CHAPTER 3

A BIGGER PICTURE

I cannot imagine a God who rewards and punishes the object of Its creation, whose purposes are modeled after our own—a God, in short, who is but a reflection of human frailty.

from Albert Einstein's obituary,
N.Y. Times, April 19,1955

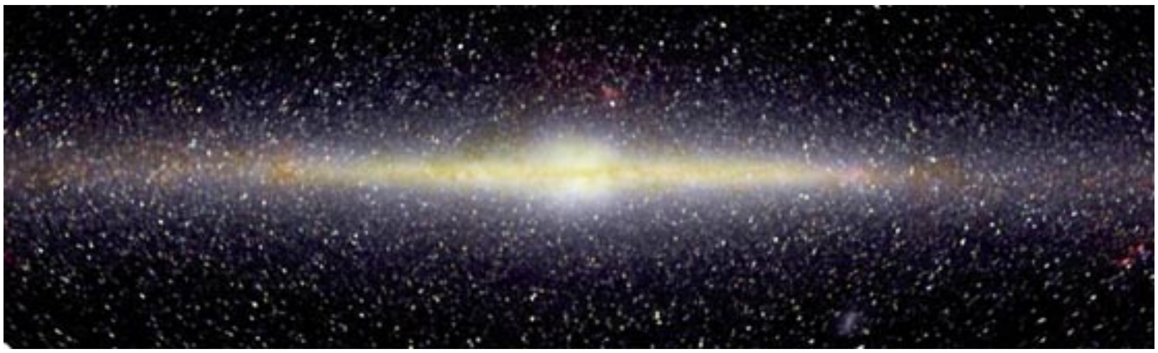
My first trip to Europe was a delight for many reasons, but it held an additional, unexpected treat that wasn't on my itinerary. As my Rome-bound flight cruised at 35,000 feet through crystal clear skies over the Atlantic, I looked out my window at the horizon and was surprised to see *the earth's curvature*. It was ever so slight, but it was there . . . and it really surprised me.

Why? Because by extending the curve in my mind's eye, I could *feel* the enormity of the great circle that bounds our planet. In a very first-hand, personal way, I realized what most people only know intellectually: that in comparison to the six-foot high creatures that strut upon its surface, the earth is big.

After some time, my mind switched gears and I began to look at the situation from a whole new perspective. As amazing as the earth is, what with life practically screaming its presence out into the universe, the earth really is only a middling size planet, one of nine (now eight with Pluto’s demotion) relatively minuscule chunks of *stuff* that orbit our star, the Sun.

Now the sun, that’s big!

. . . sort of. It would take 110 earths to span the Sun's diameter, requiring over 700,000 earths to fill it. Yet as stars go, *it* isn't all that spectacular. For instance, the constellation Orion (the Warrior) has in its left shoulder a star named Betelgeuse. Betelgeuse is a red super-giant whose diameter varies over a three-year period from *400* to *600* times that of our sun. That means that if Betelgeuse were at the center of our solar system, we'd be inside it. It's tough to believe, but our sun is really a pretty tiny star, just one of the approximately *two to four hundred-billion* (200,000,000,000 to 400,000.000.000) or so that reside within our galaxy, the Milky Way.



Now the Milky Way, that is big. It takes light traveling at 186,000 miles *per second* approximately 110,000 years to go from one side of the Milky Way to the other. But how *special* is it?

Well, . . . it isn't. The Milky Way is a normal size galaxy, just one in the *two-hundred billion to a TRILLION* galaxies that are in range of the Mt. Palomar telescope.[1]

I do believe human life—all life for that matter—is wondrous, but as I hurtled toward my European adventure I came to an unwitting conclusion: What we're really talking about when we discuss *mankind in relationship to the cosmos* is an itsy bitsy, six-foot tall creature that is scampering around on an absolutely *minuscule bit of nothing* (the earth) that orbits a so-so size star (the Sun) that is one of *approximately 250,000,000,000 stars* in a galaxy that is one of upwards of *1,000,000,000,000 galaxies*.

Having made those observations:

—Does it make sense to expect a Creator with the wherewithal to generate such a minutely complex, yet monumentally immense structure as a universe to pick the highly imperfect residents of one tiny planet to be the pinnacle of Its creation?

—Would you expect a Being of such depth to be so shortsighted and wasteful as to arbitrarily choose *a tiny subset* of its creation on that planet to be "saved," warts and

1 The Palomar telescope uses a 200-inch, seventeen foot reflecting mirror and can pick up the light of a single candle at ten thousand miles. Scientists used it to count the number of galaxies that reside in sections of the sky, then extrapolated to get a number for the whole celestial sphere.

all, while mysteriously condemning the rest to suffer hellfire and damnation? In fact, would you expect a Consciousness on that level to be so ill tempered and impatient as to damn *any* of Its creation for improprieties enacted during one, short, often difficult life-time?

—Can you envision such a Being as being impotent in the face of what we humans rather pathetically call evil?

—Would you expect It to be swayed by prayers that amount to special favors for personal gain?

—And above all, does it make sense that such a Being would go to the trouble of creating a universe like ours *without a damn good reason*?

It is hard to imagine any Being with the juice to generate the 200,000,000,000,000,000,000,000 plus stars that apparently exist within the universe to act in any of the above-mentioned ways, yet many people so believe.

What's more, it is not at all uncommon for humans to intellectually acknowledge a God that is *just* and *all powerful* (assuming one believes in God at all) while *emotionally* approaching that Being the same way primitive societies treated their tribal deities. God is something we pray to for help when we need it; we try to make deals with God when we want something that seems out of our reach; we even demand that God forgive us our sins and grant us eternal salvation regardless of whether we deserve it, all the while expecting It to smite those who sin against us.

In short, people's beliefs about God often carry so much confusion and emotional baggage, at least in the face of the immensity of creation, that it is no wonder so many young people have turned away from the old beliefs and taken up instead the banner of atheism.[2]

[2] After reading the *first* version of this section, a friend of mine left the following note in the margin: "At this point, some 30-40% (minimum) of your readership decides to use your book for heating fuel . . . I see your point, but I think your presentation may seem to many to be a bit too harsh and hard-hitting a criticism of Christianity." Please understand that this isn't aimed at Christianity (I thought I had been relatively generic in my discussion—he evidently didn't agree). Most major religions maintain that their followers are especially privileged in their relationship with the Creator; it isn't just Christians who believe themselves *the chosen*.

Still, up until now we've been talking about "God" as though "God" exists. The atheists in the crowd have been politely attentive, but all the while they have undoubtedly been thinking, "Yeah, but *does* God exist?" It's a good question . . .

To address it, the best place to start is . . . *in the Beginning*.

In the Beginning (the theme of the movie *2001* should swell appropriately here), as far as western science is concerned, there was *absolutely nothing*. What existed was a vacuum devoid of structure or time or even radiation (i.e., darkness throughout).

Except actually, we've already fudged a bit. There was *one* thing that did exist in the beginning. It was energy—the energy wrapped up in the primordial vacuum.

We don't have physics that explains the singularity that was the beginning, but knowing what we know about the universe as it stands now, we might take an educated guess about how things might have proceeded.

The first thing to note is that the energy density out in open space seems fairly evenly distributed, but down at the super, super microscopic level, it isn't. At that level, there were random, quantum mechanical upheavals[3] constantly happening. And according to the Heisenberg Uncertainty Principles, these upheavals can be freakishly large as long as they are spectacularly short-lived.

Shifting gears slightly, Einstein's Theory of Relativity maintains that mass and energy are two forms of the same thing. This has been substantiated in physics labs all over the world. Take pure energy of just the right amount, irradiate a vacuum with it and voila, you end up with a particle and its antiparticle. This is called *pair production*. The point is, you can start with nothing but energy and end up *creating matter*.[4]

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[3] Quantum Mechanics is the study of the dynamics of very small systems—systems at the sub-atomic level. Quantum Mechanical phenomenon is very peculiar. One of those peculiarities is that within extremely confined volumes, energy content at a point can fluctuate over a short time interval in ways it could never do in the macroscopic world.

[4] Note from 2019: As an interesting side point, this process goes the other way. Put, say, an electron and its anti-particle, a positron, together and you get what is called *annihilation*. The particles explode, but not like a normal explosion where the particles break into still smaller pieces—electrons are, after all, elementary particles, they aren't made *up* of smaller pieces.

After the explosion, there will be nothing physically left. The particles cease to exist, not because they have been blown to smithereens but because they have literally converted themselves from matter *into pure energy*.

New thought: Nature uses this mass/energy relationship in a very interesting way. Every second, the sun takes 657,000,000 tons of hydrogen and fuses it into 653,000,000 tons of helium. What happens to the

Bottom line: If you have energy and the right conditions, you have the possibility of creating matter. So going back to "the beginning," the theory holds that an unusually large, radical, quantum mechanical-type energy fluctuation occurred by freak chance—a trillion trillion trillion trillion (etc.) to one shot, to the energy of the primordial vacuum—at a super, super microscopic level. The energy content of the fluctuation was so great that it triggered the creation of a bit of matter. The presence of that matter warped the geometry of the region and, in turn, drew fantastic amounts of free energy to the point. That energy was converted to matter, drawing still more energy.

As a consequence of all of this, in a rapidly escalating reaction, all that would eventually become our physical universe came gushing forth in one nearly instantaneous, gigantic BIG BANG.

As described in a 1985 *Astronomy* magazine article entitled "In the Beginning . . . ":

> . . . So we are left with the remarkable possibility that, in the beginning, there existed nothing at all, and that nearly all of the matter and radiation we now see emerged from it. This process has been described by University of California physicist Frank Wilczyk: "The reason that there is something instead of nothing," he said, "is that 'nothing' is unstable." A ball sitting on the summit of a steep hill needs but the slightest tap to see it in motion. A random (energy) fluctuation in space is apparently all that was required to unleash the incredible latent energy of the vacuum, creating matter and energy and an expanding universe from quite literally nothing at all.

If the theory is correct, by 10^{-36} seconds after the Big Bang the then viewable universe was 10^{-29} centimeters across, all of the stuff inside today's event horizon (i.e., what we can see today) spanned a distance of 2 meters out from that point, and the universe's average temperature was ten billion-billion-billion degrees Kelvin.

By 10^{-10} seconds (one ten-billionth of a second) after the Big Bang, the viewable universe was 6 centimeters across and the stuff that would eventually become our

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4,000,000 tons that are lost in the fusion process? It is turned into pure energy—the energy that bathes our planet in the life-giving radiation that allows us to exist.

Original footnote: As I point out to my astronomy students, if you fused on gram of hydrogen into helium, you would lose .007 grams of matter to E=mc^2. That would liberate enough energy to boost 350 four-thousand pound Cadillacs a hundred miles into the atmosphere. Mass conversion through fusion generates a serious amount of energy!

modern-day universe was found inside a radius equal to the distance between the sun and Pluto. The temperature of the universe had fallen to around one million billion degrees Kelvin, and all of the subatomic particles (electrons, quarks, etc.) had come into existence.[5]

One second after the Big Bang, the universe we currently know had a radius of 200 Light Years and a temperature of ten billion degrees Kelvin.

At approximately *ten minutes* after the Big Bang, all of the nuclei that would ever exist had been formed. It took another 380,000 years for the universe to cool enough so that electrons could combine with those nuclei to form atoms (thereby allowing light to free-stream—before that, the universe was a fog of electrons and light couldn't travel very far unabated), and 200,000,000 years for first-generation stars were formed.

As of now, the universe has existed for 13.6 billion years, is 2.4 million billion billion miles in diameter (that is 2.4×10^{24} miles), is populated by third generation stars and has an average temperature of 3 degrees Kelvin.

Exactly how stars came into existence is a small point of contention within the scientific community, but generally the idea is simple. As the outward rushing atomic debris from the Big Bang cooled enough to allow gravitational attraction to become a significant player within the realm of cosmic forces, enormous areas of stellar gas began to coalesce into increasingly compact units of material. As the gasses collapsed inward, temperatures at the core skyrocketed. At 10,000,000 degrees Kelvin, hydrogen fusion "ignited" and began to produce helium and enormous amounts of radiated energy . . . and a star was born.

The life-cycle of today's third generation stars is much like that of their first and second generation counterparts. After millions to billions of years of hydrogen fusion (the actual time depends upon the size of the star), the supply of hydrogen in the core slowly diminishes leaving mostly helium. In the process, the fusion reaction slows and the core begins to cool and contract. The contraction produces non-nuclear heating. This initiates

[5] Interesting note: The nuclear accelerator at Cern can generate the energies we believe existed as early as 10x10^-12 (this notation reads "ten times ten to the minus 12) seconds after the Big Bang. That means the energies associated with 10x10^-10 seconds are also attainable. Theory predicts that at those energies, subatomic particles called W-bosons should be produced via pair production. In fact, according to experiments done at Cern, they do. Pretty impressive results!

hydrogen burning in the shell *just outside the core* which, in turn, makes the outer region of the star expand outward.[6] When the core temperature reaches a little over 100 million degrees Kelvin, *helium* fusion begins.

Helium fusion follows a cycle similar to that of hydrogen fusion with helium fusion producing carbon and oxygen.[7] Sooner or later the helium in the core begins to exhaust. Nuclear burning slows, the core contracts causing non-nuclear core heat-up. If the star is large enough, the core hits 600,000,000 degrees Kelvin and carbon begins fusing to make still larger atoms.

For the biggest stars, this process can go on all the way up to a core of iron.[8] No star core fuses elements larger than iron because iron fusion requires energy *input* instead of providing energy release.

Stars with cores greater than 1.4 solar masses die by exploding in what is called a supernova. As it occurs, the outside of the star blows outward producing a supernova remnant.[9] The inward explosion either produces a neutron star or a black hole, depending upon the star's original size.

Some minor notes and general information about how our universe physically works:

1.) An atom's nucleus is made up of electrically positive protons and electrically neutral neutrons.

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6 This expansion produces a star that is around 100 times the diameter of the original star. Called *red giants*, these stars put out more energy than before (hence their luminosity goes up), but because their surface area has increase to such a degree, the amount of energy released per unit area goes down (translation: their surface isn't as hot as it had been, which accounts for their red color).

7 You might wonder why no beryllium, lithium or boron is produced. In fact, it is, but the output of each has a half-life that is very short. This means that as the star "burns," these atoms go away fast. But those atoms are found on earth, so where do they come from? When large stars supernova (die by blowing up at the end of their lifetime), high energy subatomic particles are accelerated to such high velocities that when they collide with carbon, which is abundant in stars at that point, they can actually knock one, two or three protons out of the carbon nuclei . . . leaving boron, lithium or beryllium. That means the boron you get when you buy a box of the cleaner Boraxo at the supermarket were once carbon atoms inside a star that, when the star died, became something other than carbon . . . like boron.

8 Interesting, whereas a large star takes ten million years to exhaust its hydrogen supply, it burns so furiously at the end of its life that it only takes one day to produce its iron core.

9 The Crab nebula is a remnant that was created by a supernova that was observed by the Chinese in 1054. The explosion put out 2,000,000 times the normal energy output of the star and was visible in daylight for two weeks.

2.) The number of protons determines an atom's *kind* (e.g., all *hydrogen* atoms have 1 proton, all *helium* atoms have 2 protons, etc.)

3.) Proton/proton repulsion in the nucleus is overcome by *the strong force* that exists between protons, but that force is only effective over a distance equal to the diameter of a proton. As many, many protons can exist in the nucleus, electrically neutral neutrons are needed to spread the nucleus out, distancing the protons from one another and diminishing the proton's repulsive effect.

4.) The number of neutrons of a particular kind of atom can vary (e.g., standard carbon has 6 protons but carbon atoms can also have 7 or 8 neutrons).

5.) Atoms with varying numbers of neutrons are called *isotopes*.

6.) Atomic structures tend to migrate toward situation in which the energy required to hold the nucleus together is a minimum.

7.) Atoms whose proton to neutron ratio generates an energetically unstable situation are said to be *radioactive*.

8.) The *half-life* of a radioactive atom marks the amount of time half of a sample of the atom will remain intact (that is, it gives us an idea of how quickly it will decay into something else). Atoms with a short half-life are said to be radioactive.

9.) The way radioactive decay (beta decay) works is interesting.

   a.) A proton is itself made up of a two *down quarks* and one *up quark*.

   b.) A neutron is made up of two *up quarks* and one *down quark*.

   c.) When an energetically unstable nuclei radioactively decays, rearranging itself into a hopefully more energetically acceptable state, the *up quark* of one of its neutrons turns into a lighter *down quark* while ejecting a high speed electron, called a *beta particle*, along with an anti-neutrino. This is called *beta decay*.

   d.) But when the *up quark* turns into the *down quark*, the neutron turns into a proton.

   e.) And as the number of protons in an atom determines the *kind* of atom it is (iridium has 77 protons, platinum has 78, etc.), *beta decay* motivates an atom of one "kind" to become an atom of an entirely different kind.

   f.) So, for instance, if an iridium atom were to beta decay, the end result would be a platinum atom.

Continuing on:

During a supernova, enormous numbers of free neutrons are generated which can combine with atoms (elements) already present in the star. Super-neutron-rich elements are not stable, so they radioactively decay via beta-decay. As was said above, this produces *new elements* with higher proton counts. What's more, this process continues in a given atom until the resulting atom is *stable*.[10]

Called the *r-process*, this is how the elements that are larger than iron (i.e.: gold, silver, etc.) are produced. In other words, with the exception of the hydrogen and helium, almost all of the atoms that make up your body and, quite literally, *everything around you* were created as the consequence of the life or death of a star. We are, in short, *star stuff* (and thank you, Carl Sagan).

While the outside of the star is being blown outward, the core of the star (which is usually around the size of the sun) is being compressed inward. If the structure has a mass between 1.4 and 1.8 solar masses, electrons will be forced into the nuclei of their atoms, combining with protons to make neutrons. With all of the *space* within the atoms removed, what stops the implosion are neutrons jammed up against neutrons.

These structures are called *neutron star*. They are only around 12 miles across and they have a mass density equivalent to compressing 1000 Nimitz class aircraft carriers to the size of a marble. Along with being monstrously compact, the *conservation of angular momentum* motivated them to spin REALLY FAST with the fastest having angular speeds upwards of 700 revolutions per second (think about it—an object that is 12 miles across spinning 700 times a second!!!!!).

This is some kind of serious cosmic action.

Stars with cores that are greater than 1.8 solar masses *never* stop imploding, generating what are called *black holes* (that is, structures that are so gravitationally massive that not even *light* can escape them). It was Einstein's Theory of Relativity that predicted these.

So why are we talking about all of this?

10 As an example, iridium 208 (this is an iridium atom with 77 protons and 131 neutrons) will, on average, beta decay FIVE TIMES in a forty-five minute period. After that time, the atom will have become a lead atom with 82 protons, and will have a half-life of 5.2x10^9 year (the age of the universe is 13.6x10^9 years . . . so this is a long time and, as far as we are concerned, a stable atom!).

When I was a kid, science was so pleased with itself over this theory that it could hardly stand it. Why? Because within it, science had accomplished one of its most cherished goals: the presentation of a nice, neat, clean, mechanical model that explains where the universe came from . . . all without the apparent need for a Creator.[11]

But there are two problems . . . big ones . . . that science has not been able to satisfactorily address: (1) how to explain the *apparent precision* of the universe and (2) how to account for the circumstances that *led* to the Big Bang.

The first difficulty—the precision problem—has two sides to it.

Side One: Although it's not something the public is concerned with, physicists in the last eighty years have made remarkable observations concerning the *fundamental mathematical constants* that intimately relate the natural laws that govern this place.

Light energy, for instance, is something we cannot exist without. But light is very strange. Under certain circumstances, it acts like a *wave* doing things that waves can do but that *particles* could never accomplish (Young's experiment demonstrated this side of light in 1803). Under other circumstances, light acts like a *particle* doing things that particles can do but that *waves* couldn't possibly accomplish (Einstein received a Nobel Prize in the early twentieth century for showing that the *photoelectric effect* was just such a phenomenon). What this means is that light can act either as a particle-like bundle of energy or as a wave-form of particular frequency, depending upon the situation.

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11 This is a fairly gutsy statement, considering we live in a nation populated primarily by God-fearing Christians. Richard Dickerson, an evolutionary molecular biologist who is also a Christian, spoke about this problem of "no need for God" in an article entitled "Letter to a Creationist" published in The Science Teacher magazine (September, 1990).

The main thrust of the article was to refute Fundamentalist Christian claims that one's stand on God must either be that "the Bible says it all and it's literally correct," or "science has the last word on everything and it says there is no God." His contention was that there are moderate positions between those extremes. Specifically, he suggests two alternative ways a Christian scientist could treat the dilemma. The first maintains that God created the universe; that the first two chapters of Genesis were meant to be taken figuratively; and that the universe is inherently logical, being God's handiwork, so that any understanding gained by studying it will not probably be grossly wrong. The second maintains that issues about God are private and don't belong within the domain of scientific speculation. Dickerson went on to say that he knows of no scientists who belong to the "science is all" point of view, and that almost all Christian scientists he knows adhere to either of the two alternatives presented above.

The article was great if you happen to find Creationist Theory irritating, but it ignored one important point. Although I'm sure there are scientists who are also devout Christians, the general tone of most scientific endeavors had historically bred an atheistic, "I don't need God for anything" attitude.

Early in the twentieth century, Einstein suggested that the energy (E) of a light particle's bundle and the frequency (ν) of its wave-form are directly proportional. In equation form the relationship is $E=h\nu$, where *h* is called Planck's constant.

What is interesting is that all of the major physical constants, Planck's constant included, were supposedly fixed randomly during the Big Bang, or so it would seem. What is amazing is that if Planck's constant had been set just a tiny, tiny, tiny bit bigger or smaller, the universe would have evolved in an entirely different way. Stars, for instance, either wouldn't have evolved at all or would have evolved in a highly restricted manner.

In addition, many of the elementary constants, though not physically dependent upon one another, nevertheless act together to effectively support not only the universe as we know it, but the universe *that needs to be if we are to exist*. As explained by P.W.C. Davies in his book, The Accidental Universe:

> The numerical values that nature has assigned to fundamental constants, constants such as the charge on an electron, the mass of a proton, the speed of light, the Newtonian gravitational constant, etc., may be mysterious, but they are crucially relevant to the structure of the universe that we perceive. As more and more physical systems, from nuclei to galaxies, have become better understood, scientists have begun to realize that many characteristics of these systems are remarkably sensitive to the precise values of the fundamental constants.
>
> More intriguing still, certain crucial structures, such as solar-type stars, depend for their characteristic features on wildly improbable numerical accidents that combine together fundamental constants from distinct branches of physics.
>
> Recent discoveries about the primeval cosmos oblige us to accept that the expanding universe has been set up in its motion with a cooperation of astonishing precision.

Please note that the optimal phrases in this eloquent commentary is *wildly improbable numerical accidents* and *cooperation of astonishing precision*.

The problem: "Where did all this precision come from?[‡]

[‡] From 2019: Although this would have been poo-poo'ed mightily when I was a kid, the only retort scientists seem to have been able to come up with to answer this obviously perplexing question is that there have been (or are) an infinite number of universes, and that in that infinity there *must* be one that, by random chance, has managed to fit the bill . . . and that universe is ours. And sure, this might be true. What nobody in the scientific community seems to have noticed, though, is that, given this idea's inability

Side two: This *apparent-precision* problem becomes even more evident when one looks at life. For example, how did the human body get to the state it is in now, given the fact that there was no life on this planet at the start?

According to one theory,[12] things began a billion and a half years ago when electrical storms and intense ultraviolet radiation allowed the predominate chemical compounds in the earth's atmosphere—nitrogen, hydrogen, water and methane—to interact and create complex chemical structures called *amino acids*. Within a few hundred million years, the amino acids had combined to form even more complex molecules—DNA molecules—that were able to act as chemical templates for self-replication.

The first life form—a virus—was nothing more than a DNA molecule surrounded by a sack of organic molecules called proteins. Over more time, random variations in the coded DNA produced additional proteins called enzymes which, in turn, allowed the first primitive cellular structures to form. Advanced cells developed as these primitive cells coupled with viruses began to coexist in a symbiotic relationship. Natural selection took things from there.

Mammals appeared approximately two hundred million years ago; Homo Sapiens (early man) came a quarter of a million years ago.

As things stand today, the human body is made up of somewhere around *60,000,000,000,000* (sixty trillion) cells,[13] each of which carries the DNA plan for the entire complex. Each cell knows exactly where it fits into the blueprint, which is fortunate. If that were *not* the case, skin cells on your hand could mistakenly follow the blueprint for cells used in tooth enamel and you would end up with a hand as hard as a rock.

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to be proven, and given how *out there* the claim seems, it is not altogether different from the claim that *God exists*.

12 In fact, there are a number of competing theories out today, some more likely than the one about to be presented. That is all right. Whether this is the true scenario or not is not important. All we are concerned with here is the GENERAL TREND in scientific thinking concerning the evolution of life.

13 How big is sixty trillion? If you had sixty trillion dollars and wanted to spend it, you would have to spend around $350,000 every hour, 24 hours a day, 365 days a year for 2000 years to get rid of your money. That is, if you started at the time of Christ, you'd still have around twenty-four billion dollars left to spend as of January 1992 when this book was written.

There are *75,000 miles* of capillaries, veins, and arteries in the body's blood transport system; the heart muscle pumps the equivalent of *500,000 tons* of blood in a normal lifetime.

The lungs are made up of *250,000,000* tiny air sacks, and the body's bone marrow produces *1,000,000* red blood cells *every second.*

There are *125,000,000* rod cells per eye with each cell containing *30,000,000* molecules of light-catching pigment. The eye can transmit *1,500,000* signals simultaneously to the brain, which contains *30,000,000,000* neurons. Each neuron can be connected to as many as *80,000* other neurons at once.

The body's DNA provides the immune system with the capacity to produce over *1,000,000,000* antibodies allowing the body the potential to fight off diseases that don't even exist yet. The liver can perform over *500* tasks, some of which cannot by duplicated today within our finest chemical laboratories, and produces over *1,000* different enzymes. Without its services, we would not be able to detoxify such poisonous materials as nicotine, caffeine, alcohol, and the myriad of other "food products" we human seem to indiscriminately ingest on a regular basis.

As each body part is enormously intricate within itself, when laced together into "the system," the living machine we end up with is absolutely beyond belief. Through the agency of a number of very sophisticated systems (the nervous system, the digestive system, the lymph system, etc.) the body has the ability to coordinate the activities of its very different, very independent parts (the liver, kidneys, brain, not to mention the astronomical number of individual cells that work together to make up these parts) in such a way as to allow it to survive *without any conscious effort on your part*.

It would take a large library to catalogue all we currently know about how the body works. It would probably take a city of libraries to catalogue all we don't know.

With all this in mind, think now about that nice, clean, tidy theory of evolution science has lain before us. Noting that nature doesn't appear to migrate toward complexity on its own—science suggests that, if anything, it tends toward disorder (thermodynamic entropy)[14]—what are the odds against something as remarkably complex as a human being evolving by pure chance from nothing more than four molecular compounds and some lightning?

Funny you should ask. A mid-1980 Science News article announced the revised results of two university professors who had calculated just those odds—the odds that humankind could have evolved to its current point from scratch, so to speak. The old estimate was one chance in 1,000,000,000,000,000,000,000,000 (that is, one in one-trillion-trillion).[15] By doing some clever assuming, the professors had gotten it down to a more respectable one chance in 100,000,000,000,000 (one-hundred-trillion).[16]

Put another way, you'd have a better chance of taking a cargo plane to 10,000 feet, dumping a half million bricks and five tons of mixed concrete out its bay doors, then expect to find the bricks landing *by chance* in such a way as to construct a completely finished, two story, old-English style home, complete with patio and Jacuzzi appropriately situated in the back yard. §

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14 Think about your room at home. It starts out sort of clean on Sunday. By Wednesday, is it cleaner? Not likely . . . Entropy!

15 That is probably surprising, given the number of stars that exist within the universe and, hence, the number of opportunities for life to come into being, but not all stars are in a position to handle life-bearing planets. Planets in binary and trinary star systems (i.e., solar-type systems that have two or three stars in them—over half of the apparent stars in the night sky are made up of these creatures) don't have the temperature stability required to support life (the temperature of a planet in such a system will be dependent upon where the planet is at a given instant, relative to the stars in the system). Of the single-star system, not all have planets. Of those with planets, not all have planets the appropriate distance from the star (planets that are too far away would freeze; planets too close would boil). Of the systems with planets at the appropriate distance, not all of those planets have atmospheres. Of those with atmospheres, not all have the right proportion of gasses.

16 What is interesting is that if those same mathematicians had calculated the odds that psychic phenomena might be a reality, and if they had found it to be *one chance in a million*, they would surely have condemned as insane anyone who, in the face of those odds, still professed a belief in psychic phenomenon. Yet in perfect sincerity, scientists for years preached the belief that mankind evolved by chance from practically nothing . . . *hundred-trillion to one odds against* and all.

§ Note as of 2019: When you listen to biologists talk about the theory of evolution, you get the feeling that once it started, it was fated to evolve as it did and that life and humans were a natural, evolutionary consequence of the process. Clearly the process produced humans, but I suspect there were a lot of points along the way where things could have gone differently and we wouldn't have ended up with life as we know it. Otherwise, one might expect the universe would be teaming with other-worldly Kim Kardashians, oodling all over the place, and that doesn't seem to be what we have.

Bottom line: As impressive as the aura of knowledge and rightness is around most scientific theories, science's *evolution by chance* scenario is so fantastically improbable that it ranks right up there with the literal version of *God made the world in seven days*.

Oh, and the *second major drawback* to science's Big Bang theory takes considerably less explanation but is potentially much more damaging.

The *energy* that supported the primeval vacuum . . . where did it come from? We know how the energy was stored—in the nothingness that existed before time and space came into being. But for the life of us, we don't have a clue as to where all that initial energy came from in the first place.

In short, we really haven't *explained* the beginning at all.

So what does this all mean?

For the atheists in the crowd: The Big Bang most probably happened; Darwin's theory of *natural selection* and the mechanism for evolution espoused by modern-day biologist's are probably on-target. But for life to have evolved as it has, given its complexity, the odds are that there was more than *random chance* acting.[17] It is almost certain that there had to be an impetus, a plan, *possibly* a Creator involved.

And for the religious folks in the crowd: Considering the power and insight required of a Creator able to put together something as immense and yet as complex as a universe, the chance that that Being is *anything at all* like the God Western religions believe in is highly unlikely.

In other words, I suspect I've managed to irritate just about everyone.

[17] Again, it is interesting to note that observations like these have drawn a considerable number of young scientists from the ranks of atheism to the ranks of agnosticism. That is, they aren't willing to say that God exists, but they are equally unwilling to say that God doesn't exist. In short, they are bright and honest enough to realize that they just don't know.