evolutionary stories is "pathways." Perhaps the pathway was that left-handed amino acids gathered on rare metals such as platinum? Or maybe they gathered on clay? Or maybe they came from meteorites? Anything but design!

6. THE PROBLEM OF CHEMISTRY.

Some evolutionists believe chemistry is the answer to the problem of how a cell could have formed by accident. They are wrong. Chemistry *is* the problem.

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.

- First, even if we assume 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. Remember, these are lifeless chemicals that don't know what they are supposed to do!

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#10-24

Visual
#10-25

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#10-26

- 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.

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.

Since these are lifeless chemicals, the amino acids don't 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.

Chemically speaking, it isn't too difficult to put together a mixture of gases to produce amino acids and other simple organic compounds. However, joining these products into polymers and coacervates is a different story. Because even our most sophisticated experiments produce mostly the wrong types of chemicals, biochemists have a choice: either filter them carefully to eliminate undesired substances, or use purified L- amino acids, D- sugars and the like. The choice is easy. They don't start with the kind of chemical soup that comes out of an apparatus like Miller's, but buy the desired compounds in purified form from a chemical supplier. Only then do they have any hope of assembling more complex biological substances. It's like giving our groundhogs a head start by bringing them across hundreds of lanes of the highway in helicopters.

It's 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.

The simplest known cell contains about 600 proteins, each composed of about 400 L- amino acids. It consists not of one type of amino acid as in our previous illustration, but *twenty* types. They must be arranged in correct sequence in order for life

Visual
#10-27

Visual
#10-28

to occur. But let's 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 $10^{64,480}$ (Wysong, 1976, 85-92).

For the sake of argument, let's 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.

"But that's not realistic," evolutionists say. "There are millions of different types of cells. The first one could have been any one of billions of possible types."

Good point. Let's say there could have been as many types of cells as there are electrons in the whole universe. It doesn't help. The probability that any one of these 10^{80} could form by chance is still only one in $10^{78,356}$. We're still more than 78,000 orders of magnitude beyond impossible!

d. Inability to Reproduce.

Suppose the correct amino acids could overcome these fantastic odds and link together exactly the right way into proteins. Suppose also that these proteins could join properly to form a living cell. What then? Evolution runs squarely into a situation of irreducible complexity. In addition to the proteins, there would have to be some sort of information storage system to enable it to reproduce. Otherwise, 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 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 while maintaining at least minimal function every step of the way. What an incredible series of coincidences! Belief in such an event has nothing to do with science.

It is an act of faith, contrary to the evidence.

7. THE DNA/ENZYME DILEMMA.

Every organism's DNA is made up of the same four compounds known as *bases* or *nucleotides*, usually represented by the letters A, C, G, and T (Adenine, Cytosine, Guanine, and Thymine). This economy of resources enables DNA to work in a fashion similar to Morse code, which uses dots, dashes, and pauses to convey any message we want to send.

A strand of DNA consists of a double helix - the geometric shape followed by the threads on a screw - made up of millions or billions 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 "simple" cells contain an incredible amount of information. For example, the DNA of the single-celled bacterium *Escherichia coli* is made up of over four million nucleotides (J. Watson, 1965, 123), all in correct sequence. If we were to represent each of them by a letter, we would need over six vol-

umes of three hundred pages each just to write down the instructions needed to put together this one “simple” cell.

Visual
#10-31

Though DNA is crucial to a cell’s reproduction, the 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 are sped up by special types of 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 life would be impossible.***

Visual
#10-32

Living cells use thousands of enzymes. One of their key functions is to perform the chemistry needed to manufacture DNA. However, the cell needs DNA to perform the chemistry needed to manufacture *them*! As Horgan (2011) puts it, “DNA can make neither proteins nor copies of itself without the help of catalytic proteins called enzymes.” If the first living cell didn’t have DNA it couldn’t have made enzymes, but if it didn’t have enzymes it couldn’t have made DNA. This is an irreducibly complex pairing. Neither could have evolved by gradual changes in dissimilar mechanisms; both had to be present from the very beginning.

DNA is not only the most complex information storage system known, but it also reproduces itself. It is extremely low in entropy and high in information. We have never seen random chemical processes produce a decrease in entropy even on a small scale; indeed, the Second Law of Thermodynamics tells us that they cannot. The only reason to believe DNA and enzymes originated by random chemical processes is the desire to get rid of God.

