

Atoms and Souls
The Prehistoric Origins of
Science and Religion

by

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Nullius in Verba

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Atoms and Souls

On a planet with a rocky crust, in the boondocks of the Milky Way Galaxy, we took advantage of the sun's energy and began to make copies of ourselves. Eventually, over billions of years, we changed. We assembled, first, as complex molecules, and later as a wide variety of complex adaptive systems—including what today we call primates. At first, we gestured with our arms, hands, eyes, and bodies, at times wildly, while making sounds of various lengths and tones.

We cautiously examined the various fire-mountains, and we fearfully felt the ground shaking. We came to believe that some kind of very powerful Entity beneath us. On some evenings, in the distance, we could see liquid fire winding down the side of the Mountain; and sometimes the Mountain heaved out flying rocks-of-fire and huge clouds of smoke, as the sky assaulted the mountain with bolts of lightning. Some of us, the braver ones, would move guardedly towards the Mountain and try to steal the fire and its heat.

Thanks to fat-rich marrow from the bones of large animals we scavenged, our brains gradually evolved larger. We continued to gesture, but now we could make sounds that were quiet, nuanced and subtle, or loud, clear, and commanding. We became talking apes¹—capable of large scale cooperation, imaginative thinking, and able to manipulate our environment with opposable thumbs and tools. This is the story of how we first came to know.



Paleolithic family. Image by author and Dall-E.

Preface

You might wonder, with real and potential catastrophes such as pandemics, global warming, nuclear annihilation, super-volcano eruptions, asteroid and comet impacts, nuclear war, and a robot apocalypse, why we need to know anything about the origins of science and religion?

1. Religion is a major influence in the world. Many people turn to it for meaning in their lives. Many believe in such things as gods, ghosts, spirits, reincarnation, past lives, a promised Messiah, etc., even though they were taught chemistry, physics, biology, geology, and astronomy. I know because I was once one of them.
2. Some religious people interpret their “sacred” writings as absolute truths from “God” and believe that only one religion is the true religion.
3. Some ignore scientific evidence, which can put the rest of us at risk.
4. Some believe it is their duty to harm or even kill those who do not share their beliefs.
5. Some advocate for the United States to be a Christian nation covered by Biblical scripture.²

It's crucial to recognize that the founders of the United States were part of the “American Enlightenment,” a movement that applied scientific reasoning to politics and largely favored religious tolerance over state-established religion. Benjamin Franklin and many of his contemporaries would likely have been skeptical of attempts to view political leaders as messianic figures or to interpret governance through a lens of religious prophecy.

In this book, you will learn many ideas. In many debates about religion and science, I have seen little mention of these ideas. Some have been mentioned or hinted at before by others, whom I have tried to acknowledge. However, I know of no comprehensive treatment of them as occurs here. Even if there has been such a treatment, these ideas are worth repeating.

At one time, ancient Greeks, such as Archimedes, Euclid, Hipparchus, and Hippocrates, made groundbreaking advancements in logic, mathematics, astronomy, engineering, and medicine. However, much of this knowledge was lost in Europe during a Dark Age that spanned centuries. This could happen again—if we are not vigilant.³

When I first began writing about science and religion some twenty-five years ago, my goal was to uproot the tree of religion, expose those roots to the world, and by doing so, let the tree wither and die in the harsh light of science. Perhaps this was an overly ambitious goal. Nowadays, with this book, I hope to encourage people to push back against superstition, dogma, and religious extremism.

Researching this book profoundly changed me. I believe if you read through to the end with an open mind, it might change you too. As you read, you'll see that many religious figures—ministers, priests, rabbis, mullahs, monks—who claim to understand our ancient sacred texts, are either unaware of the true inspiration for these texts or choose not to reveal it. Even renowned scholars like Carl Jung, Joseph Campbell, and more recently, Jordan B. Peterson, who have sought to decipher mythology and religion, missed how much *nature*

inspired these narratives. They have overlaid psychological interpretations, which, while apparently benefiting many, have also missed something more fundamental.

