BIBLICAL BIOLOGY 101

BY ROBERT W. CARTER, PH.D.

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First edition: November 2024

ISBN: 978-1-954198-12-8

Cover, design, and layout: Zackery Kruger

Published by

CREATION BOOK PUBLISHERS

PO Box 350
Powder Springs, GA, 30127, USA
Phone: 1-800-616-1264
creationbookpublishers.com

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FOREWORD

It is an honor to 'set the table' for Dr Robert Carter's latest book, *Biblical Biology 101*. As a scientist and speaker for *Creation Ministries International* (CMI), I have come to respect and rely upon Rob's expertise in the broad field of biology. I met him through several CMI events at my church many years ago. It was my privilege to be his 'tour guide' for local activities during each visit. One time, we tried ice fishing, and although we did not catch any fish, Rob's enthusiasm for science in general and biology in particular was evident in the afternoon conversations. Over the years, I've heard him lecture many times in person, watched his videos, listened to his podcasts, read his articles and books, and even followed him around an aquarium while he served as a tour guide for a field trip at the Creation Ministries International 2021 Super-Conference. In those situations, Dr Carter expertly addressed a wide range of topics, including natural selection, genetics, and many foundational biological processes. To those of you familiar with Dr Carter's work, it goes without saying that he approaches everything from a solid biblical perspective.

In *Biblical Biology 101*, Dr Carter skillfully takes readers on a comprehensive journey to answer common biological questions from a Biblical perspective. What is life and how did it begin? What are the pitfalls of evolutionary theory, and how should Christians address them? How can we explain the diversity of life from bacteria to plants and animals? After thoroughly covering those topics, Dr Carter concludes the book with a section explaining how many biological processes, including photosynthesis and cell division, combine to 'simply' make life work. This comprehensive coverage will surely leave readers reassured and satisfied with the depth of knowledge they gain.

Without hesitation, I endorse Dr Carter's insights and explanations in *Biblical Biology 101*. His commitment to seeing this work through to completion is commendable. This book is not just essential reading, but a treasure trove of knowledge for anyone seeking to understand the origin of life, the diversity of living organisms, and foundational biological processes from a Biblical perspective. His clear explanations from cover to cover will undoubtedly enlighten and inform us all. This work already has a special place on my bookshelf, and I trust it will on yours too.

DR JEFF BENJAMIN
Ph.D. in Forestry, Scientist/speaker, CMI-US

ENDORSEMENTS

Wow! What an incredible amount of Bible and biology packed into one book. It's difficult to find quality content that holds both a high view of scripture and a high view of science, but *Biblical Biology 101* does just that. Carter uses his training in biology and his extensive creation research to explain the cutting-edge ideas of modern creation biology in a simple-to-understand textbook format. He really hits the nail on the head in one chapter heading—"Life Is Designed to Change". If you want to explore biology and see how it supports a biblical understanding of the world, then this is the book for you. Great for the classroom (or to brush up on all the stuff you missed in the classroom)—this book will make you think! As a Christian, molecular biologist, and homeschooling father of eight, *Biblical Biology* is exactly the sort of thought-provoking content I want to put into the hands of my high school kids.

DR JOEL BROWN

Ph.D., Director of Creation Research Society
Molecular Biologist and student of God's Creation

This is a comprehensive overview of the big ideas in contemporary biology with an emphasis on topics relevant to the creation/evolution debate. *Biblical Biology 101* summarizes the major proceedings in creation biology, including the author's own findings through decades of research. Dr Carter also addresses areas where creationists still have not formed a consensus, putting forth his perspectives in a humble and objective manner. For the purpose of a meaningful discussion, the author did not refrain from using evolutionary terminology, while pointing out the philosophical connotations behind the etymology of such terms. Instead of teaching the details of diverse life forms and cellular processes which the reader would quickly forget, the focus on overarching principles helps the reader to form a long-lasting impression and prepares the reader for further study in relevant areas. The book is a useful reference for creation scientists and interested lay people, and it may also be used as a textbook for students who do not intend to major in biology but need a basic grasp of the subject matter in order to carry out efficient Christian ministries.

DR YINGGUANG LIU

Professor of Microbiology, Liberty University College of Osteopathic Medicine
Vice Chair of the Board of Directors, Chinese Creation Science Association

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Section 1

THE GRAND THING WE CALL "LIFE"

Section 1 Introduction

WHAT IS LIFE?

Biology does not have to be difficult. There are many facts that are very easy to understand, and some simple but profound ideas drive this entire branch of knowledge. If we can wrap our minds around just some of these ideas, we will be able to better understand the creative brilliance God displayed when He created life.

This book is about the joy of learning.

> It is the glory of God to conceal things, but the glory of kings is to search things out (Proverbs 25:2).

We may not be kings, but we have more free time to explore God's world than people did in any other time in history. It should be our joy to be, "Thinking God's thoughts after Him," as the great astronomer Johannes Kepler (1571-1630) once said.[1]

In the following pages, you will learn about the Big Ideas in biology. You are going to soar above the field and be introduced to the major things you need to know to have a good understanding of the way life works. Instead of learning the names of every chemical involved in something like photosynthesis, you will see *why* it is important and *how* it works. At the same time, we are going to be praising the One who created this amazing process, without which life on earth would be impossible.

When you are done, you will have more than a layman's grasp of the most important things you need to know. In fact, you will probably understand biology better than most other people.

Are you ready?

Biology: the study of life

OK, so we want to study life, but what exactly *is* life? When God created living things, he made them all follow the same basic patterns. In fact, seven defining things tell us that something is 'alive'.

First, living things reproduce. Thus, a rock is not alive, but a bacterium is. Even though that rock might contain many of the same elements the bacterium has, a rock cannot reproduce. Therefore, it is not alive. The **Law of Biogenesis** is at work here. It tells us that only life begets life.

Second, living things are more complex than the environment in which they live. The reason living things can do what they do is that they are very complicated.

Johannes Kepler

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Thus, they can solve problems, like finding food. A rock cannot make decisions. Even bacteria make decisions. There is a vast gulf between the two.

Third, all living things are composed of cells. From single-celled bacteria to multi-quadrillion-celled whales, life is based on the cell. What is a cell? On the simplest level, it could be confused with a tiny bag of salts. In reality, it is a miniature miracle: as complex as a city, but in nano-scale. Every cell does everything

you might see in a small city, every day. From the trash collectors, to construction crews, to the post office, to the mayor, we see all these functions inside the cell. But unlike a city, the cell can make a copy of itself in just a few minutes.

Viruses throw a curve ball into the discussion of the cellular basis of life. They are not technically alive. They do not reproduce on their own but must hijack a cell and make that cell make copies of the virus. They require a chapter to themselves (chapter 8).

Fourth, living things maintain a constant internal environment. The fancy word for this is **homeostasis**, or 'staying the same'. Living things must maintain a specific environment inside their cells, no matter what happens on the outside. The ability to tightly regulate their own internal environment is critical.

Fifth, living things are different on the inside than the environment around them. We might call this **heterostasis**. Have you heard the claim that our cells have the same salt content as the ocean? This is absolute nonsense![2] It also runs counter to a fundamental principle of biology: the inside of a cell is always different from the outside of a cell. The cell must be able to find and concentrate on what it needs and keep out the things it does not need.

Sixth, living things make what they need. No living thing gets everything it needs directly from the environment. For example, plants take simple chemicals like carbon dioxide and water and turn them into sugar. They then use that sugar to power complex chemical reactions that are, in turn, used to create things like proteins, wood fibre, and DNA. They do not get these things from the air or the dirt in which they live. Instead, they make them *from* the air and dirt!

Finally, life requires information. There is a code, very much like a computer program, in the DNA of all living things. This code instructs the cell to do all the things listed above. It directs reproduction, homeostasis, and the manufacturing of all the complex chemicals and components a cell needs.

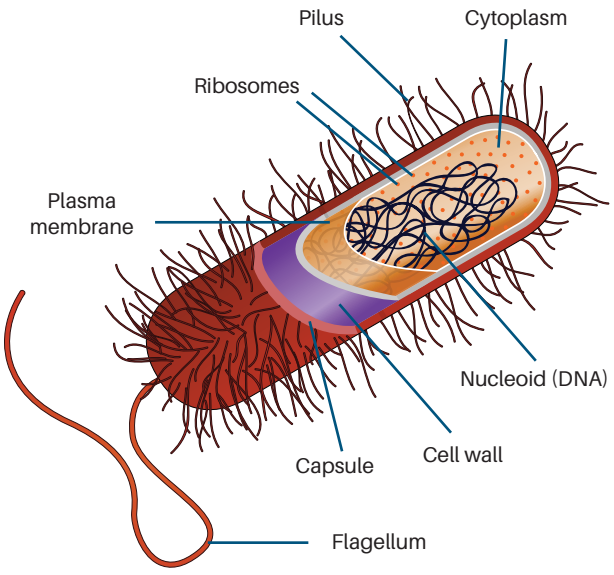
God created life in a truly miraculous way. Once 'alive', His creations have managed to survive and reproduce, adjusting themselves to new environments, for thousands of years. This only works because God gave life a jump start.

Are you ready to answer the question, "What does it take to be alive?" We just gave you seven Big Ideas. Each of these is something life requires. All living things: reproduce, are complex decision makers, are composed of cells, maintain internal homeostasis and external heterostasis, manufacture complex molecules that cannot be produced by natural chemistry alone, and are based on information.

Believe it or not, you are now on your way to becoming a biology expert.

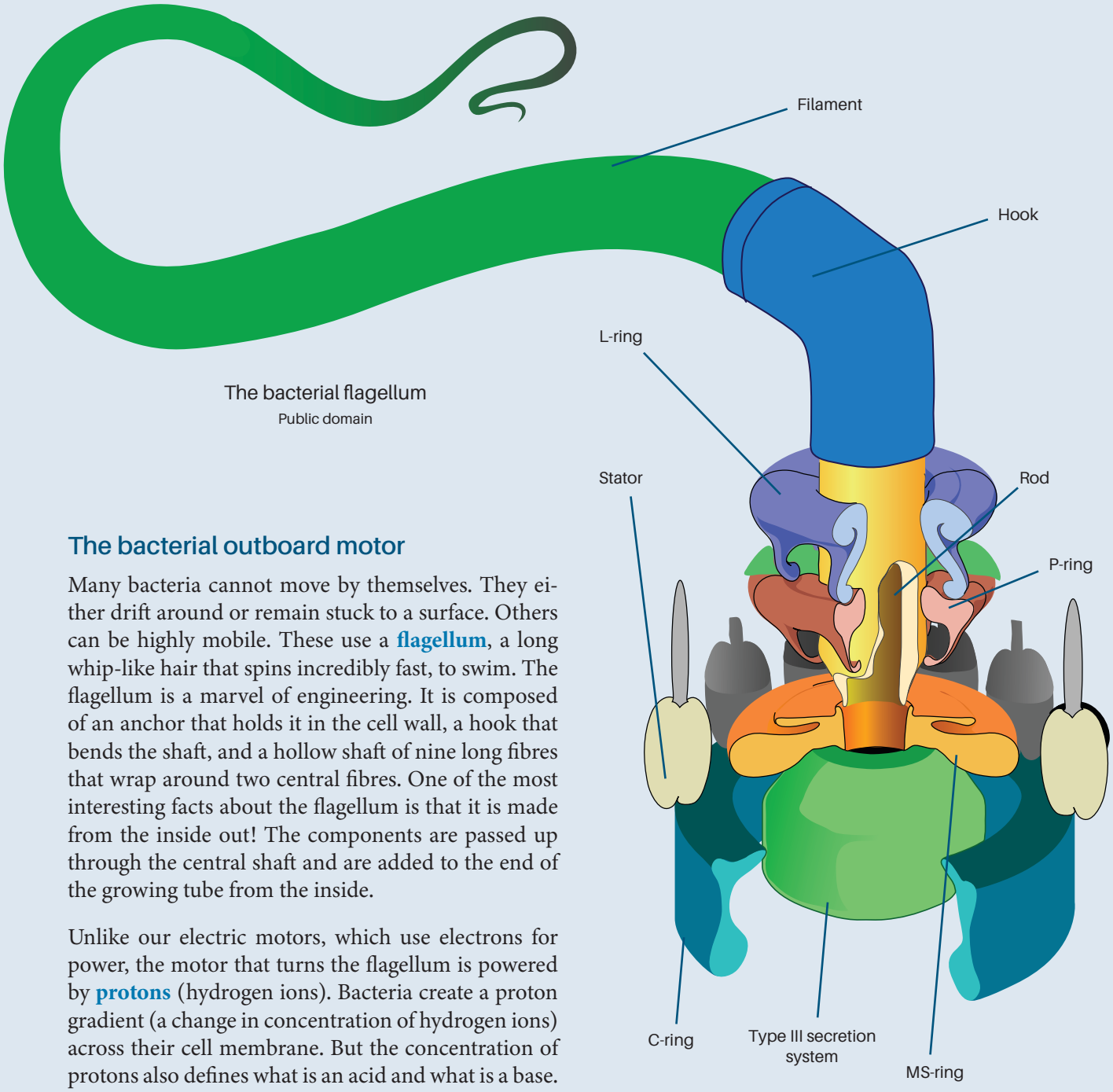
The two basic types of cells

There are two basic types of cells found among living things. Bacterial cells are a lot less complicated than yours. They don't have any real compartmentalization. Cellular activities, although carefully controlled, are happening all over the cell. Their DNA tends to be clumped in one place, so there is some organization, but this is very much unlike the cells of higher organisms. Bacteria are also called **prokaryotes**, but this word has strong evolutionary connotations. The word *pro* (πρό) is the Greek word for 'before' and *karyon* (κάρυον) means nut or kernel. In the evolutionary model, these organisms came *before* the more complex organisms with a **nucleus**. Of course, if God created life, bacteria did not come before other living things. They are not 'older'. Neither are they ancestral to more complex organisms.



A typical bacterial cell

Ali Zifan (CC BY-SA 4.0)



The bacterial flagellum

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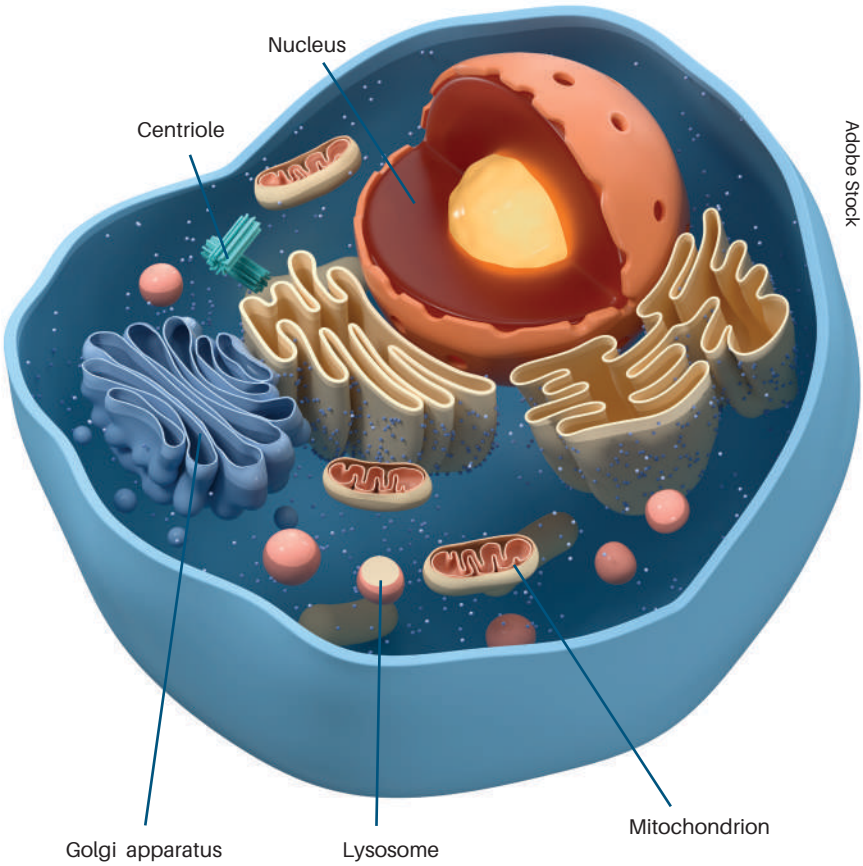
The bacterial outboard motor

Many bacteria cannot move by themselves. They either drift around or remain stuck to a surface. Others can be highly mobile. These use a **flagellum**, a long whip-like hair that spins incredibly fast, to swim. The flagellum is a marvel of engineering. It is composed of an anchor that holds it in the cell wall, a hook that bends the shaft, and a hollow shaft of nine long fibres that wrap around two central fibres. One of the most interesting facts about the flagellum is that it is made from the inside out! The components are passed up through the central shaft and are added to the end of the growing tube from the inside.

Unlike our electric motors, which use electrons for power, the motor that turns the flagellum is powered by **protons** (hydrogen ions). Bacteria create a proton gradient (a change in concentration of hydrogen ions) across their cell membrane. But the concentration of protons also defines what is an acid and what is a base. Liquids with a high proton concentration are acidic. In the end, bacteria capitalize on this, allowing hydrogen ions to flow from the acidic outside environment to the basic environment of the inner cell, using the flow to turn the flagellum like a ship's propeller.

Bacteriologists have known about this motor for decades. But they are still studying and learning new things about it. For example, we recently discovered that it has a clutch, like all good engines, to disconnect the motor from the tail.[3,4] The motor has two gear mechanisms: one to change direction in a millisecond, and the other to shift from 'high gear' to 'low gear' if it moves into more viscous fluids.[5] Some bacteria combine the power of seven motors into one tail.[6,7]

Animals, plants, and fungi are call
The Greek prefix eu- (εύ) means g
true. So, these are the organisms wi
real 'kernels', that is, a nucleus. Ev-
erything from single-celled amoe-
bas to human beings have cells
with nuclei.



A typical eukaryotic cell

As you can see from the diagram, our cells are subdivided into many different compartments. The nucleus houses our **DNA**. Within the nuclear membrane are many pores that allow proteins to enter and **RNA** (we'll talk about this later) to exit. Other membrane-bound vesicles include the complex, highly folded **Golgi apparatus**, which serves as a packaging and delivery system for the cell and the cell **membrane**. It even sends packages outside the cell. **Lysosomes** contain enzymes that digest things. **Peroxisomes** contain enzymes that detoxify deadly perox-ides. **Mitochondria** convert sugars to energy. The **endoplasmic reticulum** (*don't you just love long scientific words?*) synthesizes fats and proteins. The 'rough' endoplasmic reticulum is studded with protein manufacturing machines called ribosomes, which create proteins.

Conclusions

You have just dipped your feet into the waters, and you have already discovered that they are wide and deep. The living world is fascinating. It is amazing. Studying it makes our eyes grow wide and our mouths hang open. Our heads become dizzy with the details, and the names, and the sheer volume of information that comes at us when we study biology. Yet, life is also a testimony to the genius of our Creator. God is astounding. Let us not pull back. We will learn much about Him in our quest to understand life.

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Chapter 1

HOW DID LIFE BEGIN?

And God said, "Let the waters swarm with swarms of living creatures..."
(Genesis 1:20a)

If you want to truly separate belief in creation from belief in evolution, you must ask how life began. The evolutionist and the creationist will say very different things!

The evolutionary world is completely dependent on two important philosophies: **materialism** and **naturalism**. The hardcore evolutionist believes the material world is all that exists, and they believe natural processes can explain everything that has ever happened anywhere in the universe. Thus, they are forced to conclude that life arose from non-life by a completely unguided process. Traditionally, this was called **chemical evolution** (or sometimes **abiogenesis**). It is a critical concept for their theory. As the famous evolutionary biologist Richard Lewontin (1929–2021) said:

> Moreover, that materialism is absolute, for we cannot allow a Divine Foot in the door.[1]

With such a dogmatic stance, they will not, indeed they cannot, allow for any hint of an outside force applying any guidance to the history of life.

Yet, we often hear people say things like, "The origin of life is not part of evolution. Evolution only deals with changes in living things." This completely untethers evolutionary theory from its naturalistic roots. Historically, going back at least as far as Charles Darwin (1809-1882), the evolutionary community has talked about chemical evolution as if it were nothing more than a presage to biological evolution. They have always believed that there was a continuum between chemicals and living things. Without a way to apply that to the pre-living world, multiple non-naturalistic possibilities open up.

The creationist, on the other hand, is not bound by those assumptions. Instead, starting from a belief in God (a philosophy called **theism**) we can then invoke God at any point. Some Christians confusingly accept evolutionary deep time and only bring in the Bible when it comes to the creation of man. They either have man evolving from apes, afterwhich God imparts a 'spirit' into some ape-man, or they allow God to create Adam and Eve from scratch, but only after millions of years of evolution has already taken place. This raises many theological difficulties.[2]

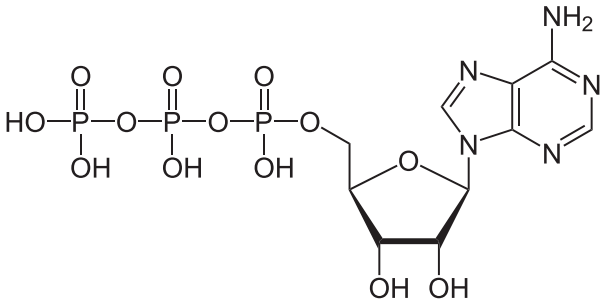
The 'young earth' creationist position, on the other hand, is thoroughly biblical. Once materialistic naturalism is rejected, we understand that God could have created the universe anyway in which He saw fit and over as much time as He wanted. Yet, He also gave us a record in the book of Genesis that clearly tells us how long He took (six consecutive days) and how long ago (a little more than 6,000 years in the past[3]). Importantly, the order of events in Genesis contradicts the long-age order[4].

There is a stark difference in the way these two groups answer the question, "How did life begin?" Thus, there should be a way to determine who is right and who is wrong. The rest of this chapter will focus on the dramatic failure of evolutionary theory to explain how life came to be.

A little chemistry

Life is, at the most basic level, dependent on chemicals. These chemicals are sometimes simple, like water or carbon dioxide. Other chemicals are extremely complex, like **proteins** and **nucleic acids**. Some of the chemicals life depends upon would be expected to exist in the non-living world, like iron. Others are so rare in nature that they would never be expected to be part of early life.

For example, phosphorus is very hard to find in nature because it readily oxidizes, forming various **phosphates**, which have a strong tendency to form



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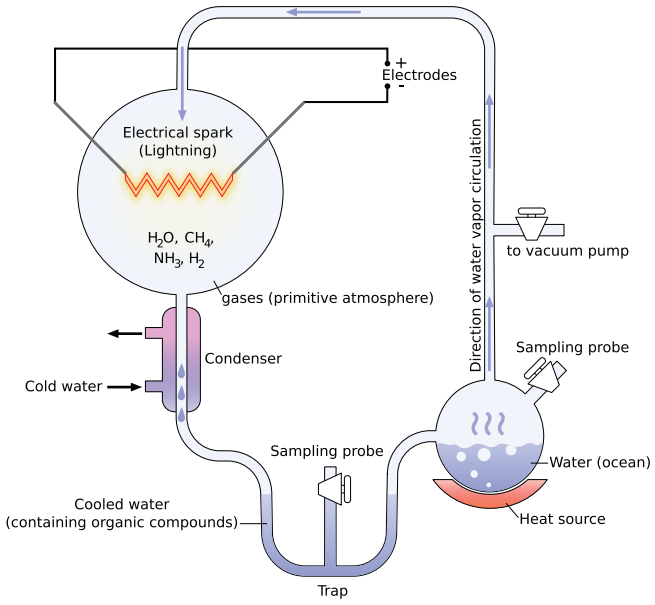
ATP (adenosine triphosphate)

insoluble salts with metal ions. They tend to get removed from the environment very quickly. But phosphorus is *incredibly* important for all forms of life. Not only is phosphate necessary to form DNA and RNA, but most living things require **ATP** (**adenosine *triphosphate***) to power most cellular processes. ATP has another property that makes it unlikely: it is extremely fragile, reacting with anything it meets. Highly reactive molecules are not found in any appreciable quantities in the non-living world. Yet, life is absolutely dependent upon them.

Finally, some of the chemicals required by life cannot be made in any sort of a 'chemical soup'. You may have heard of the **Miller–Urey experiment** in the 1950s, where scientists placed simple gases into a spark chamber and created biological molecules. This is



Miller-Urey experiment

GFDL (CC BY-SA 3.0)

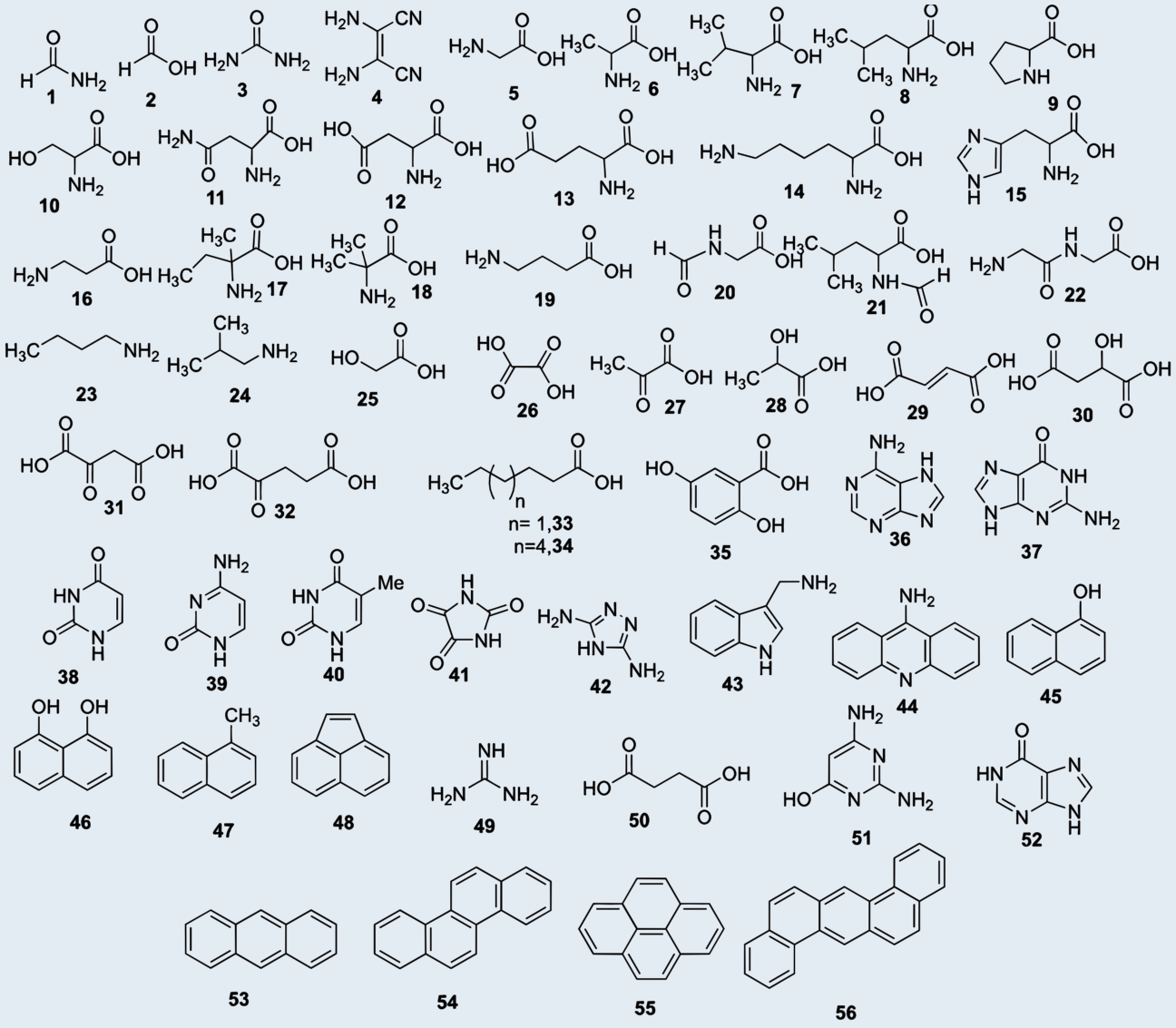
true; they did, sort of. But the molecules they created were simple, and some of the important molecules that life depends upon were absent. They showed that (1) random chemical reactions produce random chemicals and that (2) random chemical reactions do not create complex and highly reactive chemicals.

Chemical evolutionists never take the broth and tar from Miller-type experiments and try to go further. This could not work, and they know it. The products are too dilute and contaminated. Instead, once they identify a product, they will order it in pure form from a chemical supply house. They will then react it with a second chemical to make traces of a third chemical. They will then get a pure sample of the third chemical and repeat the process. In the end, they might proclaim that some chemicals 'could have formed on a primordial earth without intelligent input', but this is a highly misleading claim.

The polymerization problem

Life must also overcome the polymerization problem. You are not made of simple, free-floating chemicals. Instead, many of the things that make the human body are composed of long chains of sugars (**polysaccharides**), **amino acids** (proteins), or **nucleotides** (DNA and RNA). These molecules can be extremely long: human **chromosome** 1 is about 0.3 m (1 foot) in length!

Yet, these long chains of simpler chemicals are easy to break down. To form them, the body removes an

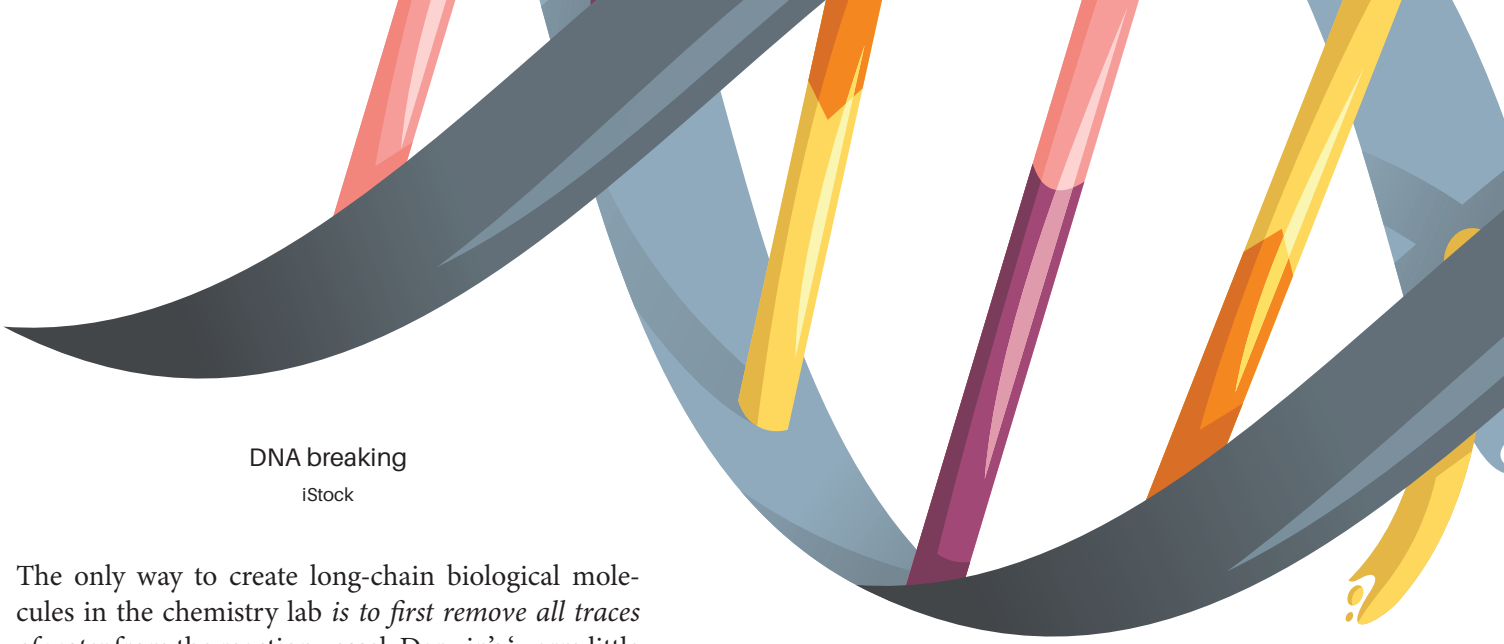


Simple molecules that were produced in the Miller-Urey experiment

Criado-Reyes, J., Bizzarri, B.M., García-Ruiz, J.M. *et al.* (CC BY 4.0)

-OH from one end of one chemical and an -H from one end of another and then joins the molecules together. In other words, every bond between the sugars, amino acids, and nucleotides in the molecules that make up living things was made by creating a water molecule (H_2O). This is why this reaction is called **condensation**.

But here's the problem: most chemical reactions are reversible, and they usually have a preferred direction. In this case, water will break these bonds much faster than they will ever form in nature. If you took a beaker full of sugar water and let it sit for a million years, you would not find any long-chain polysaccharides in that beaker. Yet, if you took long-chain polysaccharides and put them into a beaker of water, they would slowly break down into simple sugars. So, despite evolutionists' appeal to eons of time for their magic to work, vast ages are the *enemy*.



DNA breaking

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The only way to create long-chain biological molecules in the chemistry lab *is to first remove all traces of water* from the reaction vessel. Darwin's 'warm little pond' idea is the absolute worst place for life to form.[5]

Mirror image madness

Yet another consideration is that many biological molecules have mirror-image forms. We call them left-handed and right-handed, depending on the way polarized light twists as it passes through a purified solution of these chemicals.[6] Living things exclusively use right-handed sugars and left-handed amino acids.

There is no reason for this. Life could easily use the other forms. Worse, there is no reason why living things could not use a mixture of left-handed and right-handed versions. True, if you add left-handed amino acids to a protein, you will disrupt its shape and destroy its function. But that is only because it was designed in a certain way. God *could* have used a mixture. He did not. Considering that there are 21 amino acids used in proteins, the probability that living things would use only one form is vanishingly small.[7] Thus, probability tells us that life was designed.

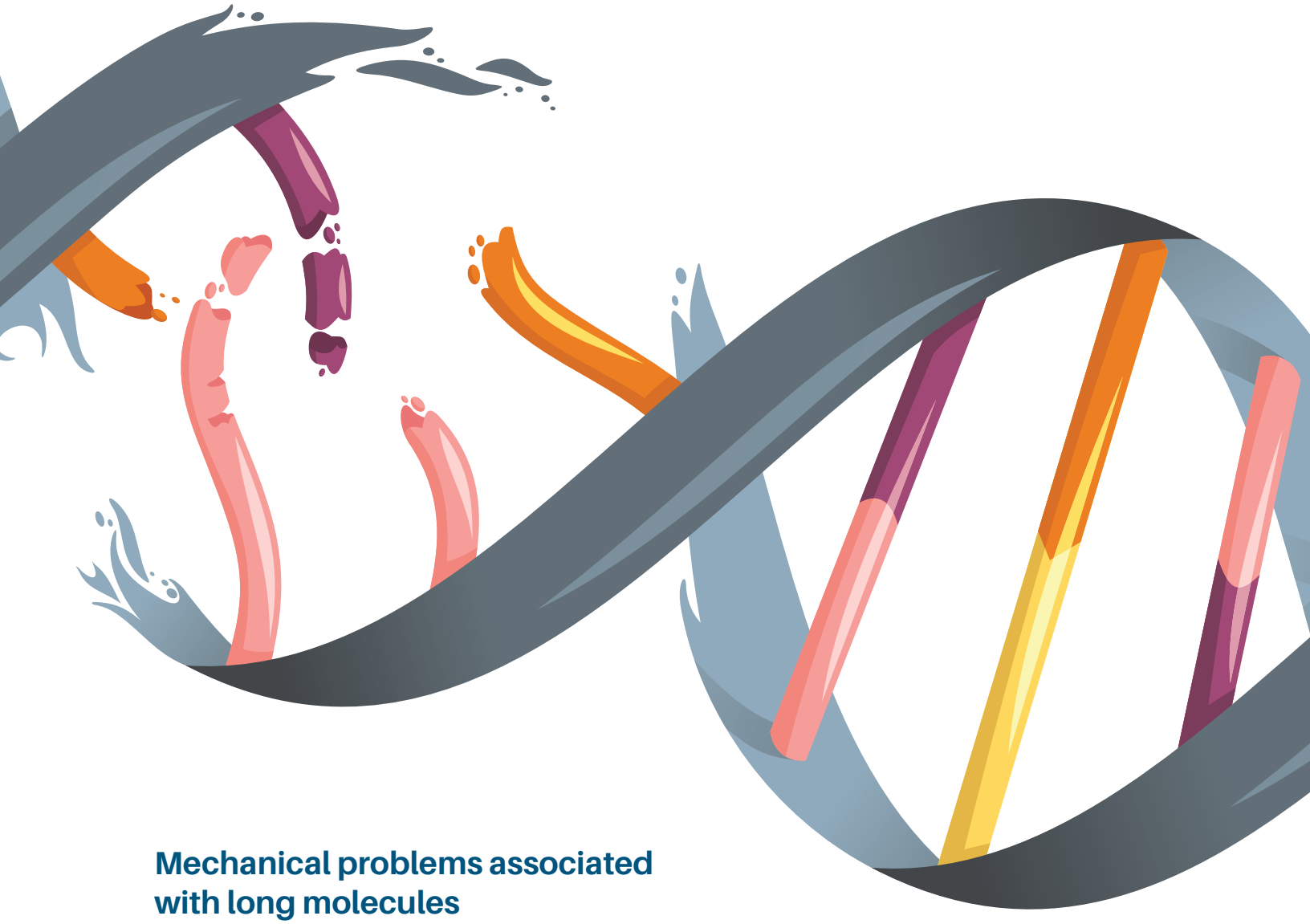
This is not true of DNA, however. A wrong-handed sugar would disrupt the pairing, and the chain could not grow further. Yet, there is no reason DNA could not use the other sugar in each rung of the ladder. This would create a molecule that is a mirror image of normal DNA, twisting in the other direction but having all the same chemical properties.

This handedness or **chirality**[8] is a huge problem for evolutionists. Miller's experiments produce a 50-50 mixture of left- and right-handed amino acids, called a **racemic** mixture or **racemate**.[9] Chemists have a hard job separating a racemate into its components, and usually use an already existing one-handed (**homochiral**) substance to do so. But this substance is almost always derived from a living creature—made by homochiral enzymes coded upon homochiral DNA. But where the first homochiral molecules came from is a mystery for chemical evolutionists.

Furthermore, homochiral compounds turn racemic over time. In fact, one dating method uses the rate of amino acid racemization to estimate the ages of biological samples. Time, again, is the enemy of vital molecules.[10]

Extreme physical forces at small scales

Physics is also a major problem. Consider a jar of water. Some of the water molecules are moving very slowly and some quite quickly.[11] At room temperature, the average water molecule is moving about 590 m/s (1,300 mph). Some are moving faster than the speed of sound in water (about 1,500 m/s, or about 3,300 mph). They don't get very far before they bump into another molecule, but just consider that there are single water molecules jetting around and smacking into the other molecules at very high speeds. This would not be important if there was just water in the jar. Add long-chain, fragile, or highly reactive molecules to the mix and the problem is obvious. Water is a highly destructive molecule. For life to form from non-living chemicals, you would need to get them all in place and wrap them inside a cell membrane in less time than it takes those fast-moving water molecules to cross the diameter of the cell. Good luck!



Mechanical problems associated with long molecules

Long molecules have another problem: knots. Living cells have a suite of complex DNA repair proteins that are constantly untangling the knots and stress-related breaks in DNA. Without these proteins, called **topoisomerases**, we would die in short order. Thus, to retain DNA in the cell, you need very complex systems, but those systems would not have existed when life began. Worse, those systems are composed of proteins that are coded in the DNA. But they could not be decoded unless these machines were already operating to prevent tangling. So, which came first, DNA or the complex maintenance systems *encoded within the DNA* that prevent the DNA from breaking as it twists and turns in the vibrating, watery solution inside the cell?[12]

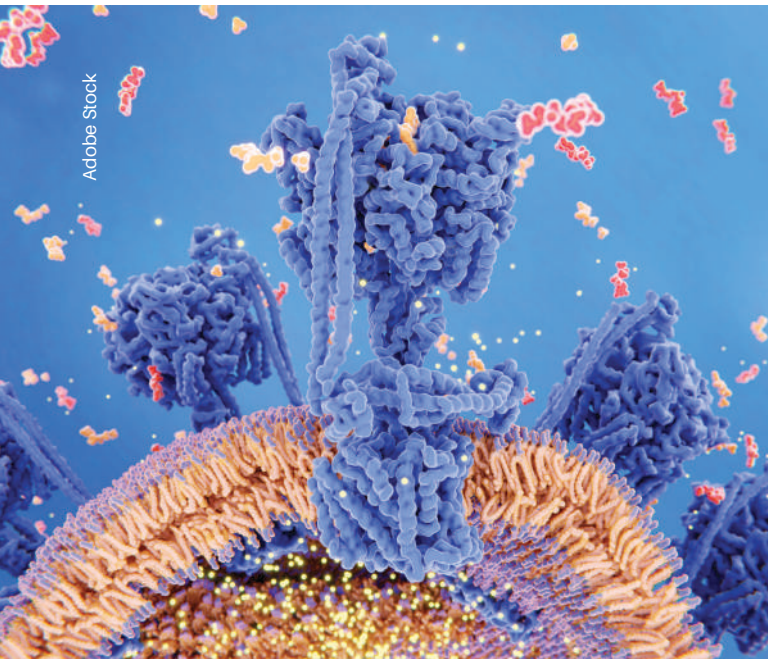
If left to themselves, most proteins tend to clump together in unpredictable ways. To properly fold a protein, chaperone proteins grab onto the growing strand, preventing it from becoming a tangled knot. They usher the unfolded protein to a large, watermelon-shaped protein complex called a chaperonin. Once inside, the protein is carefully and properly folded before being let out. Without these complex systems, proteins would be worthless. Yet, it takes folded proteins to fold proteins. So, which came first, folded proteins or the folded proteins needed to fold proteins? How did the first chaperonin fold correctly?

We just introduced two massive problems in all origin of life scenarios: the **chicken-and-egg problem** and the **information** challenge. Let's deal with each in turn.

Chicken-and-egg problems

A chicken-and-egg problem is one where the things at the beginning and end of a cycle are mutually interdependent.[13] There are *many* of these in living things.

We have already asked this question in reference to DNA and proteins, but let's step this up even more. We mentioned ATP above. ATP is made by a protein complex called **ATP synthase**. This is the world's smallest electric motor, a true marvel of engineering.[14] But the codes for these proteins reside in DNA. Most of the machines that make proteins from DNA require ATP.[15] Uh oh. How can they use ATP before ATP synthase is manufactured? In fact, ATP is required at every step of the process, making **messenger RNA** from the DNA,



An ATP synthase motor

charging the **transfer RNAs** with amino acids and activating them so they can bond, translating the RNA into protein, folding the protein, etc.

While some simple cells, under some conditions, can produce small amounts of ATP by incompletely breaking down sugars,[16] it requires a *massive* amount of ATP to produce the ATP synthase motor. The cell must remain efficient if it is going to survive, so one would never expect a primitive cell to expend gobs of ATP as it experimented with ways to make ATP synthase. So, which came first, ATP, ATP synthase, the code for the ATP synthase proteins, or the code for the machines that produce the ATP synthase proteins? These must all exist simultaneously and be operating simultaneously for life to exist. All abiotic origin-of-life scenarios fail when presented with the chicken-and-egg problem.

Extreme chemistry

What I am about to describe applies to all forms of life, but the discussion of the amazing chemistry that bacteria perform should help us to realize how incredibly different they are from the simple chemicals from which they supposedly evolved. Living things have everything they need for self-making (**autopoiesis**), they have a specific set of machines to do this, and these processes are vastly different from the natural world of non-living things.[17,18]

First and foremost, bacteria work on one molecule at a time. This is utterly different from the abiotic world, where dirty, mass-action chemistry rules the day. Instead, bacteria operate with single-molecule specificity. They can take an organic compound and add or take away one specific part, quickly and efficiently, with little to no byproducts. Every bacterial **species** contains special proteins called **enzymes**. These are complex machines, usually made of protein but some are protein-RNA complexes. Enzymes do things that are otherwise impossible. With them, bacteria are able to perform perfectly pure, single-molecule-specific biochemistry using the equivalent of molecular scissors.

Enzymes perform feats of chemistry that make industrial chemists drool with envy, and they create complex and delicate molecules that (a) are not ever found outside of living things and (b) would never be predicted from the basic laws of environmental chemistry. There is an absurd number of *possible* proteins. Even a short protein of 100 amino acids has an uncountable number of possible amino acid sequences.[19] Most random sequences would produce a protein that has no function at all. Yet, bacterial enzymes are both specialized and optimized. Worse, almost all proteins are modified by the cell after they are made. The activity of an enzyme is often not dictated by the amino acid sequence but by the chemical modifications that occur after the fact. Even if a cell accidentally stumbled onto an amazing new enzyme sequence, enzymes are generally useless before they are chemically changed or otherwise activated by the cell.

Enzymes are also amazing **catalysts**. A catalyst is a substance that speeds up chemical reactions without

being consumed. It is not just that these little protein machines can do improbable and complex chemistry. They can also do it very, very fast. Reactions that would take millions, even billions, of years to run to completion are finished in the blink of an eye inside bacterial cells, and life would be impossible were it not so.[20] One extreme catalyst is phosphatase, which speeds up the hydrolysis (splitting) of phosphate bonds by a factor of 10^{21}. This enzyme allows reactions vital for cell signalling and regulation to take place in a hundredth of a second. Without the enzyme, this essential reaction would take a trillion years—almost a hundred times the supposed evolutionary age of the universe![21]

Some of the best industrial catalysts were made by taking known enzymes and mutating them. Some call this 'directed evolution', but it would be better to call it *goal-directed selection*.[22] I used directed selection to discover new and useful protein variants as part of my doctoral work.[23]

The information challenge

Life is based on information. In one sense, living things are nothing more than information processors. Cellular information tells them when to eat, when to turn a gene off and another on, or when to turn and run from a predator.

We can give the evolutionists all the time they want and all the simple chemicals their hearts desire. We can give them a 'warm little pond' that magically created long-chain molecules. We can put cellular membranes and ATP into that pond. We can let them claim that cells will automatically form with all the requisite parts already in place.

And we can retort, "So what?"

For, even if they have a cell with all the proper parts, and in the proper order, they are nowhere close to creating life. Why? Because life requires information, and there would be no information on the DNA within that cell.

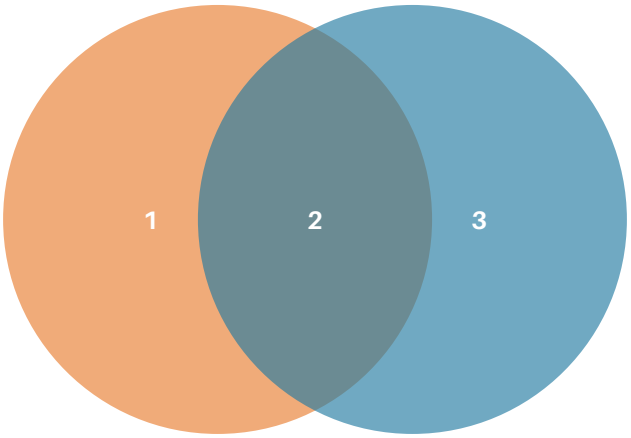
In the same way, you could assemble a million computers, adding a hard drive, a central processing unit, and memory. You could randomly add millions of ones and zeros to the hard drives and randomly program the CPUs with commands. You could plug them in. A working computer and the thing you just made would be exactly the same in all respects *except one*. None of your computers will work because they are missing something intangible: information.

Nobody would *ever* expect you to get a working computer in this scenario, and if you did, someone would no doubt accuse you of cheating. Why? Because complex computer operating systems do not arise from random bits. Instead, they are created by intelligent beings. This is the information challenge. Information only comes from intelligence.

Overlapping claims

Opposing theories will each explain at least some of the available data. Because of this, evolution absolutely makes some correct predictions. We must be careful, though, because many people have concluded evolution is true based on the faulty premise that any evidence that supports evolution must be proof against creation. What if, on the other hand, both evolution and creation claim to explain the same thing? Clearly, that thing cannot be used in support of only one side of the debate.

We can use a Venn diagram to illustrate this. Draw two overlapping circles. The area covered by both circles



Overlapping predictive realms

are things that both claim to explain. The areas outside both circles, however, is where the real argument lies. Creationists believe in 'change over time', so clearly the fact that species change and adapt cannot be used as proof that evolution is true and biblical creation is

false. Of course, change is *necessary* for evolutionists, but it is not *sufficient* to explain evolution unless they can explain the origin of very complex systems, which they can't.

Creationists (at least all those at CMI) also believe in **natural selection** (chapter 3). Thus, the fact that some organisms are a better fit to their environment and will thus tend to have more offspring is as much a part of biblical, **young-earth creationism** as it is a central tenet of **Darwinian evolution**. *Both sides claim the same thing.*

What do you do when two theories are fighting over the same territory? You look elsewhere. This is why we wrote the book *Evolution's Achilles' Heels* and made our (double award-winning) documentary of the same title.[24] Our goal was to turn the tables on the evolutionists and make them defend their position against our best arguments. These arguments were not in the area of overlap between the two theories!

Creation can also explain the rise of new species from the original organisms God created (chapter 2). Even Darwin's book *The Origin of Species* was chock full of creationist ideas. He did not lay down an evolutionary argument until he said, "I see no limit to the amount of change," and it took him over a hundred pages to get to the point.[25] Here, he identified an area of non-overlap. Creationists definitely see limits to the amount of change. If the information for some feature or trait is not within a species, the species will never develop it. Yet, we must be careful, for we are not talking about little things but big things. **Mutation** and natural selection can lead to **adaptations** like the ability to digest new chemicals. This is a little thing. They cannot, however, invent something like **photosynthesis**, **sexual reproduction**, or even upright-walking humans. Those are big things that would require millions of evolutionary experiments, and yet no tinkering with existing features would ever be expected to create dramatic leaps in cellular technology.

Consider photosynthesis. Why would a cell experiment with the complex and incredibly unlikely process of grabbing photons and packing that energy into carbon-carbon bonds in the form of sugar? The amount of energy the cell would have to invest in all that experimenting would be extreme and there would be no payback until the system was working to perfection. In the meantime, other cells would have been using all that spare time and energy to generate offspring. The other cells win. Every time.

What is 'evolution'

We have already used the term 'evolution' several times, so let's take a minute to explain what it means. The basic definition is simply 'unfolding'. In a biological sense, evolution is a gradual unfolding or change in living things over time. Yet, this is not a proper definition because it leaves a critical part of the theory out. Evolution is not just 'change over time'. In fact, although that is the definition found in most textbooks, 'change over time' is a lame definition. Why? Because creationists believe in change over time! Instead, any definition of evolution must include the phrase 'common ancestry'. Evolution is the belief that *enough* change over *enough* time can lead to the common ancestry of all species. Consider also this definition of the general theory of evolution by British zoologist Gerald Kerkut (1927–2004):

> [T]here is the theory that all the living forms in the world have arisen from a single source which itself came from an inorganic form. This theory can be called the 'General Theory of Evolution' and the evidence that supports it is not sufficiently strong to allow us to consider it as anything more than a working hypothesis.[26]

Being that this is a "working hypothesis", we are right to ask a question: Can small changes over vast ages explain all living creatures? We just identified an area of non-overlap. This is a very, very important thing to understand. Darwin, and nearly all evolutionists since him, used small-scale changes to infer tremendous changes over deep time. He did not have a way of accounting for the source of the instructions for the amazing new abilities found in living organisms, and he ignored the fact that anything created by an intelligent being can be tinkered with *after* it is created.

Essentially, once life exists, it can be changed. But such changes do not explain the complexity of life. Life can change because it is robust, complex, and overdesigned. It was made to withstand abuse and keep on rolling. Yet, there are limits to the amount of change it can withstand before living systems collapse. Like

Louis Pasteur
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any good engineer, God built life according to a set of specifications. Life will survive only as long as those specifications are not exceeded.

Evolution requires a lot of new structures and a tremendous amount of new information. But the changes required to go from the first, simple living thing to modern, complex life are not what we see in real time. Random mutations are not producing better organisms.

The spontaneous origin of life debate

Louis Pasteur[27]

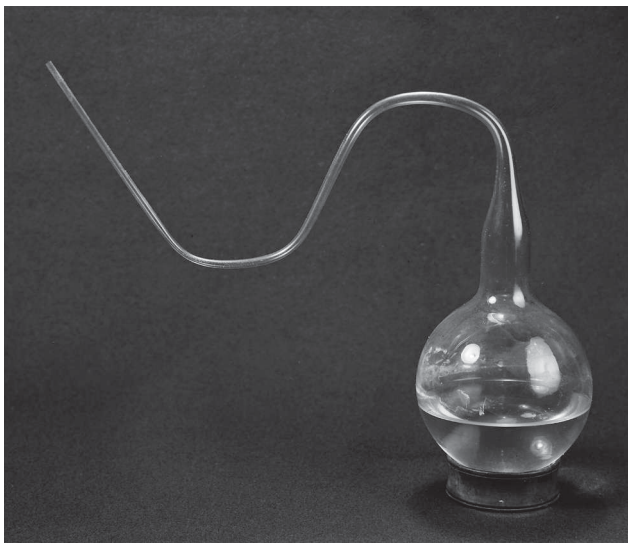
Each time we go to the refrigerator and take out a bottle of milk, we should be reminded of the work of the outstanding French scientist, Louis Pasteur (1822–1895). Pasteur discovered that milks turns sour because of the action of tiny living organisms too small to see with the naked eye. He developed a process of gently heating milk to kill these organisms without changing its flavour or nutritional value. This dedicated Christian was the discoverer of **pasteurization**; he founded the field of **microbiology**; he was the first to figure out that chemicals can come in mirror-image forms; he saved the French silk industry after discovering that fungus-diseased silkworm moth (*Bombyx mori*) eggs could be seen under a microscope (and then be destroyed); he developed the world's first **vaccine** for rabies;[28] he was a professor at several prestigious universities; and he was given France's highest award for citizens.[29]

Pasteur also stood directly against Darwinian evolution.

Many people before his day believed that small animals sprang to life automatically from non-living matter (such as rotting flour, a sweaty shirt, or decaying meat).

This belief that living matter arose from non-living material is called **spontaneous generation.** The idea of maggots' coming spontaneously to life out of decaying meat was successfully challenged in 1668 by Italian biologist Francesco Redi. When he covered the meat with gauze to prevent flies from laying their eggs on it, no maggots appeared in the meat.

Yet, long after the idea of spontaneous generation of animals had been discarded, scientists still clung to the idea of spontaneous generation of microbes. To disprove this idea, Pasteur boiled some broth to kill any microbes present. He did this in a flask with a



Swan-necked flask used by Pasteur

long, thin, curved neck. This allowed air to get to the broth, but not microbes. No microbes appeared in the broth. Pasteur's findings showed that microbes were not spontaneously generated from the broth itself. Microbes would only appear in the broth if they were allowed in with the air. He clearly showed that even for microbes, life came only from life.

But spontaneous generation is an essential part of the theory of evolution—a branch called chemical evolution. Pasteur's work should have dealt the death blow to the idea of spontaneous generation, but much of the medical profession still resisted his ideas. Some were unable to cope with Pasteur's thinking on germs and vaccination. Others resented medical research being conducted by someone whose training was in chemistry, not medicine. Such opposition seems hard to understand considering that Pasteur's work has saved more human lives than any other.[30]

Pasteur saw no conflict between science and Christianity. In fact, he believed that "science brings men nearer to God."[31] In his work as a scientist, he perceived evidence of wisdom and design, not randomness and chaos. Pasteur stated that: "The more I study nature, the more I stand amazed at the work of the Creator."[32]

Haeckel and Huxley

The evolutionary community did not at all appreciate the implications of Pasteur's work, so they pulled out all the stops in an attempt to refute it. Two men were at the center of this effort. One was Darwin's friend and confidant, the Englishman Thomas Huxley. His nickname was "Darwin's Bulldog" and without him Darwin's ideas would not have been as widely promoted. He was also a racist, like most early evolutionists, as some evolutionists have belatedly discovered.[33]

The other was a professor at the University of Jena in Germany, Ernst Haeckel. He was alternatively called, "Darwin's bulldog on the continent," and, "The Gadfly of Jena." CMI's Russell Grigg simply called him, "The Apostle of Deceit."[34] He is quite possibly the most lyingest scientist *ever*. He gave us important scientific terms that are still in use today, like *ecology* and *phylum*, and he named many of the stages during embryological development. He was also a virulent racist who lambasted the Bible for teaching equality of races because of our common descent from Adam.[35]

Haeckel and Huxley were involved in a major fraud of fundamental importance. You almost certainly did not learn about this in science class, but it was huge news back in the day and their claims were critically influential in establishing evolution as the dominant scientific paradigm. In 1868, Haeckel took up 73 pages in a prestigious journal to document a new form of incipient life he called the ***Monera***. These were completely imaginary, leaping from the febrile fields of Haeckel's mind. He provided intricate, detailed 'drawings' and ascribed scientific names like *Protamoeba primitivia* to his imaginary critters, which, he claimed, were at the junction of the living and non-living worlds. Pasteur must have been wrong,

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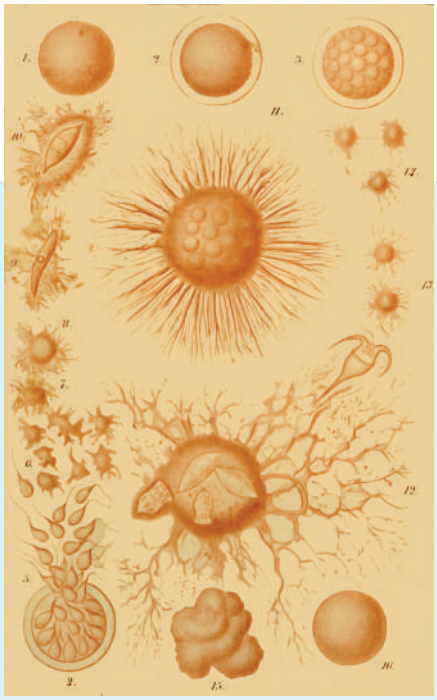

An illustration used in Haeckel's book *The History of Creation,* of the life cycle of a fictional Moneron named *Protomyxa aurantiaca*.

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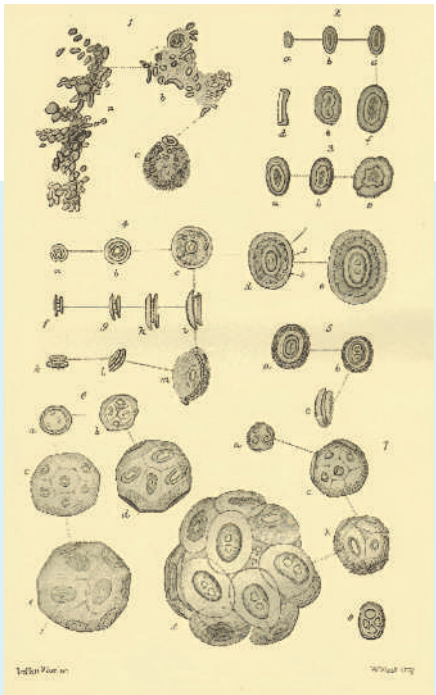

Drawings of *Bathybius*, top left, alongside various plankton

because Professor Haeckel had discovered that life is constantly evolving from gooey-looking proto-life.

In 1868, while examining old bottles of deep-sea sediments, Huxley claimed to have found **protoplasm**, the stuff that life formed from and must be continually forming from. The word is a combination of Greek root words. *Protos* (πρῶτος), of course, means early, primitive, or first. *Plasma* (πλάσμα) has to do with something that is molded or created. In biology, it was used to denote a living substance. Finding this 'primitive living substance' was of major importance to then-popular evolutionary theories. Specifically, many people believed that the inside of the cell was filled with a mystical substance with something like a vital force (e.g., protoplasm). Today, we call it **cytoplasm**. Finding what they thought was protoplasm *outside* the cell allowed them to make a direct link between the physical and biological world.

But how wrong they were!

The sediment samples Huxley examined had been collected in 1857, two years before Pasteur published his work on spontaneous generation. Huxley saw what looked like cellular material, but it was amorphous. It was really like a whitish slime that sat on top of the sediments in the bottles. With this discovery, Huxley proclaimed there was a 100% continuum from simple chemicals to humans. Haeckel agreed. He wrote to the journal *Nature* to trumpet Huxley's discovery. It probably helped Haeckel's attitude that Huxley had named the stuff ***Bathybius haeckelii***.[36]

The story did not hold together for long, however. Five years later, in 1875, a chemist on board a deep-sea drilling ship noticed the same material in his bottles, but in only those in which the contents were preserved in alcohol. *Bathybius haeckelii* was nothing more than amorphous calcium sulfate, a simple precipitate of seawater. Huxley did not fully admit his error until 1879. Haeckel held on until 1883, and even then only admitted the error grudgingly and obtusely.[37]

Why is this discussion of a short-lived fraud included in a book about biblical biology? It is so that we can understand how important having a mechanistic explanation of the origin of life is to Darwinism. The naturalistic, materialistic philosophical worldview behind Darwinism simply cannot tolerate the fact that life is complex, well-engineered, and obviously

designed. This is no less true in the 2000s than it was in the 1800s.

"Aliens did it!"

Faced with the difficulties inherent in all origin-of-life scenarios, many people have turned to another possible explanation: aliens. The 'old guard' evolutionists are still stuck in their naturalistic mindset, but many younger people, even younger professors, believe that life must have come from outside earth. Dubbed **panspermia**, the notion comes in several forms.

Undirected panspermia is the idea that life can be distributed around the universe in tiny seeds, perhaps carried inside the crevasses of a stony asteroid. In fact, given billions of years and many opportunities for life to have arisen, they believe the universe could be teaming with life. There are massive problems with this, besides the first hurdle that life must first arise spontaneously. Interstellar space is not friendly to living things. **Cosmic rays** are powerful enough to sterilize anything they come in contact with. There is no atmosphere in space, so any volatile gases and water in living things will sublime (vaporize). Then there is the problem of reentry. If a potentially life-bearing asteroid hit the atmosphere, the life inside would burn up!

Not satisfied with this scenario, other people have turned to something called **directed panspermia**. Yes, 'directed', as in 'intelligently planted'. Perhaps aliens seeded life on earth several billion years ago.

Panspermia answers no real questions, for it does not explain how life formed. It only pushes the problem into some remote place where we have even less of an ability to test our theories. Yet, the objections outlined above still hold, most importantly the information challenge. And the panspermia advocates have a time problem. Even in a big bang universe, there is a hard wall that they cannot cross. They only have a few billion years. Directed panspermia is even worse, for even after appealing to **intelligent design**, they *still* can't explain how life started.

How did life begin?

Clearly, life must have been designed by a super-intelligent being. But how did God make life? This is a fascinating question. It is a bit beyond what we can understand, but we know enough about biology to at least have a rough idea.

First, God had to have a plan. He *knew* what He was doing, after all. He had to choose an information storage system (DNA), code an instruction set into that system (the genome), and design multiple maintenance, repair, and duplication systems (that are all coded into the genome).

He had to plan out the energy storage, generation, and utilization systems (based on ATP), code those things into the genome, and stock the cell with enough energy that it would immediately begin working as soon as He let it go.

He had to design complex biochemical manufacturing and recycling processes and code those into the genome as well. He designed large and complex proteins, polysaccharides, and nucleotides. He also designed multiple systems to chemically modify those long-chain molecules. Some of these, like DNA, RNA, and protein modifications are becoming well understood. Others, like the 'sugar code', are only now beginning to be studied.

He programmed the cells to make exact copies of themselves in only a few minutes. He designed photosynthesis, an incredibly improbable series of chemical reactions that does the near-impossible. He designed sexual reproduction, multicellular organisms, and the hormonal regulation of development in complex species.

Finally, He designed life to withstand many insults and injuries, from handling chemicals that should be poisonous to dealing with the mutations that are constantly threatening to kill us.

These systems had to be designed, assembled, integrated, and turned on simultaneously. It is like God performed the ultimate balancing act, holding all the parts of life together like a 3D puzzle. When He switched from creating work to sustaining work, the most improbable machine one could ever imagine was sitting there, whirring away and doing everything it was designed to do.

In the end, the living world does nothing but bring glory to the Almighty Creator. This is the essence of *Biblical Biology 101*.

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