8. THE CELL MEMBRANE.

Visual
#10-33

Let’s suppose chemical processes were able to put together the proper amino acids to make a cell, then added the DNA it needed to reproduce. One more hurdle remains. We have to put a membrane around the whole thing to protect it and keep it together. Evolutionists would say this is the easy part, because fatty compounds called *phospholipids* combine readily to form membranes. This is true, but it is much too simplistic an explanation of what happens.

The phospholipids have a *hydrophilic* (“water-loving”) head and a *hydrophobic* (“water-fearing”) tail. They link up in pairs to form a double layered membrane, with the tails inward and the heads outward (Postlethwait et al., 1991, 53-54). This membrane does *too* good a job of protection for evolution to take place, because it keeps out most of the molecules a cell needs for reproduction and growth. Phosphates, key ingredients in DNA, have an especially difficult time getting in. (Lumsden, 1994, 317-333; also, personal communication with Dr. Lumsden.)

Suppose you did an experiment in which some amino acids came together into proteins while DNA formed in the same place at the same time, all enclosed in a membrane. What would happen next? Nothing! A phospholipid membrane would prevent most of the additional substances the cell needed from getting in. Whatever was inside would be cut off from the nutrients and raw materials needed for further growth. Your cell could neither grow nor reproduce. It would soon be dead.

Living cells are able to take in nutrients and energy because their membranes are much more than just a double layer of phospholipids. There are thousands of microscopic gateways called *permeases* or *ion channels* which let specific substances and electrical signals in and out of the cell at specific places (Postlethwait et al., 1991, 53-54; Neher & Sakmann, 1992, 44-51). These gates are made of protein molecules and function somewhat like selective drinking straws. When they open, only a few types of molecules can get through. The rest have to find some other gate designed to let them through, then wait for that gate to open.

What determines which proteins comprise which gates to let which substances through at which locations? DNA. It is needed to produce all the parts of a cell, even the outer wall. If not for DNA, the membrane would prevent anything useful from getting into the cell. It could never grow or reproduce. Yet another dilemma for evolution: DNA is needed to form ion channels, and ion channels are needed to bring in the building blocks of DNA. This pairing, too, is irreducibly complex. You can't have one without the other.

To summarize: there are at least seven scientific reasons to reject the belief that life began by random action of nonliving chemicals.

1. Geologic evidence for oxygen in the early atmosphere.
2. The oxygen-ultraviolet dilemma.
3. Need for a trapping mechanism able to remove compounds from contact with energy and expose them to it as needed.
4. Need for bacteria to produce fixated nitrogen, and need for fixated nitrogen to produce bacteria.
5. Use of only L- amino acids and D- sugars. (Optical isomers)
6. Even with intelligent supervision, the biochemistry is far too complicated.
7. The DNA/enzyme dilemma.
8. Impermeability of the cell membrane to needed substances.

D. DIRECTED PAN-SPERMIA.

Because of such problems, a number of evolutionists have reluctantly admitted that the accidental formation of life on earth (*abiogenesis*) seems impossible. One such scientist is Dr. Francis Crick, recipient of the Nobel Prize for his co-discovery of the structure of DNA. Dr. Crick declares that belief in abiogenesis on earth is nonsense. (Despite his expertise, his refusal to accept the majority opinion of evolutionary biologists has caused him to be labeled an eccentric. It would be interesting to find out how many of his critics have been awarded the Nobel Prize for *their* work.)

Though the evidence has led Dr. Crick to reject the possibility of abiogenesis on earth, he is not a creationist. Like many other scientists, he rules out creation for philosophical reasons. His alternative is a model called *Directed Pan-Spermia*, which says that life was sent to this planet by another civilization somewhere out in space. Pan-spermia has nothing to do with science because it cannot be observed or tested. The fact that it has gained acceptance as an alternative to creation underscores the impossibility of life on earth beginning by accident.

Dr. Crick is not alone in acknowledging this impossibility. Others have reached similar conclusions because of mathematical considerations. Wichramasinghe, Hoyle, Ambrose, Lovel, and others have calculated the odds using various assumptions for the age of the earth, the composition of the atmosphere, the purity of the primordial soup, the rate of combination of chemicals, the amount of the earth's surface available for reactions to take place, the number of places in the cell where a different arrangement of amino acids is allowed, etc. Depending how generous their assumptions are and how complex the substance desired (whether a single protein molecule or instead, a complete living cell), they calculate the odds as, at best, one in 10^{450} , or at worst, one in $10^{2,000,000}$ (Hoyle & Wichramasinghe, 1981, 24; Ambrose, 1982, 135). Such a number is beyond imagination.