Looking from a multidisciplinary scientific viewpoint, one can penetrate to the fundamental phenomena. These stories or myths were not primarily psychological, Freudian, Jungian, literary, functionalist, structuralist, moralistic, magical, or induced by psychotropic mushrooms or other plants. Of course, certain events, like the birth of a child, long considered wondrous, have inspired myths. However, the most influential myths do correspond well with a naturalistic origin, and, as you progress through this book, you will notice that each succeeding chapter reinforces the ones before it, gradually creating an organized, overarching theory. What once seemed like a jumble of uninterpretable facts will start to coalesce, gaining clarity and coherence through the relationships and explanations provided by the theory.⁴

Although for many millennia, people believed in a “life force” that distinguished living things from inanimate matter, once we evolved into talking apes, and later writing apes, offloading our knowledge onto stone, papyri, clay, tree bark, paper, and digital devices, we extended our brains, and our capacity for knowledge grew immensely. This expansion immensely helped science to flourish. Scientists like van Leeuwenhoek, Lavoisier, Pasteur, Hooke, Harvey, Copernicus, Galileo, Newton, Kepler, Einstein, Cuvier, Darwin, Mendel, Mendeleev, Norbert Weiner, James Watson, and Francis Crick demonstrated that the idea of a “life force” was an unnecessary hypothesis. Likewise, I hope to demonstrate in this book that a “divine force” is an unnecessary hypothesis for religion.

Who is this book for? 1) For those who are concerned about the intrusion of religion into USA politics, and for those who are curious about the origins of science and religion. Much like seals and bears, dogs and wolves, and chimps and humans, etc. science and religion also share a common ancestry. 2) This book could also serve as a valuable resource in academic settings, helping to clarify translations from ancient texts. 3) In simpler form, it might be useful in dissolving harmful ideologies, whenever they threaten to tip

the culture into another Dark Age. 4) It may help some people to reconcile science and religion by demonstrating their common origins.

Part I: The Sky Above Us. The field of “archeoastronomy” is firmly established and many responsible investigators publish their findings each year.⁵ In Part 1, I explore some less discussed, but important topics. I explain why it looks to us like the sun “goes down.” Every major religion has described this incorrectly. I also explain why the Moon looks larger near the horizon. Also, without going to orbit, I give some simple ways to perceive, with your own eyes, the roundness of the Earth.

Part II: The Fire Below Us. Part II describes my personal encounters with three active volcanoes, and then explores, from a naturalistic perspective, various world myths: from the Nile River Valley, to the Levant, India, Tibet, Middle and South America, China, Northern Europe, North America, Greece, Rome, Arabia, and North America.

Part III: The Air Around Us. It is extremely remarkable that our species, prehistorically just talking apes, would have decided that there was something “spiritual” that exists outside of the “material” world. (I am talking about ancient views of “spirituality,” not more modern interpretations, such as “the interconnected web of all existence.” However, thanks to the relatively recent discovery of element number 8 (oxygen), we can reexamine ancient “spirituality” from a new perspective: what might be called empirical spirituality.

Part IV: The Knowledge Within Us. I 1) explore “usable knowledge,” a paradigm for the analysis of both science and religion, 2) describe ideas that have helped me to think better, and 3) narrate how I convinced many people that I had been abducted by aliens.

Part V: Provisional Generalizations. I describe and elaborate on Einstein’s conception of God, why religion is popular in an age of science, and the mysterious purpose of life.

So come with me on a journey into the ancient past, a journey far down the Tree of Knowledge, through astronomy, chemistry, geology, and alchemy, to the roots of the tree, to before the words “religion” and “science” existed. There, we will examine some of the most spectacular narratives of our ancestors and perhaps understand them for the first time.

Part I: The Sky Above Us

1.0 The Sunset Delusion

I think that in the discussion of natural problems we ought to begin not with the Scriptures, but with experiments, and demonstrations.

Galileo

The Mayans, Egyptians, Babylonians, Chinese, the early Europeans, and the early humans elsewhere stared out at the lights in the night sky and conjectured. They tracked the course of these lights as best they could, oriented their monuments to them, and created stories to explain them.

Only in the last 100 years have we had the scientific tools to find the distance, course, and substance of these bodies. The early humans thought the Earth was somehow special, somehow different from what was “Up There.” They thought the Sun rose, moved across the heavens, and set.

Although we see the Sun “come up” or “go down,” we have known for several hundred years, since about the time of Galileo in 1633, that *the Sun does not move*.⁶ We live in a heliocentric not a geocentric arrangement. If you see it move, if you see it *rise*, set, or even *travel across the sky*, you are seeing something that is not occurring.

An analogy that might help: we have all experienced sitting in an auto or train while having another vehicle sitting next to us. Suddenly, we think we are moving. However, it turns out that the *other* vehicle was moving. Disoriented for a second, we transition to the correct view. Likewise, we see the Sun moving. After a transitional stage, we will see the Earth spinning, not the Sun moving.

You might protest, “But it *looks* like the Sun is moving!” Ludwig Wittgenstein, the Austrian philosopher, used to say, “What would it look like if the Sun were *not* moving?” The answer to this question is, of course, it would look exactly as it looks now, as the Sun *isn't* moving! Our *sensations* are not at fault, the model our brain is using to organize those sensations is at fault—our *perception* is at fault.

Another analogy: imagine it is a black night. We think we are stationary—all we see is a light, perhaps a lantern, moving around us. Then, at dawn, we discover that we are standing on a spinning disk and what we thought was a lantern is in reality an immense and powerful light miles away. Likewise, we are on the “Earth-go-round,” and the small sun, “circling us,” turns out to be gigantic and very far away.

1.1 Historical Background

Our model of heaven was wrong. It was a somewhat useful model once upon a time.

The Christian Bible mentions the “sun” about 190 times using words such as “going in,” “go in,” “gone in,” “sunk,” “rise,” “riseth,” “risen,” “rising,” “set,” “setting.”⁷ Nowhere does it mention the Earth spinning and the Sun being stationary with respect to the Earth (except when Joshua asks Jehovah to make the sun “stand still,” which it allegedly does temporarily, while Israel takes vengeance on its enemies).

The Koran mentions the sun 41 times using such words as, “rise,” “sunrise,” “declining,” “rising,” “runs,” “follows,” “pursuing.”⁸ Although Allah “created the sun,” there is no hint that it is stationary, with the Earth rotating while going round it.

None of our ancient religious texts or mythological stories ever had these motions right.⁹ So the next time we hear someone make an extraordinary claim such as “There is knowledge of DNA in Holy Scriptures,” we can ask him or her, “Then how come it didn't even know the sun was the center of the solar system?”

It was not until the Golden Age of Greece that we have a clear record of someone getting it right. Although Aristotle championed a geocentric system, there was a Greek by the name of Philolaus, who wrote about the Pythagoreans in the Fourth Century BC: “For them...the Earth is only one of the moving stars, and its circular motion about its own center produces the day and night.”¹⁰ Aristarchus (310-230 BC) also correctly stated that the Sun was the center of our solar system. However, the heliocentric theory was never popular in ancient Greece.

What *was* popular in Greece and elsewhere was a book by Ptolemy, (100-178 AD), called by the Arabic name *Almagest (The Greatest)*, an Earth-centered interpretation.¹¹ This was to become the leading astronomical book for more than thirteen centuries until the time of Copernicus (1473-1543). It was quite a feat to diagram the movements of the planets based on a false model, but Ptolemy managed to do it using a complicated system of small circles on a larger circle (called epicycles).

Copernicus (1473-1543) found that Ptolemy’s complicated system could be more easily explained and diagrammed if the Sun were the center of the system. He eventually wrote a book, *De revolutionibus orbitum coelestium (On the Revolutions of the Heavenly Spheres)*.¹² He was very reluctant to publish, seeking additional confirming data, so the book was published only near his death and dedicated to Pope Paul III. It presented the heliocentric theory rather apologetically and defensively—as sort of a mathematical hypothesis. In the introduction (which some say was not written by Copernicus) it says, “It is not necessary that these hypotheses should be true, or even [probable].”

Giordano Bruno (1548-1600) apparently looked up at the sky and imagined (correctly) that all the tiny points of light—stars—were also suns, very far away. A prolific mathematician, philosopher, and poet, he too professed that the Earth went around the Sun, and that there were infinite worlds besides Earth that were inhabited.¹³ Recent discoveries have shown that many stars have planets, although we don’t know yet if any of them have life. Bruno was eventually declared a heretic and burned at the stake. Today he is

considered a hero by philosophers and other freethinkers, and the SETI (Search for Extraterrestrial Intelligence) League sponsors a Memorial Award in his honor for his “infinite worlds theory.”

Galileo was not apologetic like Copernicus, nor foolishly arrogant like Bruno. He wholeheartedly championed the Sun-centered system in his brilliant *Dialogue Concerning the Two Chief World Systems*.¹⁴ He was, however, summoned to the Inquisition in Rome in 1633, retracted his statements, and stated that the Earth did not move. He reportedly muttered under his breath afterwards, “*E pur si muove* (And yet it moves).” They placed him under house arrest and ordered him to never publish anything more about the heliocentric hypothesis. However, his final book, *Discourses on the Two New Sciences*, was smuggled out of Italy and published in Holland.

Acceptable proof of a rotating Earth eluded Galileo, Newton and others for more than 200 years. Galileo concluded that no experiment performed with ordinary objects on Earth could prove whether it was turning.¹⁵

Nevertheless, in Paris, in 1851, Leon Foucault, with no formal college degree, proved Galileo wrong with his precisely engineered pendulum.¹⁶ This pendulum *kept its plane of swing in space while the Earth rotated beneath it*,¹⁷ showing visually the spin of the Earth. Foucault was not a member of France’s inner circle of scientists and they were much embarrassed by his simple and elegant proof. Not only did he show the rotation of the Earth, but, even though he was not a mathematician, he produced a simple mathematical formula that predicted the pendulum’s movement at different latitudes on the globe.¹⁸

This discovery by Foucault finally convinced the Catholic Church¹⁹ of the Earth’s motion, and 145 years later, in October of 1992, Pope John Paul II offered an apology for the Galileo affair. The apology indicated that scripture should not be taken *literally* when describing the *physical* world, and Galileo was complemented for being more correct in his interpretation of scripture than the theologians of the time.²⁰

In the twentieth century, Bucky Fuller developed a spherical-shaped device, a “Geoscope,” a

miniature Earth, for viewing the stars. Its axis is parallel to the Earth's axis, and its North Pole points to the Earth's North Pole. The 4,000-mile distance between the Earth's center and the Geoscope is negligible when compared to the distance to the stars. This allows one, while sitting inside the Geoscope, to experience the Earth as a planet among the stars.²¹

Inspired by Fuller's practical model, I began thinking about ways to correct our perception of our Star.

1.2 Semantic Readjustment

I have trained myself to see the Earth *spinning*, rather than the "Sun setting." I made a video about this and posted it online. When you see the Earth spinning, and feel it in your gut, not just know it intellectually, it is an awesome experience.²² How do you do this? Using semantics.

Benjamin Lee Whorf, (1897–1941), a chemist by training, and Edward Sapir, a linguistics professor at Yale, proposed that language influences our thinking.²³ This is now known as the Whorf-Sapir hypothesis and in its "strong form" states that both our culture and thoughts are dependent on the language we use. For example, while living in China, at times I "saw" things that I had no experience with or words for. For example, the ground floor of some small two story buildings in a nearby village had sliding "garage doors," but there were never cars inside, just people. This situation could not register in my mind. Only after a couple of years did I realized that those "garage doors" opened into living rooms and the small building were homes.

In its strong form, the hypothesis states that *our language determines our reality*, and so this is sometimes called "linguistic determinism." In the 1960s Whorf's ideas fell out of favor, partly because of Chomsky's influence. However, in the late 20th century there has been a resurgence of interest in what his

“linguistic relativism.”²⁴ Today, most scientists accept a weaker form of Whorf and Sapir’s hypothesis²⁵ and believe that language, thought and perception have coevolved—in a kind of eternal dance. The words “sunset,” “sunrise,” and “sundown” have been with us for many, many thousands of years and they shape the model in our brains of the Sun. Using words that are semantically more correct may help.

Bucky Fuller (1895-1983) suggested using “sun sight” for “sunrise” and “sun eclipse” or “sun ‘clipse” for “sunset.” Although this is an improvement, I prefer *spin-out* for “sunset” and *spin-in* for “sunrise.” In other words, the *point* on the Earth where I stand *rotates away* from our Star, and later *rotates to* it. These statements, like Fuller’s, match our current reality better than “sunset.”

Archaic	Bucky Fuller	My Suggestions
sunrise	sun sight	spin-in or spin-to
sunset	sun ‘clipse	spin-out or spin-away

In place of the word “Sun,” I propose using the word “Home Star.” As you undoubtedly know, during daylight hours the other stars are all there, but the Home Star’s brightness blinds us to them. There had been a fierce competition among astronomers to be the first to measure the *distance* to a star using the diameter of the Earth’s orbit. Friedrich Bessel won the competition in 1838 and was said to “put our ideas about the universe for the first time on a sound basis.”²⁶ Other scientists calculated the *brightness* of stars, and found them to be about as bright as our Sun. Temperature and chemical composition also were found to be like the Sun’s. The famous painting, *Starry Night* (1889), by Van Gogh, was inspired by his realization that the stars were suns.

In using “Home Star,” you may notice that your perspective on the solar system begins to change. You may see and even feel the distance between yourself and our Star differently. Look at the Home Star and say alternately, “It’s the Sun...no, it’s the Home Star... no, it’s the Sun...it’s the Home Star...” and see what happens. You have begun to correct the model in your brain.

Furthermore, if I show you a photo of a “tiny model car” with an all white background, then tell you

it is a “real car,” suddenly it will become larger and more distant. Likewise, now that you know what you are dealing with, a star, you can viscerally compare the true distance between our Home Star and the other stars. If you do it at “sunset,” the effect is quite noticeable and almost overwhelming. The Earth shrinks in size, and the Home Star gains in size and recedes in distance, until you perceive them correctly, in true proportion, within the immense disk of our Star’s planetary network.



Another way to correct our faulty model might be to use what I call a Parallel Globe. At spin-out, I placed a globe on a beach in Los Angeles with Los Angeles at the “top.” I pointed the North Pole on the globe towards the North Pole on the Earth. So, the globe sat “piggyback” on Earth. South America was in darkness on both. A 4,000 mile shift in the globe, to move its center to the center of the Earth, is minuscule compared to the 93,000,000 miles to the Sun.²⁷ So South America is in darkness on both the Parallel Globe and the Earth. (See image.) By examining the other parts of the globe, we can see fairly accurately how a location on Earth would view our Home Star at that time.

Yet another, maybe simpler way to adjust your perception is to realize that our Star’s shadows all point directly out of the solar system. The line from our Star, to the top of your head, to the top of your shadow’s head on the ground is a line pointing out of our planetary system. If you observe this for a while it will also help correct your perception.

Unlike Earth, the Heavens were thought to be perfect by early humans. When Galileo first pointed his telescope towards the Moon and the rest of the known planets, I imagine that the hair on his body stood out as he saw, for the first time, mountains on our Moon and four other moons orbiting Jupiter. It's sad to note that others didn't believe him. So the “sunset” is really a “spin-out from the Home Star.” Go outside and point and say proudly to your neighbor, “Look! We are spinning away from our Home Star!” You are spreading a more correct model.²⁸

There is another important factor in all of this: the Earth is somewhat tilted over as it rotate and revolves. Which brings us to another delusion: “solstices.”

1.3 The Solstice

The ancients perceived the Yellow Emperor at different places along the horizon. It rose and set farther south each day, increasing the hours of darkness, until one day it seemed to stop. (Solstice literally means sun stop). Then It began to reverse—each day It “rose” and “set” farther north. This was a time of celebration because they knew that spring was coming back again, that the Earth would renew.

Nowadays, you may have noticed that the ring of the horizon intersects our Star at different points, depending on the time of year. If your streets lay along north-south-east-west directions, then, sometime in the spring and fall, driving becomes difficult due to the glare. This is at the equinox (meaning equal day and night) when, except near the poles, the horizon line intersects our Star exactly due east and due west.

The ancients marked the two Sun “stops” with a hill or rock on the horizon and later perhaps a pole or a stone, which guided us when to plant crops in future years. Eventually, we built many stone *circles* which still exist throughout England and Northern Europe.

The ancients did not know that the Yellow Emperor was motionless in the center of our planetary

system. They did not know that the Earth whirled, that it was tilted by 23.5 degrees, that it rounded the our Star at 18.5 miles per second. Nowadays, we know that *our Star does not move in relation to the Earth*. The Earth is *shifting* its position with respect to the Home Star. The Earth is like a ball that is spinning and is tilted in a fixed way as it goes *around* our motionless Star. It is the tilt of the Earth as it rounds the Home Star that creates these shifts in the intersection point along the horizon.

Galileo gave a marvelous argument in favor of this motion in his *Dialogues*. Discussing the motion of sunspots, he says that if the Earth's axis is tilted as it goes around the sun this would cause "the passage of the spots to appear to us to be sometimes along straight lines, but only twice a year, at all other times they would appear to be perceptively curved arcs."²⁹ That is the exact course these spots take. In the northern hemisphere (where 95% of humanity live), we are tilted most toward the Home Star in the summer. We are tilted most away from the Home Star in the winter. (Of course, it is just the opposite in Australia.) So there are better names than Solstice and Equinox. I suggest: Orbital Point One (Spring Equinox), Orbital Point Two (Summer Solstice), Orbital Point Three (Fall Equinox), and Orbital Point Four (Winter Solstice).

1.4 Future Scenario

Of course, the increase in space tourism may help to bring about semantic readjustment as they search for newer and more accurate words to describe our Earth-Star relationship.

A science fiction scenario I wrote helps explain this chapter:

This is the 158th orbit since the beginning of the Atomic Era. I am Karmato Dozenson, anthropologist. I was born on Earth and have lived here for 45 orbits, except for a half-orbit doing fieldwork on the Moon, one vacation to the Space Casinos, and three vacations to the High Orbit

Space Platform. Today, I stand on the beach, on Oregon Shores, and face our Home Star as the spin-away is just beginning.

Most of Earth has the day off, as this is Orbital Point One, in ancient times called “the Spring Equinox.” Carrying me with it, the Earth whirls slowly, majestically. I am not religious, but there is something magical about a spinout (in ancient times called a “sunset”), I guess because you can actually see the Earth spinning.

This one is magnificent due to the partial cloud coverage. The reflection on the ocean is red. The clouds are various shades of pink, red, and purple and are slowly changing colors. The ocean rises up and “meets” our Star—blocking out more and more of it.

I think back to ancient times. How odd that we used to think that our Star moved around us. Even around the time we first landed on the Moon, we still used the word “sunset.” I have seen people talk about this on ancient 2-D shows.

I try hard to see things from their perspective. I think, “our Star is going down.” The words sound silly. I have been too conditioned since early childhood to see the Earth turning. To see myself, at spinout time, as facing sideways out of the solar system. To see shadows as markers, tracing a ray of light on its way out of the solar system.

I try again. I focus and use the ancient terminology, “The Sun is setting, the Earth is not spinning, the Sun is setting, the Earth is not spinning.” Then, for an instant I see it! I see it as the ancients must have seen it! As an anthropologist, I am thrilled. Our Star seemed so close and so small, like the Moon—

Then everything flipped back and the Earth was slowly spinning again.

Now the ocean has covered the very last bit of our Star. The clouds mostly have a purple color. “Goodbye Home Star,” I say all loud. “Here in Oregon they will see you again after exactly 12

hours while I will be leaving for my third trip to the Moon.”

I walk away. It gets cold here right after the spinout.

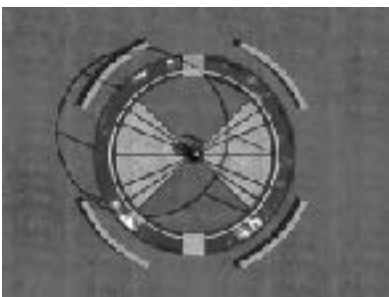
1.5 Conclusion

Our early language still affects you today. Newer language, associated with newer, more accurate models, can help you to see the world and the universe in a different way, in a simpler and more accurate way.

Our religions and ancient mythologies had this wrong. We humans have “mental models” that to a greater or lesser degree match the world outside. These mental models have greater or lesser usability. (More on this later.) The older models sometimes become antiquated when newer discoveries are made and especially since the invention of writing.

Our species is too often disconnected from the environment that first stimulated the rise of mathematics and science. So by using words like *spin-out*, *spin-in*, home Star, etc., perhaps you can gain an awareness of your connection to other planets, and of your proper place in the solar system. By using *Home Star*, perhaps you will have a better sense of your place in our galaxy.

With this in mind, I designed an outdoor artifact: Spacehenge. Its predecessor, Stonehenge, was one of the first computers. It was designed to calculate the midsummer and midwinter Sun location. In contrast, Spacehenge was designed to calculate the four primary orbital points. So at Stonehenge, the Sun went round the Earth. At Spacehenge, the Earth goes round the Sun. (See images here, or color images and animations at my website.)



2.0 Earth and Moon Delusions

Where the senses fail us, reason must step in.
Galileo

2.1 The Flat Earth Delusion

If you have lived near the ocean, as I have, you can watch the ships come into port. Near Long Beach Harbor, a very busy port, I saw two large cargo ships, identical in design, passing each other laterally, but one was several miles off the coast and the other was only a mile off the coast. The one farther out was showing much less of her hull.

At first, I thought this was some sort of optical illusion, or one ship was loaded more heavily. Then I remembered that I, of course, was living on a round Earth, and that the more distant ship was partially hidden by the curvature of the Earth. I immediately felt a sort of sick feeling in my gut as I experienced it. It was somewhat frightening, yet wonderful.

I had a portable telescope in my car that I focused on the two ships, which had the effect of intensifying the experience. The ocean, for the first time, *looked curved*. Then *all* the ships more distant, took on their true perspective, and were seen as partially hidden by the Earth. Recently I have seen some photos on the Internet of very long bridges that also show the round Earth.

I began to wonder if our perception of a round Earth was natural, and that the flat-Earth mind-set is *learned* through faulty language programming much as the words “sunset” and “sunrise” had mis-

programmed us. Perhaps 1) through the use of the words “up” and “down” (which don’t exist in a round world), 2) through the use of a right-angled (x-y-z) coordinate system, 3) through the widespread use of flat maps, and 4) through other subtle words and phrases in many different disciplines, we slowly lost our intuitive hunter-fisher-gatherer sensation of a round Earth, and in our minds began to perceive it as flat.

For example, in geology we talk of “plate tectonics,” which makes you think that the “plates” that make up the Earth’s crust are flat, like dinner plates. On our round Earth they are huge curved structures similar in shape to an upside-down bowl, not a plate,

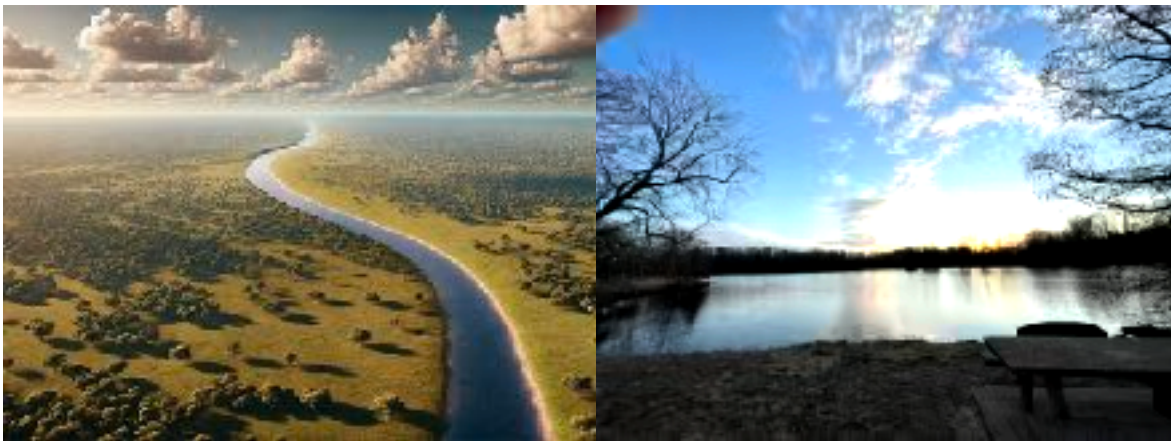
Maps attempt to represent these large “bowls.” Continents, nations, states, counties and cities exist on upside-down bowls. Oceans partly cover these gigantic bowls. The Great Plains of the U.S. is a Great Bowl. Plateaus are not flat, but curved.

Another example comes from the weatherman. He says that the wind “blows.” When we blow on our soup, that “blowing” occurs in a straight cone. However, the wind is moving in anything but a straight cone. If it did move in a straight path, it would very shortly be on its way to Mars. The wind “curves” gently from the Northeast. Or it curves strongly from the Southwest, etc. Using the word “curves” immediately summons up a view of the global dynamics of weather and gives one the immediate impression that weather is not a linear, flat-plane subject, and that, because of these curves, cannot be predicted easily, even though significant progress has been made in weather prediction in my lifetime.

Other examples from meteorology: Hurricanes are not flat, but exist as huge domes of atmosphere. Low-pressure systems and high-pressure systems are both domes of air. Fronts exist as huge arcs. The sky is like a dome above us.

Besides watching the ocean ships disappear as they depart a seaport, one day another method of seeing the round Earth came to me: watching clouds. Particularly at “sunset” (spinout) we often see many colorful clouds and the ones near the horizon appear lower than the ones over our heads. However they are

usually all at the same distance from the surface of the Earth. You may have noticed this from an airliner as you flew for miles and miles over a layer of clouds. So, the next time you see some clouds just remember that those distant “lower” clouds are at the same altitude as are the nearer clouds. As you reorient your vision, you should experience the round Earth. The effect is definitely noticeable. For example, one the two photos shown is a photo of real clouds, and the other was an AI generated photo in which I asked it to create a “virtual Infinite Flat Earth with clouds.”



Another method of directly perceiving a round Earth is to look at the clouds or sunset *upside-down*, for example by bending over forward and looking back at the clouds. This method seems to disable your childhood indoctrination with flat maps, etc.

The only correct literary use I have seen is by Thomas Wolfe. In one of his novels, I forget which one, he mentions the “arc of the sky.” So, like Wolfe, we do not have to be a slave to our antiquated language and oversimplified models. We can overcome them. We can recalibrate our sensory system using oceans, ships, bridges, clouds and upside-down viewing. We can see a round Earth.

2.2 The “Larger Moon” Delusion

Another astronomical delusion concerns the Moon. The moon looks larger near the horizon as opposed to when it is directly overhead.³⁰ No one has come up with an adequate explanation for this phenomenon, although many prominent scientists and thinkers have tried. While it's true that the Moon has an elliptical orbit around the Earth, causing it to be sometimes closer and sometimes further away, that's a different phenomenon and what we are discussing here. Like many unsolved problems in science, the "larger moon at the horizon" is misnamed. It should be categorized as part of the "Flat Earth Delusion."

One must realize that there is no "horizon." There is no line separating the Earth from the sky, and if you walk toward it, it always moves away. It is really a gradual dropping off as the Earth curves. It might be better to call it the "horizon curve." As I mentioned, we have many learned images in our brains of flat maps. Most of us have constantly looked at these flat maps since a very early age. So our sensory system has been recalibrated to see a flat Earth.

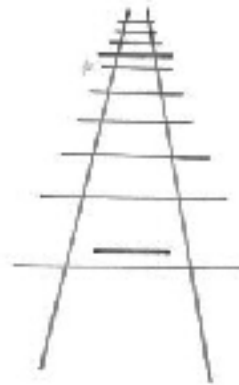
If you perceive the world as flat, when the Moon is near the horizon it will be thought of as being near a very "distant," "flat" surface. If you perceive the world as curved, then when the Moon is near the horizon it is not so very far away—which is the much more accurate perception—and the Moon does not appear larger. Once one has reeducated their nervous system to see the Earth as round rather than flat, when one remembers the "horizon curve," one will no longer see the Moon as much larger at the horizon.

Also, if one concentrates on the fact that the Moon is about 240,000 miles away, then the Moon will appear about the same size throughout the full sequence of the "Moonrise" or "Moonset."³¹ So the next time you see a "Moonrise," remember that you are actually seeing the Earth's spin: a "spin-in" to the Moon. The land you see (or the water you see) is not on a flat surface but sits on the curved surface of the Earth. What changes significantly is that *the horizon moves lower, or the Earth spins-in toward the Moon.*

The Ponzo "Illusion," is a set of parallel tracks that converge in the distance. (See images.) If some images of 2 by 4 inch planks of wood are overlaid on the tracks, the "farther" of the two planks appears to

be significantly larger than its “nearer” companion. This “background” influences our perception of the “foreground” object. When measured with a ruler the planks are shown to be the same size. However, the Ponzo “Illusion” is not really an illusion. In the context of the 3-D information given to us, it is *correct* for our senses to infer that the top stick is larger. To then say the sticks are the same size, is to switch from a 3D image to a 2D image. It’s not fair.

For the Moon delusion, it does help to explain things. Dr. Carl J. Wenning agrees with my explanation. He says, “When we see the moon ‘against’ a more ‘distant’ horizon it appears larger than when we see it ‘against’ a much ‘closer’ one. The explanation of the Moon Illusion, then, is that it is nothing more than the Ponzo Illusion inverted!”³²



Ponzo “Illusion.” Image by author.



Imagine the plank as the moon. It looks larger near the “horizon.”

So if you look at my inverted second image and think of the two planks representing the position of the moon, you will see that one appears larger when it is “lower.”

PART II: The Fire Below Us

Monsters for thousands of years asleep, grumbling and stirring in their dreams, and waking at intervals for a grandiose birth, for violent combats in which puny, ant-like man is only a powerless spectator...Alternately fearful and peaceful, destructive and benevolent, these are volcanoes.

Maurice and Katia Krafft, *Volcanologists*.³³

As I write this, there are thirty-seven volcanoes erupting somewhere and countless earthquakes of various magnitudes jiggling the crust of our planet. One day, perhaps sooner, perhaps later, you or one of your descendants, will be personally affected by one of these earthquakes or volcanoes.

For we live on an extremely hot sphere that has cooled on its surface to form a crust in constant slow fluid motion. It has been pounded and cracked for millennia by asteroids and comets—various parts of it crash into one another and form mountains and ridges that sometimes release lava and sometimes violently shake the ground. This slow flowing crust is surrounded by a very thin layer of invisible gases through which we, the talking apes, gazed outward through “The Sky Above Us” to the planets, comets and innumerable stars and galaxies. These heavenly fires and this trembling and sometimes fiery crust filled us with awe and provided the fuel for the narratives which we will explore in Part II.

A Few Useful Words for Part II:

Ash: Fine particles of pulverized rock blown from an explosion vent. Measuring less than 1/10 inch in diameter, ash may be either solid or molten when first erupted. By far the most common variety is glassy particles formed by gas bubbles bursting through liquid magma.

Ash Flow or Pyroclastic Flow: A turbulent mixture of gas and rock fragments, most of which are ash-sized particles, ejected violently from a crater or fissure. The mass of pyroclastics is normally of very high temperature and moves rapidly down the slopes or even along a level surface.

Caldera: The Spanish word for cauldron, a basin-shaped volcanic depression; by definition, at least a mile in diameter. Such large depressions are typically formed by the subsidence of volcanoes.

Central Vent: A central vent is a volcanic opening at the Earth's surface of pipe-like form.

Eruption: The process by which solid, liquid, and gaseous materials are ejected into the Earth's atmosphere and onto the Earth's surface by volcanic activity. Eruptions range from the quiet overflow of liquid rock to the tremendously violent expulsion of pyroclastics.

Geomythology: the study of oral traditions created by pre-scientific cultures to explain geological phenomena such as volcanoes, earthquakes, floods, fossils, and other natural features of the landscape. Some geomyths are simply fanciful stories based on imagination or popular misconceptions. