

G O D

According to

G O D

A Physicist Proves We've

Been Wrong About God All Along

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O N E

A Few Words About What God Is Not

Before we discuss what God is, it is highly instructive to know what God is not. There is so much misinformation streaming from communities of skeptics and believers alike that separating the Divine wheat from the imagined chaff can be a confusing task.

I am not certain who said that if you can only afford one newspaper, read the opposition. Whoever urged this, it is superb advice. Let's look at what the arguments of bona fide skeptics, purebred materialists, have to teach about our cosmic genesis. As certain as I am that there is a metaphysical dimension active in our world, so they are convinced of the exact opposite, that the world can be described, including its creation, in totally secular terms. They claim that the idea of a Creator, or God, is a human construction, a man-made apparition, arising solely to satisfy an

imagined need for an interested cause or force that brought the universe into existence.

The argument against the biblical description of our cosmic genesis is quite basic. If this supposed Creator is actively interested in Its creation, then that Creator has a very perverse sense of compassion and perhaps of humor—more like that of a monster: earthquakes, tsunamis, cyclones have swept hundreds of thousands to their horrendous deaths; approximately eighty million humans have been murdered by fellow humans in the past century. Logic, so their argument goes, dictates that a Creator God, if It existed, would have more empathy in Its guidance of the world It produced.

So powerful is this divergence from the often preconceived notion of how a concerned God “should” behave that Bart Ehrman, chair of the Department of Religion at the University of North Carolina, Chapel Hill, and former pastor of Princeton Baptist Church, rejected his belief in Christianity. The title of his 2008 book provides his reasoning: *God’s Problem: How the Bible Fails to Answer Our Most Important Question—Why We Suffer*. “The problem of pain,” he writes, “ruined my faith.”¹

Atheists also argue that God is irrelevant, an unnecessary component to human society. Even without a God forcing the rules of the Bible down our throats, humanity would have discovered that communities following the logical laws of society are likely to have a greater chance of survival than loners in the wilderness. This urban style of morality, they reason, merely evolved from—is a more sophisticated version of—our animal ancestors’ survival instinct to herd or flock together, as birds of a feather do so well. We don’t need a God to tell us that. “Morality,” Richard Dawkins, Oxford University professor of the Public Understanding of Science, tells us in his 2007 book *The God Delusion* and again in his BBC documentary *Religion: The Root of All Evil*,

“stems from altruistic genes naturally selected in our evolutionary past.”² For morality we need neither a God nor a Bible.

E. O. Wilson, in his acclaimed book *Consilience*, agrees wholeheartedly. Wilson tells us that “the Enlightenment thinkers . . . got it mostly right the first time. The assumptions they made of a lawful material world, the intrinsic unity of knowledge, and the potential of indefinite human progress are the ones we still take most readily into our hearts.” Unfortunately, his “dream of a world made orderly and fulfilling by free intellect” is a dream based on gossamer.³ It has nothing to do with reality. As Wilson describes in great detail, the intellectual freedom of the Enlightenment itself sowed the seeds for the French revolution’s Reign of Terror, in which the leading intellectuals of the day were slaughtered.

In a more recent attempt at achieving the Enlightenment’s goal of humankind’s free intellect finding the way to peace and fulfillment, we need only turn to the ultimate enactment of the philosophy of Karl Marx, his famous claim that religion is “the opium of the people.” And when religion was finally abandoned, we achieved what Marx might have envisioned, had he paid better attention to the lessons of the past. Within a century, Communist Russia (a perversion of the concept of the commune) produced the most uncommunal of all societies, brutal and totally repressive of any form of intellectual freedom.

History repeatedly brings an unwelcome message that we often strive to ignore: the unfettered use of human logic does not lead to a just and moral society, the claims of philosophers Baruch Spinoza and E. O. Wilson notwithstanding. The biological basis of our moral judgments teaches us that the human genome is programmed for pleasure and survival, not for morality.

Of course Dawkins is correct on one point here. Religion is the root of all evil, though not exactly as that statement implies.

The very concept of a definitive evil requires that there be a clear distinction between good and evil. And that distinction is totally of biblical origin. A society based on moral relativity has no fixed bounds. Individuals and groups can decide what is good for them, which in another society or situation might in fact be deemed evil.

When atheists describe God as a sinister monster, a superficial reading of the Bible seems to confirm their view. For starters, we've got biblically condoned slavery (Lev. 25:35–36; Exod. 21:26), genocide in the wars by which the invading tribes of Israel, following the Exodus from Egypt, displace the local tribes of Canaan (Deut. 20:12), and God refusing Moses entry into the Promised Land merely because he made a single mistake (Num. 20:6–12).

Yet the same Book also teaches love of neighbor and the alien (Lev. 19:18, 34). There is one law for both native and foreigner (Lev. 24:22). That demand for equality is extraordinary, especially considering that, amid the grandeur that was Greece and the glory that was Rome, a thousand years after the revelation at Sinai, foreigners were still considered barbarians and were treated likewise. The Torah, the Five Books of Moses (Genesis–Deuteronomy), demands one set of measures and weights for all customers, whether friend or foe (Deut. 25:13), and forbids murder (Exod. 20:13), robbery (Exod. 20:13; Lev. 5:21), oppressing the stranger (an admonition repeated thirty-six times in the Torah), and cruelty to animals (Deut. 25:4). Even the wanton destruction of trees is forbidden (Deut. 20:19).⁴ The biblical balance sheet is not as damning as some would have it. But then perhaps the biblical God is schizophrenic—sometimes vicious, sometimes compassionate.

God as schizophrenic? No. But God is also not as simplistic as we often paint God to be. If we take a second look at the Bible, we

discover the biblical God reveals a far more complex character than the simplistic version of an always-in-charge, predictable Ruler of the heavens and the earth. When passages of the Bible are quoted out of context, or read in translation, whether that translation is the twenty-two-hundred-year-old Greek Septuagint or a modern English version of the original Hebrew, nuances are often lost. Meanings of words are actually changed to fit within the grammar of the “newer” language.

Certainly if those persons involved in the search for extraterrestrial life received a message from outer space, that message would be studied and analyzed for every nuance. The Bible, if Divine in origin, is a message from totally “outer space.” It requires careful study. In this book, we’re going to do exactly that.

To take a quick look at some of those passages that atheists and skeptics often bring up, let’s consider the nature of slavery as described in the Bible. The Hebrew word for “slave” is “worker,” with all the connotations that differentiate the modern concept of slave from that of a worker. In Rome and Greece, the slave was no more than an animated tool. The biblical rules for the humane treatment of slaves are so strict that if a master broke the tooth or any other bodily part of a slave, the slave was immediately freed as a full citizen and with compensation (Exod. 21:26–27). The person about to become a slave must willingly sell him- or herself into slavery (Lev. 25:39, 44), which would only happen due to abject poverty. Kidnapping and selling a person into slavery was a capital offense (Exod. 21:16; Deut. 24:7). Returning an escaped slave to the master was absolutely forbidden (Deut. 23:15–16). A quick reading of *Uncle Tom’s Cabin* will put this humane biblical law into juxtaposition with more modern practices of slavery.

As for the genocide found in the Bible, which atheists flag as being condoned by God, we get quite a different perspective when viewed from within the text. The Israelites are about to complete

their forty-year trek in the desert, a trek that was to impress upon them a twofold lesson: first, their dependence upon a dependable God if they behaved themselves; and, second, that they possessed the strength and ability to carry out God's plans, that they no longer were a weak and fearful, essentially "institutionalized," group of just-freed slaves. They were a formidable nation. At this point God instructed them to destroy the local tribes that inhabited the land of Canaan. Sounds brutal and would be, if that were the end of God's command. But then we are given the key mitigating piece of information. We are told the reason for this conquest: "In order that they do not teach you to emulate their abominations that they have done for their gods . . . for even their sons and daughters they burn in fire to their gods" (Deut. 20:18; 12:31). When judging the "genocide" accusation, internalize this horrible fact: the Canaanites took their children and burned them to death. But what if they were to abandon their abominations, including child sacrifice? Then the Israelites were to make peace. How do we know this?

When the people of Israel entered Canaan, Joshua was in command. God had instructed Moses to appoint Joshua as leader since he, Moses, was to die prior to their crossing the Jordan River and entering Canaan. Needless to say, the rulers of the tribes of Canaan had no desire to have this new people share their land, especially since this invading people had zero tolerance for one of their cherished customs, the murder of their firstborn boys and girls by burning. And so the locals fought. "And Joshua made war a long time with all these kings. There was not a city that made peace with the children of Israel except the Hivri, the persons of Givon" (Josh. 11:18–19). From this almost seemingly afterthought, that one city made peace, we learn that Joshua offered peace to all the cities. That all but one refused was their choice. Perhaps giving up child sacrifice, if you are addicted to it,

is not so simple. Having neighbors who practiced these abominations is socially destructive to the entire society. In offering peace, Joshua was not abrogating God's command. He was merely executing its actual intention, to get rid of the abominations, not necessarily the abominators. To put these acts into perspective, consider living next to a home from which screams of horror and anguish regularly emanate. You discover the cause. Dad is busy raping his daughters while mom gets her pleasure by snuffing out her cigarettes on junior. If you don't take action, then you too are a monster. Now consider discovering that your neighboring village is actively conducting these abominations. That's what Joshua discovered upon his entry to Canaan. I imagine even an avowed atheist steeped in relative morality would recoil at such horror. There was no divine command for genocide; the Canaanites had to either live as decent humans or get out. Had the world taken a lesson from these biblical chapters, Hitler, Pol Pot, and Stalin would have been footnotes to, and not chapters in, history. Being overly righteous and forgiving, reasoning, "After all it's their custom, so why should we impose our values on them?" is no virtue. "There is a time to love and a time to hate; a time for war and a time for peace. . . . Don't be overly righteous or too wise; why destroy yourself" (Eccl. 3:8; 7:16).

Not all of God's traits are friendly. We don't need skeptics to tell us that the God of the Bible wants us to adhere to the standards presented in the Bible. The text itself makes very clear that if we err and diverge from those values there will be a Divine price to pay: "Take heed to yourselves, lest your heart be deceived and you turn and serve other gods and worship them. Then the anger of the Eternal God will be kindled against you and He will shut up the heavens, and there will be no rain and the ground will not yield its fruit; and you shall perish off the good land that the Eternal God gives to you" (Deut. 11:16–17). There seems no

room for argument here. And yet we will learn later that in fact God wants us to argue even when we are not totally in the right.

Take for example Moses. Moses, the human with the closest relationship to God, made one error, and God in punishment refused to allow Moses to enter the Promised Land. This, notwithstanding the fact that Moses had led the sometimes quite rebellious people of the Exodus during their forty-year trek in the wilderness prior to reaching Canaan and shaped what was initially a ragtag diverse population into a formidable and unified nation. It took forty difficult years in the desert to achieve this goal, and Moses was up to the demanding task of being the leader the entire time.

As any camper knows, food and water are essentials for any desert trek. And the Exodus was no different. God supplied a daily ration of manna every morning, but water was to be found along the way. And in that naturally arid region water was scarce. At times the supply went dry. At one such juncture, as the people cried for water, Moses grew impatient with them, became angry, and for a brief but fateful moment lost control, in both his actions and his words. “The people complained: ‘Why have you brought the congregation of God into the wilderness to die? . . . It is not a place of seeds or figs or vines or pomegranates, and there is no water to drink.’ . . . And God said to Moses ‘Take the rod, assemble the congregation, you and your brother Aaron, and speak to the rock that it give forth water.’”

Instead of speaking to the rock as God commanded, Moses in anger “said to the people, ‘Hear now, you rebels, are we to bring water from this rock?’ And Moses raised his hand and smote the rock twice, and water came forth in great abundance. . . . And God said to Moses and Aaron, ‘Because you did not believe in me to sanctify me in the eyes of the children of Israel, therefore neither of you shall bring this congregation into the land that I have given to them’” (Num. 20:4–12).

In retrospect Moses's frustration is understandable. Yet the pleading for water by the people was also justified. Moses, in that moment of desperation, had evidenced an expression of doubt in front of the entire congregation: "Are we to bring water from this rock?" Why the "we"? It was God, not Moses or Aaron, who was to bring water from the rock. God had never failed till then and was not about to fail now. But for a moment there was a doubt. Moses later argued with God to rescind the decree and allow him to accompany the people into the land of Canaan, even if he would no longer be the leader. But the damage had been done, and the answer remained no. "And God said, 'Speak no more to Me of this matter'" (Deut. 3:26). In a Divine compromise, God showed Moses the land from the peaks of the adjacent mountains. Then Moses was gathered to his people in peace. God as described in the Bible makes demands and expects us to adhere to those demands. Does that make the image of the biblical God one of a control freak? As we learn more about the nature of Divine control, we'll discover that in most cases there is quite a bit of leeway, a flexible margin, in how we are expected to comply with the rules.

But if God demands our conformance with His commands, can't God also demand the conformance of nature? And if so, then why doesn't God demand that nature behave itself? We are back to Bart Ehrman's query. If God is great, why tragedy? From the aspect of human interactions, induced evil is easily understandable. We have the free will to hurt others. God early in Genesis even admits that, though humans are created in the image of God (1:26–27), "the imagination of humankind's heart is evil from its youth" (8:21). Natural disasters, floods, famines, and earthquakes, however, are another story. Why doesn't the God of the Bible, compassionate by self-definition, control nature? We will explore in this book the weave of human and godly acts

that allows such events to happen and our role in partnering with God for their alleviation.

Miracles present a quandary of a different sort. They represent an aberration in the regularity of nature. The regularity of nature is for the most part the *sine qua non* of the scientific method. And the scientific method is the Holy Grail of skeptics. Miracles are not merely an aberration. They are in the materialist view of the world an imagined perversion of reality.

But if there is a God active in our universe and that God cannot perform miracles, cannot give nature a nudge, then this is not much of a God. Miracles upset the regularity of nature upon which the scientific method of analysis relies. And the scientific method has been phenomenally successful. It has found cures for plagues, sent people to the moon, and lightened the drudgery of the masses. Dr. Norman Geisler, a Christian philosopher and president of Southern Evangelical Seminary, in Charlotte, North Carolina, suggests that there is a way to bring the scientific and the miraculous under a single mantle. His logic is as follows.

We derive laws of nature by observing a consistency between cause and effect for certain categories of events. We derive the laws of gravity by studying the motion of falling bodies, and the laws of thermodynamics by measuring energy transfer in varied reactions, both chemical and physical. But miracles are unique, onetime events. There's no way of correlating cause and effect as a general law for an event that has no repetition. Yet, as Dr. Geisler points out, the logic of scientific scrutiny has been applied to the study of nonrepetitive events.⁵

The lack of repetition has not stopped scientists from speculating on the causes of the two most fundamental phenomena crucial to our existence: the big-bang creation of the universe and the origin of life from nonliving matter. Were these miracles? After all, they were both onetime events.

What caused the big-bang creation? Perhaps there was no cause. Our cosmic origins may derive from some unknowable, uncaused, cosmic fluke. Human logic developed in a world where discovering causes for events was crucial for survival. Was the noise in the tree caused by wind moving the branches or was it the result of a leopard preparing to leap upon one of us? Our cultural history has programmed us to seek causes for all experiences. But perhaps there are uncaused events. In the following two chapters, I discuss in greater depth the implications of uniqueness in several aspects of the physical world. Here we deal with just two onetime events: the origin of the universe and the origin of life.

Though the creation of the universe was an admittedly onetime event, the members of the National Aeronautics and Space Administration (NASA) have attributed a cause to it. NASA in 2006 and 2007 released a vivid diagram depicting the history of our expanding universe. The information illustrated thereon is so significant and fundamental to understanding the history of the universe that the initial research that led to this map earned two persons, John Mather of NASA and George Smoot of the University of California, Berkeley, the Nobel Prize in 2006.

The origin, our cosmic origin, is described in the diagram as the effect of quantum fluctuations in virtual (nonexisting) space. Before the big-bang creation of the physical universe, before the existence of space and energy, quantum fluctuations were possible. This means that, according to this august body of scientists, the laws of nature, or some aspects of the laws of nature—at least quantum mechanics—predate the physical world. If they did not predate the physical universe, then the quantum fluctuations that yielded the universe could not have materialized. The implications of this fact are extraordinary. If time as we understand it is part of the creation, as is usually assumed, then the laws of nature

predating the creation must be timeless. They predate time. The laws of nature are totally abstract. They are not nature. They are the laws that will eventually create and govern nature in the universe, once they create the universe by the big bang. This leap of scientific faith is identical to the biblical posit of a timeless, non-physical Creator, God, having created the universe.

To determine whether timeless laws of nature or a timeless God brought our existence into being, we cannot search into the past and observe the actual act of creation even with the most powerful telescopes. The universe was opaque for its initial three to four hundred thousand years. Our only clues are to be found within the universe the way it is now. Call it a reality check. Does the development of the world from the initial burst of energy that marked the big-bang beginning of our magnificent universe through to the origin of sentient life seem random or guided? If random, then there is no need for a God. But if guided, then clearly we need a Guide. We explore that cosmic evolution and its implications in the next two chapters.

The beginning of life, however, does provide some indication. All forms of life at the molecular, genetic level are so similar that it appears that all life stems from a single origin. Even the simplest of microbes are packed with phenomenally complex and extensive libraries of information encoded within their genetic material. Are the events that led to the onetime origin of life the result of a fluke or is life the result of an information-filled miraculous Cause?

The scientific method observes regularities, repetitions, in nature. If there are no significant exceptions, then logic dictates that these repetitive events represent an underlying law, a system, from which we can generalize how our world functions. We can then use this law to predict events that have not been observed, but are similar in quality to the events of the observed pattern.

For example, day by day we observe that the sun rises in the east. With that repeatability, we've discovered a "law" of nature, the sun rises in the east. With that law we can predict that tomorrow the sun will also rise in the east. Let's relate this concept of observed events and derivation of laws of nature to the origin of the complexity and information sequestered within all forms of life.

Every human experience we have, with no exception, reveals that for ordered complexity to arise and to remain stable, some aspect of the environment must cause its retention. For example, complexity can arise *de novo* via random acts, as in the shaking of a basket containing many small pieces of paper each with a letter of the alphabet on it. As the letters fall to the basket's bottom, they may land in a way that forms a word. That word would be an example of ordered complexity. But that word is always lost in subsequent tossing of the basket unless the letters that formed the word have been glued in place. Complexity is always lost unless nature somehow makes it last, "glues it in place."

Information may expand and build upon itself, but there is always, in all our experience, an informed or structured basis upon which the expanded knowledge rests and that preserves the information. A self-correcting computer program following specific rules by which it analyzes incoming information and gradually modifies those initially instilled rules is a simple example. The beautiful crystals of salt at the Dead Sea (actually, the biblical name in the original Hebrew is the Salt Sea; Gen. 14:3) are models of repetitive complexity. However, the crystals' formation is anything but random. The ionic or chemical bonding between the atoms of sodium, chlorine, bromine, and a few other elements in the water determines the structure of the crystal. Massive Sequoia trees arise from the information held in a tiny seed. And the first microbe on a formerly lifeless earth? From where did it derive, develop, and retain its wisdom? A "fluke" is not a very

scientific way of explaining the phenomena, especially since such a rationalization repudiates all scientific experience.

Harold Morowitz, while professor of molecular biophysics at Yale, computed that to create a bacterium would require more time than the universe has existed, if random combinations of molecules were the only driving force.⁶ Physicist Paul Davies was equally intrigued. He believes that life is “built into the scheme of things in a very basic way.”⁷ Simon Conway Morris, professor of evolutionary paleobiology at the University of Cambridge, finds that “the existence of life on earth appears to be surrounded with improbabilities.”⁸

Since life did arise on earth, what was the driving force that provided the information-packed complexity held within even the “simplest” of microbes? The wonder of life is not whether life arose in a microsecond, six days, a billion years, or an eternity. The wonder of life is not how much time passed during which the prebiotic nonliving matter metamorphosed into living cells containing “libraries” of complex information sequestered in their genes. The wonder of life arising from nonliving matter, from rocks and water and a few basic molecules, is life itself. Is life miraculous? According to our understanding of the origins of information and how we make scientific decisions, life’s emergence fits the description. Science and miracle in a single sentence. There was a time when that would have been seen as an obvious oxymoron.

The basic question of whether science and religion are mutually exclusive realms reduces to whether there is a place for the metaphysical to be brought within the structure of what until recently was a purely materialist science. The discovery of the big-bang creation of time-space and energy, the metamorphosis of that energy of the creation into particles, and the transformation of those particles into sentient beings, alive with feelings of

joy, the transcendental ecstasy of love, and self-awareness, all cry out for an explanation that seems to find its root in something other than the material. The physical particles from which living bodies are constructed, the atoms and molecules, show not a hint of sentience. How can we explain that a bundle of “inert” energy—simplistically stated, superpowerful rays of light—became alive, other than to assume some nonphysical, that is, some metaphysical, input was involved?

The Bible drew this conclusion millennia ago: “I am wisdom. . . . God acquired me [pure metaphysical wisdom] as the beginning of His way, the first of His works of old” (Prov. 8:12, 22).⁹ Wisdom, the first of all creations, was and is the driving force behind the sentience of life. Knighted mathematician Sir James Jeans paralleled this insight in his book, *The Mysterious Universe*: “There is a wide measure of agreement, which on the physical side of science approaches almost unanimity, that the stream of knowledge is heading toward a non-mechanical reality. The universe begins to look more like a great thought than a great machine.”¹⁰

And that would answer the ultimate question with which both science and religion struggle. Why is there an “is”? Why is there something rather than nothing? For that answer both science and religion must turn to the metaphysical.

Archskeptical Michael Shermer, atheist par excellence and publisher of *Skeptic Magazine*, in an article in *Scientific American* makes his case for a monistic view of reality: “The body and the soul are the same, and the death of the body . . . spells the end of the soul.” There is a millennia-old Talmudic tradition that the role of the Creator will be praised by believers joyfully and by skeptics even against their will. Shermer ends his exposition with “the realization that we exist together for a narrow slice of time . . . , a passing moment on the proscenium of the cosmos.”¹¹ A beautiful choice of words, and oh so true. The *Merriam-Webster*

Dictionary tells us that “proscenium” is none other than the part of the stage in front of the curtain, between the curtain and the audience. Shermer hit the proverbial nail right on the head. We live out our lives on the proscenium, the visible part of the stage. But as every theater devotee knows, the show is directed from behind the curtain.

ONE FINAL NOTE that I know many skeptics will not want to accept. There are several technical claims made in the Bible that appear to contradict firm scientific opinion. The age of the universe, for one. Bible data give a number that is less than six thousand years, while science measures the time since creation in billions of years, some fourteen or fifteen. Were there only six days from creation to Adam? And if Adam and Eve were the first humans, what about all those fossils of hominids dating back seventy thousand years?

As described in detail in my previous books, the ancient biblical commentators, those whose writings predate by many centuries the discoveries of modern science (writers of the Talmud, ca. 400; Rashi, ca. 1090; Maimonides, ca. 1190; Nahmanides, ca. 1250), learned from the detailed wording of Genesis that the universe is young and old simultaneously. These ancient commentators actually discuss what science has only recently discovered, that the flow of time is flexible. The rate at which time passes varies depending upon the conditions and the temporal locations from which events are viewed. That is the nature of time in this amazing world of ours. And with that knowledge they describe the old/young age of our universe. They talk about “beings” that we today would refer to as hominids, beings identical to humans in shape and in intelligence, lacking only the soul of humanity, the *neshama*, to make them human. According to these ancient

biblical commentators they walked the earth at the time of biblical Adam and before. “Cavemen” were never a theological problem to these ancient commentators.¹²

A superficial reading of the Bible misses all of this. But the Bible is anything but superficial. The Bible is not an easy read, and nature is not a simple study. Yet as sources of wisdom, for millennia both have intrigued and instructed peoples diverse in race, culture, and homeland. That is because their message is relevant to all times. Our task is to extract the eternal truths held within the “subtext.” In the Talmud, a sixteen-hundred-year-old commentary on the Bible, we are told that in the revelation at Sinai the words were written as black fire on white fire. The black and the white are two parts of a single Divine message—the black fire being the recorded text of the Bible, the words that we read, and the white fire being that part of the message subtly held behind the text, sequestered in nature. Only when we understand both the black and the white will we know the full meaning of that evocative message of Sinai. And for that reason the Bible opens with the creation chapter, what the twelfth-century philosopher and theologian Moses Maimonides refers to a *madah teva*, the science of nature. To understand God’s actions in this world, Maimonides tells us, we must first understand nature. In the following two chapters we’ll look at a few aspects of nature and see if we can discern within *madah teva* the metaphysical hand of God active within the physical world God created.

My hope is that we can leave behind preconceived notions and search for what the world and the Bible actually tell us about the God of creation.

T W O

The Origins of Life

One Reason I Know There Is a God

The most powerful challenge to atheists' view of the world lies within the world itself: the simple reality of existence. Why is there existence? Forget things as complex as life. Just consider the being of anything: space, time, matter in any form. Is there some "law," some axiom, that demands there be existence independent of an underlying force that brought it into being? Even if we posit that the universe and all existence are eternal, the question remains: Why is there an "is"? It's a question that calls out for an answer. Of course the facile response is if there were not existence, then we could not ask the question. True, but we do exist, and so it is a puzzle that demands probing. The greatest self-revelation of a Creator is the creation It brought into being.

Our Cosmic Genesis in a NutShell

big-bang creation → matter → life → brain → mind and
of energy of energy of energy of energy of energy of energy

But how could the energy of the big bang become a sentient mind?

There are two aspects in nature's march toward life that call out for commentary: the creation of a universe perfect for life, and the formation of sentient life able to experience the wonders of love, joy, and compassion, but built of combinations of protons, neutrons, and electrons that have not the vaguest hint of sentience within their structures. Life and consciousness emerged from nonliving matter. How?

I'd studied how the laws of nature make the particles of the world behave. How the elements were formed in stars and supernovae all made and makes logical sense. Granted there is a strong hint of a source of fine-tuning having shaped a world amenable to complex life, but still it was physics. Only when writing my third book, *The Hidden Face of God*, did I truly encounter the hidden hand of God. The majestic subtlety by which the laws of physics gracefully guide the workings of nature to meet the demands of life moves beyond the logical. At the interface between the seemingly inert matter and the life that arose from that inert substrate, for me the metaphysical became apparent.

The basic difficulty in replying to "how" life arose lies within the inherent limits of human brain power. No matter how clever we are or how much advanced education we've absorbed, whether theologian, scientist, philosopher, or New Age guru, we all think within the same box, a box delineated by a logic that can only envision qualities and quantities based on time-space-matter. We can say the word "metaphysical," meaning that which exists outside of the physical, but we cannot comprehend the metaphysical. It simply lies beyond the capacity of the human mind. And if the Bible is correct, then what created our universe, God, was and is metaphysical. How that metaphysical Creator interacts with the physical world need not in any manner conform to how we inter-

act with the world. And so, as the development of life followed a path from the energy of the big bang to the initial microbial life and then to the more complex bodies of animals and the mind of humans, that path may have been directed in ways that are humanly incomprehensible.

In our quest for the origins of life, let's start at the beginning of the evolutionary process. We would do well to ponder, especially in our schools, the puzzle of why there is existence. Unfortunately, by the time we are old enough to even contemplate the wonder of existence, we've been around so long that we just take the fact of existence for granted. But think about it. Why is there anything, why is there a universe within which life may or may not have evolved, developed, rather than nothing? It has been said quite accurately that the difference between nothing (as in before the big-bang creation) and something (the existence of our universe) is infinite.

In a refreshing expression of intellectual honesty, Nobel laureate and theoretical physicist Steven Weinberg, an avid atheist who unabashedly states that "the moral influence of religion has been awful" and further that any "signs of a benevolent designer are pretty well hidden," also tells us that even if we scientists eventually attain a "theory of everything," "we will still be left with the question of 'why?'. . . So there seems to be an irreducible mystery that science will not eliminate."¹

The conundrum of our cosmic beginning remains. The Bible of course gives God the credit for that event. "God created the heavens and the earth." That is in the very first sentence of the Bible, Genesis 1:1. But the Bible, being God-oriented, has a vested interest in listing God as the creator. Secular science, even as it embraces the concept of a creation, does not necessarily turn to God for the beginning. There are aspects of quantum physics (those are the physical laws that guide the minute subatomic

world) that allow the creation of something from nothing. Such a concept seems to violate even a rudimentary understanding of how the world works. But it does not. At the subatomic level something can come from nothing. And our universe may be that something.² However, a full exposition on how this can happen is beyond the scope of the current discussion.³

But the question is still how? Just what did the big bang produce? Science posits that the big bang was the beginning of time and space. But what about matter? That is considerably more enlightening, literally. The big bang did not produce matter as we know it, not any of the ninety-two elements, such as carbon and oxygen, and not the protons, neutrons, or electrons that would eventually combine to make the atoms of those elements.

By a fraction of a microsecond following the creation, the primary material product of the big bang was concentrated as exquisitely intense energy. There are many types of energy, but the form most manifest microseconds after the creation was electromagnetic radiation—in simplistic terms, something akin to superpowerful light beams. Then, within the first few moments following the creation, as the universe raced outward, stretching space, a transition took place (a transition the basis for which was discovered by Albert Einstein and codified in that famous equation $E = mc^2$) as energy condensed into the form of matter. A minute fraction of those light beams of energy metamorphosed and became the lightest of elements, primarily the gases hydrogen and helium. Over eons of time, mutual gravitational forces pulled those primordial gases into galaxies of stars. The immense pressures within the stellar cores crushed the nuclei of hydrogen together, fusing them to form heavier elements and, in doing so, releasing the vast amounts of energy we see as starlight. These forces of fusion coupled with those of stellar explosions, supernovae, yielded the ninety-two elements that eventually on planet

earth would form building blocks of beings that became alive and sentient. All this was made from the lightlike energy of the creation. Now that is a cause for wonder.

Light beams became alive, and became not only alive, but self-aware, and acquired the ability to wonder. The wonder is not whether this genesis took six days or fourteen billion years or even eternity. The wonder is that it happened. Of that fact there is no debate in science. According to our best understanding of the universe and equally according to the most ancient commentaries on the book of Genesis, there was only one physical creation. Science refers to it as the big bang. The Bible calls it the creation of the heavens and the earth. Every physical object in this vast universe, including our human bodies, is built of the light of creation.

To elucidate the awesome and humbling implications of this incredible transition of light into life, consider the following better understood transition. In one hand I hold a clear glass jar containing the gas oxygen. In my other hand I hold a jar of hydrogen gas. I study the chemistry of these two gases and discover that, under the correct conditions, they can combine to make water, H_2O . Water neither looks nor acts like oxygen and hydrogen, but it is made up of them. When we drink water, we are drinking hydrogen and oxygen in a very special combination. In parallel, we humans and all the matter we see about us may not look like the condensed energy of the big-bang creation, but we are. Einstein's famous equation does not mean that the energy disappears and matter takes its place. No, not at all. What that equation states is that energy can change form and take on the characteristics of matter, just as the hydrogen and oxygen remain hydrogen and oxygen even as they change form when they combine to form water. We are made of the light creation, and no scientist will argue against this. It's not New Age talk or wishful

thinking. It's established scientific reality. We, our bodies, were part of the creation.

Our cosmic genesis began billions of years ago in our perspective of time, first as beams of energy, then as the heavier elements fashioned within stars and supernovae from the primordial hydrogen and helium, next as stardust remnants expelled in the bursts of supernovae, and finally reaching home as rocks and water and a few simple molecules that became alive on the once molten earth. We were not observers to this fantastic flow toward life. We were part of it. And unlike the formerly accepted catechism that billions of years passed between the formation of the earth and the origin of life on earth, billions of years during which random reactions in fertile pools of water brimming with energy were theorized to have allowed life to evolve, the discoveries in the 1970s by Elso Barghoorn of Harvard University demonstrated that life began as early as can be geologically recorded. The oldest rocks that can bear fossils, that is sedimentary rocks, already have fossils of microbes, some caught in the act of mitosis, cell division. By the time that the earliest layers of sedimentary rock appeared on earth, nature had already invented life with its ability to survive and reproduce, to store and decipher information. DNA, with its potential to condense a vast molecular library of information within microns of space, was in place and operating. This extraordinary feat of invention and fabrication is recoded in those ancient sediments.

On the primordial, prebiotic earth, there were likely vast numbers of molecules forming and disintegrating. One of them succeeded in climbing the ladder of complexity and became alive. And most wondrous of all, tucked within that fecund molecule that eventually led to the first life, following a myriad of unimagined mutations, was the ability to reproduce. Not only to reproduce, but to do so with some variations in structure. Identi-

cal reproduction, a “copying machine,” yields stasis. What was needed and what nature produced was a molecule that could reproduce and change, somehow borrowing resources from its immediate environment, until it became a cell. But reproduction is purpose driven, the continuation of the line. That prebiotic molecule, whether by design or by dumb luck, had purpose within it from its inception.

Logically, the first compound that would eventually lead to the earliest life must have had the ability to reproduce. If it did not, then as its molecular machinery degraded, it would have disintegrated. Any beneficial mutations that might have accumulated during its span of existence would have been lost and the trek toward cellular life would then have had to begin again, *de novo*. Life appeared with purpose already as part of its birthright. This simple undisputed fact is extraordinary.

Even the so-called simpler forms of life, such as microbes, are overwhelmingly complex. The mechanisms of cellular function when studied in detail are not only mind-boggling. They are essentially identical in all forms of life, whether animal, plant, bacterial, or fungal. The likelihood that this complexity could have been chanced upon even once is vanishingly small. Having it arise independently twice by chance is essentially an impossibility. All life must have had a single common origin. But what was that origin?

Could that miraculous flow from inanimate matter to the incredible intricacy of life have been the result of purely random events? Is the incredible not necessarily the impossible?

One answer to the origin-of-life puzzle was spontaneous generation. After all, meat left out, after a very short time, was crawling with maggots. Clearly that was spontaneous generation—the meat gave rise to life. Such was the general opinion until 1860, when Louis Pasteur in a brilliant set of experiments demon-

strated that it was flies' eggs, not the meat, that produced the worms. Pasteur had laid to rest the idea of life's spontaneous generation. But Pasteur's discovery only made the puzzle more puzzling. If not spontaneous generation, then what was the source of life? How did the prebiotic inorganic matter become alive?

In 1828, the German chemist Friedrich Wöhler produced what in a sense is considered to be an organic molecule from inorganic substrates according to the laws of chemistry and physics. Inducing a reaction of cyanic acid with ammonia, two inorganic compounds, Wöhler synthesized urea, a substance that until then was associated only with living organisms. Wöhler had demonstrated that the inorganic could undeniably become organic. Of course, urea, though organic, is remote from being alive.

Then in 1953, Stanley Miller, a graduate student at the University of Chicago, produced amino acids in a series of reactions that, like those of Wöhler, started with inorganic compounds. In Miller's experiment, the starting mixture contained those compounds that were assumed to be in the atmosphere and hydrosphere of the prebiotic earth.⁴ The discovery by Miller that unguided reactions could yield amino acids was nothing less than sensational. Amino acids are the building blocks of proteins, and proteins are the basic structures of life. Stanley Miller had discovered the key to the origin of life, pure and simple random reactions. Unfortunately, the hoopla was premature. Miller's assumptions that the compounds he used were abundant on the prebiotic earth approximately four billion years ago turned out to be largely false. Furthermore, the reaction and the multitude of experimental variations on that theme never proceeded beyond producing a very few amino acids. The experiment is today considered to be irrelevant with regard to life's origins.⁵

So from where did our primordial ancestors arise? Theories of Darwinian or neo-Darwinian evolution all begin at the stage in

which self-replicating organisms are present and abundant. How to get to those bits of replicating life was and is an enigma.

With the discovery in the 1990s that a compound fundamental to all genetic codes, RNA (ribonucleic acid), could perform biochemical functions previously assumed only privy to far more complex proteins (enzymes), the concept of an “RNA world” materialized. RNA, like DNA (deoxyribonucleic acid), is a chain of nucleotides. DNA is double-stranded; most forms of RNA are single-stranded. The presence of hydroxyl groups in RNA makes it prone to hydrolysis and hence far less stable than DNA. This instability notwithstanding, the theory is that before there was DNA there was RNA, and before RNA there were inorganic compounds that via random reactions combined to achieve self-replication with moderate mutations. Then generation followed generation and finally, behold, we have the RNA. There are no data that substantiate this evolutionary theory or how it would evolve into a “DNA world” of which we are a part and to which we owe our existence. Not only is RNA unstable, but also the components required to fabricate RNA are themselves not chemically stable. There is no clue as to how these unstable substrates could have survived and combined to produce the much sought after RNA.

As Robley D. Evans, my M.I.T. Ph.D. adviser and professor of physics par excellence, repeatedly urged, always repeat in summary what you have just espoused. Consider the string of assumptions for which supporting data, if any, are vanishingly scant in an unguided world:

1. A prebiotic atmosphere and hydrosphere existed that could support the reactions among methane, ammonia, carbon dioxide, a few amino acids, and water leading to the complex substrates of RNA. Current understanding

of the prebiotic atmosphere appears to make it hostile to such reactions.

2. The assumed substrates, though diverse in properties and chemically unstable, assembled locally so that they could interact.
3. These substrates combined to form chains of polynucleotides.
4. These polynucleotides became self-replicating molecules able to cull from the adjacent medium (perhaps a slime-like inorganic soup gradually drying in an isolated puddle) the necessary components to rebuild themselves, though of course with slight variations—mutations—that allowed evolution to progress from prebiotic to life.
5. Finally a cell appeared complete with gated membrane to regulate entrance and egress, housing DNA that codes via its four nucleotides for the RNA found much earlier in this process.

Each of these stages presents chemical and physical hurdles for which there are no logical solutions. And yet we have life.

It is time to lay to rest the misguided but popularly believed untruth that in our world, gradual, step-by-step random mutations could have climbed the mountain of improbability and produced the magnificent abundance of the earth's biosphere. To accomplish this goal requires a modicum of elementary arithmetic, some basic high-school-level biology, and a touch of astronomy. But it is worth the effort to bury once and for all the ill-conceived but often unquestioned assumption that random mutations produced life or anything even tenuously related to life.

Stephen Hawking, in his *A Brief History of Time*, the most widely sold science book ever written, teaches the world about the potential power of random events to produce meaningful complex order, such as is found in a work of literature. “It is a bit like the well-known hordes of monkeys hammering away on typewriters. Most of what they write will be garbage, but very occasionally by pure chance they will type out one of Shakespeare’s sonnets.”⁶ It is a compelling premise, but totally off base at least within our universe, and it is life in our universe with which we are concerned. I am surprised that Professor Hawking would have let this slip occur. Nonetheless, it convinced one of the world’s leading literary magazines, *The New Yorker*, to devote its Christmas and New Year’s cover of 2002 to showing monkeys hammering away on typewriters. As Hawking predicted, most failed to get the sonnet. But, behold, there in the lower right-hand corner is a very happy monkey. He got the sonnet.

I don’t know many sonnets. In fact, when I thought about this, I only knew the opening line of one, “Shall I compare thee to a summer’s day.” There are not quite five hundred letters in that sonnet. All Shakespeare’s sonnets are about the same length, all by definition fourteen lines long. Can we get a sonnet by chance? If Hawking says so, it must be true.

But is it? Let’s consider 500 grab bags each holding the 26 letters of the English alphabet. I reach into the bag blindfolded and pull out a letter. The likelihood that it will be *s* for the first letter of the sonnet is one chance in 26. The likelihood that in the initial two draws from the first two bags I will get an *s* and then an *h* is one chance in 26 times 26. And so on for the 500 letters. Neglecting spaces between the words, the chance of getting entire sonnet by chance is 26 multiplied by itself 500 times. That seems as if it may be a fairly big number. And it is. Surprisingly so. That number comes out to be a one with 700 zeroes after it. In

conventional math terms, it is 10^{700} , or 10 to the exponent power of 700. To give a sense of scale for reference, the known universe, including all forms of matter and energy, weighs on the order of 10^{56} grams; the number of basic particles (protons, neutrons, electrons, muons) in the known universe is 10^{80} ; the age of the universe from our perspective of time, 10^{18} seconds. Convert all the universe into microcomputers each weighing a billionth of a gram and run each of those computers billions of times a second nonstop from the beginning of time, and we still will need greater than 10^{500} universes, or that much more time for even a remote probability of getting a sonnet, any meaningful sonnet. Chance does not produce intelligible text and certainly not a sonnet, not in our universe.

But so convincing is Hawking's argument that the students at Plymouth University in Britain convinced the National Arts Council to put up £2,000 (about \$4,000 U.S.) to try the monkeys' typing skill. With that stipend they rented a monkey house at the Paignton Zoo in Devon and placed a computer keyboard inside. The *Times* (May 9, 2003) reported on the results under the headline, "Much Ado, but Monkeys Fail Shakespeare Test." For a month, six monkeys hammered away on the keyboard. They failed to produce a single English word. Surprised, since the shortest word in the English language is one letter long? Surely the monkeys must have hit an *a* or an *I* in all their efforts. But think about it. To make the word *a*, a space on each side of the letter is required. That means typing: space, *a*, space. If there are about 100 keys on the computer keyboard, neglecting the fact that the space bar is somewhat larger than the letter keys, the probability of typing space, *a*, space is one chance in a 100 times 100 times 100, which comes out to be one chance in a million. Random guessing in a spelling bee is always a losing proposition. And that is for a single-letter word.

So why does the monkey premise make the cover of one of the world's leading intellectual publications? The reason is distressingly simple. If you are fed from your earliest days the saga that unguided random reactions produced life, then arguing from the major to the minor, certainly you'll believe the untruth that sonnets will come popping out of your random letter generator.

A proverb that *is* actually true and worthy of repeating states: the song a sparrow learns in its youth is its song for life. And we humans, at our deepest emotional level, are not so very different. What we learn in our youth is with us for life. And we all learned that Darwin got it all right, notwithstanding that the article "Did Darwin Get It All Right?" in the world's premier peer-reviewed science journal, *Science*, maintains in the subtitle that unfortunately he did not.⁷

And yet here we are on a beautiful earth brimming with life. From the scorching, more than 100-degree C waters of thermal vents to the frigidity of the Antarctic ice, from sun-soaked Saharan deserts to the blackness of the abyssal oceanic depths, life has staked out its habitat. Life is hearty. It has proven itself to be so. But by random reactions it did not start.

There is a way that the monkeys might produce the grandeur of a sonnet and a random nature yield the wonder of life. But it takes a leap of faith with only the vaguest of foundations upon which to base that leap. And that is the thought that the visible universe is only one of a multitude of universes. In a vast number of universes, say 10^{500} , each trying to produce life, one might have succeeded. In that huge number of universes, we would be in the one that succeeded, while the others would likely be lifeless. Either our universe is a tiny domain, a blip, within an infinitely large universe, or there are a vast number, perhaps an infinite number (if one can combine "infinite" and "number" in the same context), of totally separate universes. With either scenario, each domain

or universe has its own set of natural laws. Some sets are similar to our laws of nature, some are totally, even incomprehensibly, different, so different that concepts of time, space, and matter do not even apply. In their place, those unknown universes would be built of dimensions such as igildy, oguldy, uguldy, words that to us are totally meaningless for dimensions we cannot even imagine. Nor could inhabitants of those alien universes, if there are inhabitants, imagine concepts such time, space, and matter.

Sounds far-fetched, but not so. In a valiant attempt to deny the possibility that there might be in our universe any hint of deliberate design or teleology, the May 2003 issue of *Scientific American* devoted its cover to preaching that “Infinite Earths in Parallel Universes Really Exist.” No questions asked. They really exist. Several options are presented for how these parallel domains might arise. And the evidence is quite convincing—at least to the author and the journal’s editors.

And here is the piece of truth they bring to prove their point. And the following is not buried in the twelve pages of text devoted to this treatise. Rather, so persuasive is the logic that it is highlighted with extensive graphics. It begins in bold red type on a black background and then switches to white type on a black background:

Evidence: COSMOLOGISTS INFER the presence of Level Two parallel universes by scrutinizing the properties of our universe. These properties, including the strength of the forces of nature and the number of observable space and time dimensions [three spatial dimensions and one time dimension] were established by random processes during the birth of our universe. Yet they have exactly the values that sustain life. That suggests the existence of other universes with other values.⁸

As a scientist, I am embarrassed that such logic can make its way into a widely read scientific journal. Note the convoluted line of reasoning. Our universe has laws of nature made for life. The physical constants that regulate the laws of nature and the behavior of matter are perfect for sustaining life. Such perfection of such a wide variety of laws is vastly unlikely to have arisen by chance on a single throw of the cosmic dice. Therefore there must be a nearly infinite number of universes, each with its own unique set of laws of “nature.” Most universes failed to sustain life. Their own individual unique laws of nature are incompatible with complex sentient life. We’re the universe that succeeded. All the other options, many lifeless, exist “somewhere” out “there.”

Of course the perfection of nature’s laws for sustaining life in our universe in no way suggests the existence of other less life-friendly universes. The perfection of our universe’s laws of nature is a fact. What it implies is that this perfection is so highly improbable that some explanation other than a simple onetime random event is required. If we are the only universe, then *Scientific American* has inferred that we are indeed living in a designer universe. The Bible claims that the explanation for this perfection is the will of God.

The backpedaling that slips so subtly into the article is instructive. On the journal cover we are told that these “infinite earths in parallel universes really exist.” In the text we learn that perhaps they exist. Their being is “inferred.”

Of course there is a simpler option than a nearly infinite array of sterile universes. That option is that we are the only universe and we did not arise by chance. We were designed. But that of course is not acceptable logic in a materialist view of existence. However the author of the less than profound logic upon which that scientific article is based has something good going for him. And that is you can never see out of the universe within which

you reside. You can never directly contact the other universes, so you can never ever check out the proof of your theory. It's a massive leap of faith that makes the Bible's scenario seem timidly conservative by comparison. We will look at this more closely in the next chapter.

Either way, Bible or multiuniverses, at the end of the day we are still mired in the ultimate of conundrums: Why is there a universe, or even a multitude of universes, to host beings who ask these questions? Why is there something rather than nothing? Why does existence exist?

Statistics reveal the numerical paucity for randomness being the source of the stable order evidenced in life. The Torah brings the same information in the subtle wording of "And there was evening and there was morning," the closing phrase of each of the six days of the first week in Genesis. But the sun is mentioned only on day four (though the ancient commentaries tell us that the sun was there earlier, but only became visible in the sky on the fourth day). Evening means sunset. Morning means sunrise. No sun, no sunset and no sunrise. So how can the Bible justify the statement that "there was evening and there was morning" on those days prior to the sun's mention on day four?

Almost a millennium ago, the biblical commentator Nahmanides realized that there must be a deeper meaning to the words "evening" and "morning." He taught that the root or implied meaning of the Hebrew word usually translated "evening," *erev*, is "mixture," "chaos." As the sun sets, he reasoned, vision becomes blurry, mixed. The implied meaning of the word usually translated "morning," *boker*,⁹ is just the opposite. As the sun rises, vision becomes clear, orderly. Individual objects and colors can be discerned. The implied meaning of *boker* has within it the concept of order. The flow in simple terms is from P.M. to A.M. But the deeper meaning, the far more significant truth, is that six times

over, at the conclusion of each day of creation, there was a remarkable flow contrary to what is normally observed in an unguided nature. Normally, in all events, order degrades to disorder. That is why leaves decay on the ground and a cup of hot tea becomes cool as it remains on a table. But in this particular part of the universe, the opposite occurred, and the Torah emphasizes this six times over in the subtle language “And there was evening and there was morning.” The ordered complexity of life arose from a mix of rocks and water and a few simple molecules, and even more remotely, from the chaotic burst of energy that marked the big-bang creation, an energy brimming with potential, only awaiting the organizing realization at the word of God: “And God said, let there be . . .” In this part of the universe chaos gave way to life.

But what about life’s origins? A universe with laws of nature excellent for sustaining life may not have laws of nature amenable to the inception of life. The starting of life likely has vastly different physical and chemical requirements than those needed to sustain that life following its inauguration. Can random mutations in our universe actually have produced the ordered complexity of life or even a viable protein that is so well designed for sustaining life?

But let’s be more conservative in our quest and accept that somehow life started and now we need that early form of life to mutate and climb step by step the fabled mountain of improbability. Mutations that are to be passed on to the next generation must occur in the genetic material, that is, in the DNA of the reproductive line. Such a mutation might result in a variant (mutated) protein that might produce a new effective organ, say, a system leading to a kidney or the precursor of a pump that might develop into a heart. The neo-Darwinian concept of evolution claims the development of life resulted from random mutations in the DNA that yielded these varied organic structures. Some of

the variations were beneficial, some not. The rigors of the environment selected for the beneficial changes and eliminated those that were detrimental.

It's a persuasively devised theory, but let's look at that process rigorously, especially with the insights of molecular biology. The building blocks of all life are proteins. And proteins are precisely organized strings of amino acids. Information held in the DNA determines which and in what order the amino acids are formed to yield the end product, the protein. If the DNA mutates, we get a different amino acid and hence a different protein. And now comes the problem of random mutations in the neo-Darwinian theory of evolution.

The genetic system of all life is totally coded. An example of a code would be the Morse code sounds "dot dot dot dash," which look, sound, or seem nothing like the letter *v* for which they are code. If you didn't know that the sequence of sounds "dot dot dot dash" represents a *v*, you wouldn't have even a hint as to its meaning. That is one purpose of a code. And so it is with the information encoded on the DNA chromosomes. The data on the strands of DNA (the chromosomes) in our cells contain that crucial amino acid and protein-building information as assorted groupings of four different nucleic acids. Nucleic acids have absolutely zero physical resemblance to either amino acids or proteins. The information is totally coded.

In nature, this lack of similarity between code and final product ensures that there is no logical feedback from protein or amino acid to DNA. Information flow is one-way: DNA to amino acid to protein. New mutant variations of proteins arise through mutations (changes) in the sequencing order of the nucleic acids on the DNA with no physical hint of the final protein product. These random, unguided mutations are the determining factors in gain or loss of that next generation.

In all known life, there are primarily twenty different amino acids. Stringing these twenty amino acids together in varied sequences produces varied proteins, just as intelligently stringing together the twenty-six letters of the English alphabet in varied sequences will produce varied sentences and sonnets. Scientific literature suggests that all of life is made from varied combinations of several hundred thousand proteins. Humans have in the order of eighty thousand proteins. (The estimated number of proteins in humans varies among laboratories reporting their results.) Other forms of life have different numbers of proteins. But all life, whether animal, vegetable, microbial, or fungal, draws from the same “bag” of functional proteins. That being the case, it is not surprising that we humans contain some of the same proteins found in plants and animals that are very different from us. Proteins, other than those within the cluster of those used by viable life, form by mutations on the DNA sequencing of nucleic acids. Cells actually have a highly sophisticated mechanism that checks for mutations early in the molecular progression that leads to protein formation. Upon discovery of a mutation, the molecule is either sent back for revamping or destroyed. But some mutations slip by the checkpoint. These may be either useful, neutral (adding no selective advantage for survival), or lethal. A painful example of a mutation leading to a lethal protein would be a mutation that becomes a precursor for cancer.

So we have these few hundred thousand proteins that are viable in life. Others appear not to be. But let’s say we are off in our estimate. In place of a few hundred thousand viable proteins, let there be 100 million or a billion or even a trillion viable proteins. And now to the crucial numbers.

An excellent review article published in the *Proceedings of the National Academy of Science* compared the rates of point muta-

tions in the genomes of forty mammal pairs with separations ranging from 5.5 to 100 million years ago.¹⁰ The observed rates of mutation were quite similar among all the animal pairs, averaging at 2.2×10^{-9} mutations per base pair per year. This rate relates to point mutations, that is, alterations in the sequencing of the individual nucleic acids along the chromosomes of the DNA and not to sequence repetitions in which long strings of nucleic acids are replicated on the DNA. At this rate, the difference between humans and our closest genetic relative, the chimpanzee, would be approximately 30 million nucleic acids (base pair) differences, a number very similar to what is biologically measured.

Let me be transparent. I am not debating how a fin could mutate and eventually become a foot. Fins and feet have many structural elements, especially bones, in common. With a stretch of imagination, we can envision a series of changes, such as sequence repetitions, that would morph a fin into a foot. But how do random mutations initially produce the genetic information that would lead to the molecular structure of any sort of bone? Or muscles that eventually become the pumps that are prelude to a heart?

Strings of proteins vary in length from a few hundred to a few thousand amino acids. Consider a relatively short protein, such as one 200 amino acids long. Into each of the 200 spaces along the protein any one of the 20 amino acids found in life can fall. That means the total number of possible combinations is 20 times 20 times 20 repeated 200 times. The result is 20 to the power of 200, or ten to the power of 260 (10^{260}), a one with 260 zeros after it, or a billion billion billion repeated 29 times. From this vast biological grab bag of options, we are told that nature, by random chance mutations, has been able to form the few hundred thousand proteins useful to earthly life and upon which nature could exert its selective pressures.

Let us assume that the entire hydrosphere, all of the approximately 1.4×10^{21} liters of water in all the oceans and icebergs and lakes on earth, was imbibed in biological cells each weighing a billionth of a gram. We would have had 10^{33} cells reproducing, mutating, actively moving this grand process of evolution. If each cell divided each and every second since the appearance of liquid water on earth some four billion years ago, the total number of mutations, or stated another way, the number of evolutionary trials, would be 10^{50} . Although vast, this number pales when compared with the 10^{260} potential failing options for a single protein. Hitting upon the useful combinations did not, and could not, and will not happen by chance.

All biologists enamored with neo-Darwinian evolution know this truth. Their hopeful reply goes along the line that, although we now have a DNA world, other worlds may have been possible, and DNA, being the first to form and survive, merely took over. Other systems might have used other types of proteins that we see as lethal or useless in today's DNA world. There is no evidence that this is true; however, let us assume its truth. Now we have the DNA-dominated world we know. And so we are back to the above calculations as the first form of life, a microbe, mutates and either advances or perishes as it starts to climb the mountain of improbability by random mutations on the DNA that in time will lead to kidneys, bones, liver, heart, eyes, brains, mind, sentience. It has to choose randomly from the vast hyperspace of possible biological combinations the tiny fraction that are beneficial or at least neutral. Clearly there must be other factors that limit the types of mutations that can occur. There are, but not as randomly as materialist biologists would have it. And that is the entire point. Nature is skewed toward life.

And that is exactly what one of the most widely used biology textbooks, *Biochemistry*, by D. Voet and J. Voet, states, though in

subtle wording: “Keep in mind that only a small fraction of the myriads of possible peptide sequences are likely to have stable conformation. Evolution has, of course, selected such sequences for use in biological systems.”¹¹ Just how did “evolution” become so clever that it could “of course select” from the “myriads” of failures the few that function?

Jon Seger, professor of biology at the University of Utah, tells us how, of course following the central dogma of Darwinian adherents and neglecting the statistical improbability of its being driven by random mutations:

Within a population, each individual mutation is extremely rare. . . . But huge numbers of mutations may occur every generation in the species as a whole. [That is because each member of the population may only have a few mutations, but when multiplied by the total number of mating members, the total number of mutations per generation can be very large.] . . . The vast majority of the mutations are harmless or at least tolerable and a very few are actually helpful. These enter the population as exceedingly rare alternative versions of the genes in which they occur. . . . Very small effects on survival and reproduction may significantly affect the long-term rates at which different mutations accumulate in particular genes. They just accumulate where needed, first one, then another and another over many generations. Although getting two or more new cooperating mutations together in the same genome may take time, they will eventually find one another in a sexual species [and since by getting together they provide an advantage over the former configuration, the organism with this new advantage will now flourish relative to the less adapted neighbor], assuming they are not lost from the population.¹²

All that Professor Seger writes is largely true. Indeed “the vast majority of the mutations are harmless or at least tolerable,” though many may be lethal. But even if none were lethal, the problem is not the ultimate “natural selection” according to the rigors of the natural environment, selection between good and better, strong and stronger, more fertile and less fertile. Those selections are at the final stage of the process. And we see it verified each time as a strong lion vanquishes or kills a weaker competitor for the right to fertilize the females of the pride. But first nature must produce those variations of advantage via random mutations of the nucleic acids on the genome that change the chain of amino acids that form the protein that alters the viability of the “animal.”

The statistically unrealistic possibility that the fabrication of viable proteins could have occurred by unguided random mutations is simply ignored. That life developed from the simple to the complex is, in my opinion, a certainty. What drove that development is the central debate.

Simon Conway Morris is professor of evolutionary paleobiology at Cambridge University, as mentioned, and Fellow of the Royal Society of England. He is arguably the world’s leading living paleontologist. In his book *Life’s Solutions*, Conway Morris states the conundrum perfectly: “The number of potential ‘blind alleys’ is so enormous that in principle all the time since the beginning of the universe would be insufficient to find the one in a trillion trillion solutions that actually work. . . . Life is simply too complex to be assembled on any believable time scale. . . . Evolution [has the] uncanny ability to find the shortcuts across the multidimensional hyperspace of biological reality.”¹³

Conway Morris, as with most scientists active in the field of developmental biology, accepts the quite firmly established principle that life developed from the simple to the complex. The query

with which he deals in his book, and with which we struggle here, is a search for the mechanism behind the flow that has produced the magnificent biosphere of which our bodies are a part.

As such, Conway Morris opens his book with a disclaimer: “If you happen to be a ‘creation scientist’ (or something of that kind) and have read this far, may I politely suggest that you put this book back on the shelf. It will do you no good. Evolution is true, it happens, it is the way the world is, and we too are one of its products. This does not mean that evolution does not have metaphysical implications; I remain convinced that this is the case.”¹⁴ Morris uses the word “evolution” in the European sense, allowing for the “metaphysical” to have been active in the orchestration of the process. Evolution in the American sense, however, insists that the mechanism that drove life’s development was totally random mutations on the genome that were then selected for or against by the ability of the mutant organism to survive the trials of nature. In American-ese evolution and “metaphysical implications” are mutually exclusive. Conway Morris is by far not the only accomplished scientist who realizes that there is plan inherent in the development of life.

The late George Wald, Noble laureate and professor of biology at Harvard University, may have provided us with the answer to the wonder of life in an essay he wrote titled “Life and Mind in the Universe” for the 1984 Quantum Biology Symposium:

It has occurred to me lately—I must confess with some shock at first to my scientific sensibilities—that both questions [the origin of consciousness in humans and of life from nonliving matter] might be brought into some degree of congruence. This is with the assumption that mind, rather than emerging as a late outgrowth in the evolution of life, has existed always as the matrix, the source and condition of

physical reality—the stuff of which physical reality is composed is mind-stuff. It is mind that has composed a physical universe that breeds life and so eventually evolves creatures that know and create: science-, art-, and technology-making animals. In them the universe begins to know itself.¹⁵

This almost mystical analysis of life is from the same George Wald who thirty years earlier in an article in *Scientific American* declared with no equivocation that life is indebted totally to pure random chance for its existence: “The important point is that since the origin of life belongs in the category of at-least-once phenomena, time is on its side. However improbable we regard this event, or any of the steps which it involves, given enough time it will almost certainly happen. . . . Time is in fact the hero of the plot.”¹⁶ Interestingly, twenty-five years after its publication, *Scientific American* retracted that article unequivocally stating: “Although stimulating, this article probably represents one of the very few times in his professional life when Wald has been wrong.” The retraction stated “that merely to create a single bacterium would require more time than the universe might ever see if chance combinations of its molecules were the only driving force.”¹⁷

Macromolecules have been found to possess the amazing ability to “self-assemble.” This ability is built into the structure of the universe. Wald’s epiphany occurred when, in conducting the research by which he earned the Nobel Prize, he elucidated a portion of the mind-boggling complexity in the series of reactions at the eye’s retina that allows the picture in the mind to remake itself ten or fifteen times a second. At the quantum level it appeared that mind, intelligence, was somehow embedded in the process.

Equally brilliant Steven Weinberg did not have a similar epiphany when delving into the physics that might lie behind

the creation of a universe suitable for life or complexity in any form. Creation physics always leaves the opportunity for diverse explanations of beginnings: quantum fluctuations, multiple universes, an eternal megauniverse within which we are but a blip as a microuniverse. And even then “at the end of the day,” atheist Weinberg acknowledges that the ultimate question remains. Why is there anything rather than nothing?

This is science, not theology, speaking. But it is also theology. “In the beginning was the *logos* [*logos* is the Greek word for ‘logic,’ ‘intellect,’ ‘word’]” (John 1:1). A few hundred years before John, “With the word of God the heavens were made” (Ps. 33:6). And a few hundred years before that, we find the opening sentence of the Bible, Genesis 1:1. The traditional translation of that crucial verse is “In the beginning God created the heavens and the earth.” That is the traditional reading, but as Frank Lloyd Wright so pithily pointed out in his seminal book *The Natural House*, tradition can be an enemy. A more accurate rendering of the verse is “With a first cause (*B’raisheet*) God created the heavens and the earth.” “In the beginning” is the mistranslation of the first word of the Bible, the Hebrew word *B’raisheet*. The error was introduced by the Septuagint twenty-two hundred years ago and then carried through to the Latin Vulgate and finally the King James and other English translations.

B’raisheet in its simple sense translates as “In the beginning of.” But there is no object in the Hebrew text for the preposition “of.” It would read, “In the beginning of God created the heavens and the earth.” In the beginning of what? So the Greek and the Latin merely deleted the “of,” which of course is ridiculous and borders on the heretical, as if these ancient translators felt they could better state the facts than did the Bible. The compound nature of *B’raisheet* holds the clue. Several years ago a skeptical student challenged me on this, claiming that if indeed the *B*

Concisely stated, the wisdom of God embedded in the energy of the big-bang creation laid the basis for that seemingly inert energy to metamorphose and become alive. And not merely alive, but even more than that—to become alive and brimming with the sentient awareness of being alive. As Professor Wald stated so well: “It is mind that has composed a physical universe that breeds life and so eventually evolves creatures that know and create: science-, art-, and technology-making animals. In them the universe begins to know itself.”

Within every piece and aspect of the world, there lurks at its foundation the essence of wisdom, or mind, an emanation of the Force that brought it into being. As bizarre as it may seem, we will discover that the world in a very real sense has a “mind of its own”!

To understand how that dynamic Force manifests Itself in the ever changing world It created, we turn to the only two sources of relevant information: nature, that is, the world around us, and the Bible. Both provide a confirmation that God’s essence is as vibrant as the world itself. In this sense the study of nature is as much a study of God as is the study of the Bible. The eighteenth-century theologian known as the Scholar, or Gaon, of Vilna taught that when the Torah was given on Sinai, it split into portions. Only one portion was retained as the written words of the Bible. The other portion was hidden in nature. And only when we finally discover that part of Torah that was sequestered in nature will we be able to fully understand the word of God.

Psalm 19:1 declares: “The heavens proclaim the glory of God; the sky declares His handiwork.” As a person who has worked in the sciences most of my life, in both physics and the earth and life sciences, I could not agree more fully. The hand of God reveals itself in the grandeur of galactic space as well as in the details of an atom. In both realms, though they differ vastly in dimen-

sion, we can learn how God acts within this world It created. As nature provides the background for the biblical writings, so the earth provides the substrate for the miracle of life. In the next chapter we will study a few aspects of the earth that make it such a friendly place for life.