Hoyle, a mathematician, likens the possibility that a cell could form by chance to the possibility of a tornado sweeping through a junkyard and assembling a Boeing 747, ready to fly (Hoyle, 1983, 19). But even this is far too simplistic. It does not take into account the fact that in order to be like a cell, the jet must include a factory to keep itself repaired and to manufacture others like itself while in flight - not to mention that it needs a pilot (corresponding to DNA) to guide the whole process.

Visual
#10-37

Suppose we have a collection of chemicals perfectly assembled into amino acids, proteins, DNA, and cells. Let's go further and suppose we have billions of cells connected together into the form of a human body. What do we have? Unless a mysterious something called "life" is present, it's nothing more than a corpse. Science can describe the differences between living and nonliving things: a living organism can take in food and extract energy from it, excrete wastes, react to its environment, grow, and reproduce, while a corpse chemically identical to it cannot. However, known natural processes and laws are unable to explain why one is alive and the other is not. Science can't tell us what life is, much less its purpose. These are questions for philosophers and theologians, not scientists.

There is no positive evidence that the conditions needed to accidentally form a living cell have ever existed on earth; the evidence from geology indicates the opposite. Even the simplest theoretically possible cell is so complex that the probability of forming it by accident is as close to impossible as mathematics will allow us to come. We may believe one of several things.

- If we accept this belief we must also believe that the first living cells were able to survive the rigors of space travel. This doesn't solve the problem. It just pushes it out to an unknown place in space, then dares us to prove that such a place doesn't exist.

- This belief makes God out to be a deceiver. It has nothing to do with science. It is simply the result of personal prejudice against the only remaining alternative, which is:

- The worse the odds are against something being an accident, the better the odds that it was designed. We've seen that it is fantastically improbable that life originated by random chemical processes; thus, it is a virtual certainty that it was designed. Many reject this conclusion. They must also reject all the biological and chemical evidence. Their belief has nothing to do with science but is based on personal prejudice.

Science can allow us to do no more than to examine the evidence and calculate the probabilities. Each person must take a step of faith and decide which to believe. In any event, known natural processes and laws CANNOT account for the origin of life. Something or someone not explainable by natural processes must be responsible.

IV. IS THERE LIFE ON OTHER PLANETS?

Visual
#10-38

In recent years astronomers have reported the discovery of hundreds of planets around other stars. This naturally raises the question: *Is there life on other planets?* 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. However, UFO believers use scientific terminology to hide the fact that their real motive is to eliminate the need for a creator. In seeking to get rid of Him they have to ignore the tremendous amount of evidence that life could not begin anywhere in the universe by random chemical processes.

A. MISCONCEPTIONS ABOUT EXTRASOLAR PLANETS.

Visual
#10-39

In this chapter we've seen a great deal of evidence that life could not be an accident on this or any other planet. But how do we even know there *are* other planets outside the solar system?

1. *Lack of Visual Confirmation.*

Even our most powerful telescopes cannot make out the details of any object in our own solar system beyond Pluto (e.g., the Kuiper Belt).

2. *The Transit Method.*

Visual
#10-40

Suppose a planet happened to pass directly between us and its star, producing a mini-eclipse. In order for us to detect such an event, there would need to be a significant drop in the amount of light, repeating at regular intervals. However, it is widely recognized that even a Jupiter-size planet would cause a decrease of far less than one percent. Since many stars (Cepheid Variables, pulsars, etc.) pulsate at regular intervals anyway, reported discoveries of extrasolar planets by the transit method are suspect and are only accepted when confirmed by other means.

3. *Reflected Light.*

Suppose a planet were not passing between us and its star, but merely reflecting light toward us. Such a reflection would be extremely difficult to see against the background of the star. In fact, *National Geographic* estimates that looking for a planet passing next to even the closest stars would be like trying to spot a firefly in front of a lighthouse bulb from 3,000 miles away (Appenzeller, 2004, 73).

4. *Side-to-Side Motion.*

Any planet orbiting a star would exert gravitational pull on the star, making the star wobble from side to side as the planet went through a complete orbit. The amount of wobble would depend on the planet's mass and distance from the star. However, at multi-light-year distances we would have a difficult time detecting any wobble at all.

Visual
#10-41

A recent report in *National Geographic* magazine (Drake, 2016) says that a planet has been detected orbiting the closest star, Proxima Centauri, about every 11 days. Let's consider how reasonable this report is. This star is about 4.25 light-years away, or roughly 25 trillion miles. Even if it were orbited by a planet so massive that it pulled the star side-to-side by 50 million miles (half the distance of the earth from the sun!), we would only see the star go through an apparent change in angle of about 50 million / 25 trillion, or about *3/100 millionths of one degree* of arc. To put it another way, we would need to be able to detect a change of angle of just over *one ten-thousandth of one second of one minute of one degree* of arc.

Visual
#10-42

Visual
#10-43

We should be skeptical about whether any equipment in the world is capable of this kind of precision. And while side-to-side motion would be extremely difficult to detect for even this closest star, any stars farther away would display much less of an angular change if planets were orbiting them. For example, a star 20 light years away moving

50 million miles side-to-side would display an apparent motion of about *seven billionths of a degree*. This is beyond the sensitivity of any instrument yet invented.

Some astronomers have claimed to have discovered thousands of planets orbiting distant stars. Considering how difficult it would be to measure the wobble even a massive planet would cause in its home star, we might wonder how astronomers can make such confident assertions. It's not that the evidence demands that there are planets; instead, it's that they **want** there to be planets there because that way they could believe that the earth is nothing special, and get rid of God!

B. METHOD USED TO DETECT EXTRASOLAR PLANETS.

The *National Geographic* article referred to above is somewhat misleading in saying that astronomers detect planets by the "wobble" they cause in stars. Side-to-side wobble would be virtually impossible to detect. Instead, the wobbling refers to what is believed to be motion toward and away from us. This, too, cannot be directly observed but must instead be inferred by logic. The problem is that some of the premises of the astronomers' logic could easily be false.

Visual
#10-44

Recall from chapters six and seven that we can use the technique of spectroscopic analysis to tell what elements are present in distant stars. The atoms of each element have an arrangement of electrons unique to that element, causing each element to have a distinctive spectrum of bright or dark colored lines of very precise wavelengths when exposed to various energy sources. When the element is momentarily subjected to electricity, heat, and so on -- for instance, in a lab -- its electrons jump to higher energy levels but immediately begin to drop back to their normal ground state. In the process, they release photons and produce an *emission* spectrum, a pattern of bright lines against a dark background. However, when the element is between us and the source of light -- for instance, the interior of a star -- the electrons absorb a great many photons rather than releasing them. This yields an *absorption* spectrum, a pattern of dark lines against a bright background.

Visual
#10-45

Visual
#10-46

Visual
#10-47

Astronomers use absorption spectra to try to determine whether stars are moving toward us or away from us. They look for a periodic shift in the wavelength of the light from a star, then assume that such a shift is a Doppler effect (see Chapter 7) caused by a planet tugging the star toward and away from us as it orbits. If the absorption spectrum is shifted toward the blue end of the spectrum they conclude that the star is moving toward us; if toward the red, they conclude that it is moving away. If they detect a periodic pattern moving back and forth between red shift and blue shift, they conclude that something such as a planet must be periodically pulling the star toward and away from us.

Visual
#10-48

The consensus among scientists is that a Saturn-size planet should cause a star to periodically move 3 meters per second toward us, away from us, and so on. This is only about walking speed. Such an amount is extremely difficult to measure because it is only a tiny percentage of the speed of light, defined by the *Conference Generale des Poids et Mesures* (the governing body that sets standards in the metric system) at 299,792,458 m/s (Lissauer et al., 2000, 12405-12406) -- usually rounded to 3.0×10^8 m/s. A shift of 3 m/s one way or the other would be only about one part in 10^8 , or one in a hundred million.

Visual
#10-49

The speed of light does not actually change, only our perception of it. What we look for is a very tiny change in the *wavelength* of the light. For example, since hydrogen is the main ingredient in stars, we could look at one of the UV wavelengths it emits, the Lyman- α transition. Though wavelengths are usually given to only four or five digits, this one has an accepted value with eight digits, 121.56701 nanometers (Simcoe, 2004, 30). In order for us to be certain that the star really is wobbling by only one part in 10^8 , our instruments would have to be sensitive enough to detect a change in wavelength precise to another digit beyond the accepted 121.56701 nm, that is, we would need to be able to detect values ranging from 121.567009 to 121.567011 nm -- a shift of a quadrillionth of a meter! This is so tiny

a shift that few measuring devices in the entire world would be sensitive enough to detect it reliably. Even a mouse walking across the room might cause enough vibration to change the apparent results by this much.

Such precision is extremely difficult to attain even under ideal laboratory circumstances, let alone in an observatory on top of a mountain.

1. MOTION OF TELESCOPES.

Visual
#10-50

Telescopes must constantly move to keep up with the apparent motion of stars across the sky due to the rotation of the earth. It is impossible to eliminate all vibration from the motors, gears, and bearings in the control systems.

2. AIR CURRENTS.

There is a constant problem with air currents in the atmosphere distorting the starlight and making it seem to twinkle. Though most people find the twinkling of starlight pretty, it is a problem for astronomers. The telescopes used to search for distant planets have huge main mirrors which may be over 30 feet in diameter, large enough that the opposite sides of the mirror may pick up slightly different images because of the movement of the atmosphere above. The resulting image is too blurred to use in the search for planets.

In an attempt to compensate for the atmospheric distortion, the main mirror is not rigid, but is designed to flex. Its shape is adjusted hundreds of times a second by hundreds of computer-controlled pistons in an attempt to eliminate the twinkling effect (Appenzeller, 2004, 85). It is impossible to maintain a completely vibration-free system with so many moving parts.

3. LIMITATIONS OF CCD (Charge Couple Device) DETECTORS.

Few outside the astronomy community realize that because of such problems as these, astronomers do not even attempt to measure the actual wavelength of the incoming light! Instead, they rely on indirect measurements and calculations.

Searching for planets involves more than just looking into a big telescope. In order to be useful for this purpose, the light gathered by a telescope's main mirror is reflected into various detecting devices such as infrared and UV detectors and so on, far more sensitive than the human eye.

Visual
#10-51

In an attempt to detect even the tiniest shift in the colors of a specific star, astronomers use a technique developed by Butler, Marcy, Williams, McCarthy, Dosanjh, and Vogt (Butler et al., 1996, 500-509). They first run the star's light through an optical filter containing iodine vapor, used because one of its absorption lines has a wavelength extremely close to one of the absorption lines of calcium, frequently seen in stars. Since the iodine filter is mounted to the telescope, its spectral lines should not move even the slightest amount no matter what the star does. The beam of light is then focused into an instrument called a charge-coupled device, or CCD. This piece of equipment contains tiny picture elements or *pixels* so sensitive that each one can detect the presence of a single photon of light. (You may be familiar with the term "megapixel" from digital cameras. This tells how many million individual pixels an incoming image is divided into.) If everything goes according to plan, any shift in the wavelength should be detected by the CCD and enable the observers to calculate the star's velocity toward or away from earth.

Visual
#10-52

Such a technique sounds impressive until we look at the uncertainties involved.

a. Size of Pixels.

The physical size of each pixel is in the range of microns (10^{-6} meters), whereas the wavelength of the light being studied is measured in several hundred nanometers (around 10^{-7} m). That is, the pixels are at least ten times larger than the wavelength of the light being studied.

b. Amount of Shifting.

If a star is really moving with a relative velocity of ± 3 m/s relative to the earth, the wavelength would only be shifted by the width of a few dozen atoms (Appenzeller, 2004). This is far smaller than the size of the pixels in even the best CCD.

c. Quality of Pixels.

Third, the pixels themselves are subject to manufacturing defects, distortion, and electrical noise.

Visual
#10-53

Let's review the problems involved with such measurements. Though the telescope is protected from the wind by being inside a large dome, distortion may enter due to many factors: (1) vibration from the telescope tracking motors, (2) air currents in the atmosphere above, (3) vibration from the mirror shape correcting motors, (4) ground vibration from distant traffic, trains, and even earthquakes, (5) space debris interfering with the light, (6) defects in pixels on the CCD, (7) electrical noise, or (8) faulty assumptions or calculations.

d. Other Possible Sources of Relative Motion.

A change of apparent wavelength depends only on relative motion between the observer and the object being observed. It need not mean the star is moving, but instead could mean that we observers are the ones moving. For instance, if you were standing at the north or south pole, your speed due to the earth's rotation would be zero. However, the speed of rotation at the equator is over 460 meters/second. Depending how far north or south an observatory is from the equator, its speed could be anywhere in between those two numbers. Unless scientists are looking at a star directly over one of the poles, they need to correct for the rotational speed. At first the earth moves the observatory toward the star and produces a blue shift in the light; after the star lines up directly overhead and the earth continues to rotate away from it, the light will be red shifted.

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e. Limited Observation Time.

A casual reading of media reports might lead us to think that scientists select a single star and observe it intently for long periods of time. This is not the case. Astronomers have to sign up well in advance for time on the larger telescopes, and there is always a line waiting behind them. Suppose an astronomer wants to observe a particular star. He only has a limited time on the telescope, followed by dozens or hundreds of others waiting for their turn. Eventually he gets a little more time, and the cycle repeats. (All this depends on the weather too.) Because there are gaps between observations, there may be other sources of fluctuation that he didn't notice.

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- Unless the observations occur at exactly the same time of night, the earth's rotation toward or away from the star may introduce errors.
- If the observations are days or weeks apart, even the relatively weak pull of the moon's gravity could move the earth enough to give faulty readings.
- If the star being observed is close to the earth's plane of orbit, we move toward it for six months and away for six months. If not corrected for, this motion could also induce errors.

f. Pulsation of Stars.

It is a well-known fact that stars pulsate. When we measure starlight, we have no way to see inside the star. All we can observe is the outer layer or *photosphere*, composed of turbulent clouds of gas. In any star, there is a constant interaction between gravity pulling inward and heat pushing outward. This delicate balance often makes the photosphere pulsate at speeds estimated at up to 300 meters/sec, without the star moving at all. Remember, we are trying to detect a fluctuation corresponding to only about 3 m/s. Since an astronomer can never be sure he is observing at

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exactly the right time, he can never be sure he is observing anything more than the pulsation of the photosphere.

These uncertainties do not prove that there are no planets around distant stars, but they certainly should make us think twice about the bold claims in the media based on such flimsy evidence.

C. BASIC REQUIREMENTS FOR LIFE.

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Some of the reports of planets around stars have been determined to be false (e.g., “Study Puts in Doubt Existence of ‘Nearby’ Planets,” *Reuter’s News Service*, Feb. 26, 1997). Even if others do turn out to be true, these planets would have to be extremely massive in order to cause a shift detectable from earth. They would also have to be orbiting very close to their parent stars in order for the period of the Doppler shift (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.

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Why is carbon so important? Of all the naturally occurring elements (atomic numbers 1 through 93), 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 112 or so are also incapable of forming chains. Even if numbers 113 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.

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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. Thus, in order for it to be available to form carbon-based compounds, it must first be bound to one or more other elements in some sort of compound. The simplest and most plentiful compound containing both hydrogen and oxygen is water, H₂O. Scientists have discovered that anaerobic bacteria can exist without oxygen in its gaseous form (O₂), 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.

D. WHAT THE BIBLE SAYS ABOUT LIFE IN SPACE.

Remember, all we see is an extremely small periodic variation in the wavelength of the light from the stars in question. We interpret this as an indication that they are being pulled alternately toward and away from us by an orbiting companion. However, even if this is correct the orbiting objects need not be planets. A companion brown dwarf star could induce the same type of variation.

Even if there are planets out there, the Bible implies that the only place in the universe there is flesh-and-blood life is right here on earth. (Angels and demons don’t 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.
- 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

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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 there 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 on earth, then Zorblatt's sin didn't have much of an effect anyway. Would Jesus have to die on each planet where somebody sinned?
- The Bible says He 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?

E. UFOs.

Interest in UFOs (Unidentified Flying Objects) seems to be at an all time high. As long as they 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?

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We 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's pretty good at deception; he's had thousands of years to practice.

Anybody who doubts that alien encounters are a demonic deception should compare the drawings and descriptions from earlier in the 20th century to those of the present. Back then just about all the 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.

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Why are people so eager to believe in UFOs? Because we are buffeted with problems: suffering, death, war, uncertainty about the future, loneliness, a sense of meaninglessness, and on and on. We haven't been able to find the answers for ourselves, and things keep getting worse and worse. But just wait – when the UFOs show up, they will have all the answers! And you never have to repent for your sins! Of course, God has the answer too, but He requires you to repent. No, it's much more convenient to believe in UFOs. They let you live any way you want to.

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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 since the mid 1960s, without the slightest glimmer of success. 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 all this money looking for them in space?*

F. HOW ABOUT LIFE ON MARS?

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#10-64

In August 1996 NASA stunned the world with the announcement that it had found a meteorite showing traces of ancient life on Mars ("Life on Mars? Prove us Wrong, Researchers Dare," AP story by Paul Recer, August 8, 1996, *New Orleans Times-Picayune*). Many greeted the report with excitement, feeling vindicated in their belief in extraterrestrial life. Others are more skeptical.

The potato-sized meteorite was found in Antarctica in 1984. It is believed to be from Mars because the mixture of gases in some of its pores is similar to the composition of the Martian atmosphere detected by the Viking lander. The story is that the rock crystallized from molten lava about 4.5 billion years ago, about the time the earth began. It then sat undisturbed until about 16 million years ago when an asteroid or meteor impact blasted it off Mars. It floated in space, gradually moving toward the sun, until it crossed earth's orbit and landed in Antarctica about 13,000 years ago.

There are a number of problems with this scenario. First, the quantity of gas available

for analysis is too small for us to be certain of its origin. Second, if the rock trapped the gases 4.5 billion years ago, why should it contain the mixture of gases found in the *present* Martian atmosphere? Evolutionists believe the earth's atmosphere has changed drastically in that time. How could the Martian atmosphere be the same as it was 4.5 billion years ago? If this really is a Martian rock, the presence of a modern mix of gases would point toward a fairly recent origin.

The alleged evidence for ancient life on this meteorite consists of microscopic molecules known as aromatic hydrocarbons. However, life is only one of hundreds of ways to produce aromatic hydrocarbons (personal communication, E.A. Boudreaux, Ph.D. in Physical Chemistry). In addition, living things change the naturally occurring ratio of sulfur-34 to sulfur-32; according to geochemist Jim Papike of the University of New Mexico, who personally examined the meteorite, the ratio is inconsistent with biological activity ("Scientist Finds Rock Lacking," AP story by Matt Mygatt, August 9, 1996, *New Orleans Times-Picayune*).

A syndicated story that appeared just two days later ("NASA Trying to Ride Publicity All the Way to Mars" by Ralph Vartabedian of the *Los Angeles Times*, in *New Orleans Times-Picayune*, August 10, 1996) appears to confirm skeptics' suspicions. It seems that Congress was planning to cut NASA's budget a half billion dollars a year through the turn of the century. All of a sudden, a meteorite that lay on a shelf for over a decade begins to point toward life on Mars. Everybody is excited and NASA gets its budget back. Does anybody smell a massive fund raising scheme?

G. HOW ABOUT WATER ON MARS?

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The landing of twin space probes on Mars in 2004 has led to excitement over the possibility that water may have been plentiful there long ago, leading to speculation about the possibility of life. Most reports make no mention of the fact that though water is necessary for life, it is not sufficient by itself. Many other conditions must also be favorable, such as those dealt with earlier in this chapter.

The presence of water anywhere in the universe should come as no surprise to Bible-believing creationists. In 2 Peter 3:5, the Bible hints that water (made of the elements hydrogen and oxygen) may have been the raw material from which the earth was formed. Physical chemist Edward Boudreaux has shown that such a scenario for the origin of the naturally occurring chemical elements is thermodynamically feasible. (Boudreaux, 2003; also, personal communication with Dr. Boudreaux.) This fits too with Humphreys' model of "white hole" expansion previously seen in Chapter Seven. In fact, it would be a surprise *not* to find traces of water in outer space, since Psalms 148:4 tells us,

"Praise him, ye heavens of heavens, and ye waters that [be] above the heavens."
Of course there's water in space!

SUMMARY:

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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.

CHAPTER 10 REVIEW

- I. The search for design is a normal part of many areas of science.
 - A. The burden of proof is on those who deny the possibility of design.
 - B. The best arguments for design are those that reveal extreme improbability of chance processes, as well as examples of irreducible complexity.
- II. Life has not been produced in laboratories from lifeless chemicals. Genetic experiments start with already living cells.
 - A. The Oparin-Haldane hypothesis for the origin of life by chemical processes has at least seven major problems:
 1. A non-oxygen atmosphere is needed because oxygen interferes with desired chemical reactions. Geology tells us there has always been free oxygen in the earth's atmosphere.
 2. Long-wave ultraviolet is deadly to living cells and must be filtered out. If there were no oxygen in the atmosphere, UV would pour in at full strength and kill everything, as well as breaking down the potential components of cells as fast as they could form.
 3. There is no known natural trapping mechanism to remove organic compounds from contact with the energy source that produced them before it could operate again and destroy them. The trap would have to repeatedly remove them from contact with the energy and re-expose them at exactly the right times.
 4. Living cells use only left-handed amino acids in their proteins and right-handed sugars in their DNA. Random chemical processes produce a 50/50 mix of left- and right-handed forms. Evolutionists try to explain away this phenomenon. Creationists view it as evidence of design.
 5. Chemical reactions in an apparatus such as those used to test the Oparin-Haldane hypothesis produce mostly garbage compounds. Because of the reactions between the substances in the apparatus, it is a virtual certainty that life could not have originated in such a manner.

Experimenters trying to assemble amino acids into polymers do not start with an organic soup because the chemistry is too complex. Instead, they buy purified amino acids from a chemical manufacturer.
 6. DNA can only be duplicated when specific enzymes are present, but the enzymes can only be produced when DNA is present. Neither could have come together without the other. They had to appear simultaneously.
 7. Evolutionists believe a phospholipid membrane came together spontaneously around the first living cell. However, this type of membrane prevents phosphates and other compounds essential to reproduction from getting in. The cell would have died and life on earth would have ended without the simultaneous appearance of DNA to place permeases in the membrane.
 - B. Directed Pan-Spermia is a desperate attempt to avoid admitting the obvious, that God directly created life. This belief does not solve the problem; it just pushes it out to some non-observable place in space.
- III. We can study life's functions, but we do not know what it is, nor its source.

Creationists accept the obvious: life was directly created.

Atheists reject the evidence and believe life is an accident anyway.

Theistic evolutionists have to believe that God used chemical evolution to create life, then erased all traces of how He did it and planted false evidence instead.
- IV. Belief that life exists on other planets is based on philosophical preference, not scientific evidence. We have not actually seen any planets, only a periodic shift in wavelength of light from various stars. The amount of observed shifting is so small that detecting it reliably is beyond the

range of our technology. All the reports of planets outside the solar system are based more on wishful thinking than on scientific evidence.

Some UFO reports have defied physical explanation. Christians believe they are a demonic deception. Many people prefer to believe in UFOs rather than in God because they think UFOs offer solutions to all our problems without requiring us to repent and change our lives.

Reports of life on Mars are greatly exaggerated. They may be nothing more than a fund raising ploy for NASA.

The presence of water on Mars or any other planet is no indication of life in space. Life requires far more than water.

CHAPTER 10 REVIEW QUESTIONS

1. Give an example of the search for design being a normal art of science. _____
2. Many reject the possibility of design because they are concerned that it would bring _____ into science.
3. If a series of correlated events are each very improbable but happen anyway (_____ in a specific direction), this can be a very strong argument for design.
4. The strongest argument for design is irreducible _____, where all the parts have to be present and working with at least minimal function in order for the structure or organism to operate at all.
5. How many specific kinds of amino acids are used to put together the proteins that compose cells? _____
6. Most of the products of origin-of-life experiments are _____ used in living things.
7. Oxygen makes up over 21% of the atmosphere. Because it _____ with the reactions needed to produce amino acids, it is deliberately eliminated from origin-of-life experiments.
8. The reason living things are able to deal with atmospheric oxygen is that their _____ guides the way chemical reactions operate. According to the Oparin-Haldane (evolutionary) hypothesis, there would have been none of this at the beginning of life.
9. If there were no oxygen in the atmosphere, there would be no _____ layer to filter out the sun's deadly UV rays.
10. Origin of life experiments require a trapping mechanism to remove the amino acids from the energy source that produced them. Otherwise, the next time the source operated it would _____ them.
11. Amino acids can exist in a right-handed (D-) or left-handed (L-) form. Every amino acid in the proteins of every cell ever studied has been _____ handed. The probability of this happening by chance is practically zero.

12. Rather than the paired nitrogen atoms found in the atmosphere (N₂), amino acids require individual nitrogen atoms. In nature, the great majority of these are separated (fixated) by _____ – which would not have existed before life began.
13. _____ is required to make enzymes, and enzymes are required to make _____. Both would have had to be present from the beginning of life.
14. The cell membrane does such a good job protecting the cell that important substances can only get in and out through microscopic _____ called permeases or ion channels. If they were not present the cell would starve.
15. These gateways are put in specific places because of _____. If it were not present they would not exist. If they did not exist, _____ could never reproduce.
16. A hypothesis known as “Directed Pan-Spermia” has been proposed because even some atheists recognize that _____ could never have arisen on earth by chemical accidents.
17. The Bible says that Adam’s sin even affected the rest of the cosmos, and that the heavens will some day dissolve with a roar.
- a. If there are flesh and blood beings in space who never sinned, it would be _____ of God to judge them.
- b. Jesus died once and for all (Rom. 6:10, Heb. 7:27, Heb. 9:26-28, Heb. 10:10, 1 Pet. 3:18 et al.) on _____. If beings elsewhere sinned, He would have had to die more than once to pay for *their* sins too.

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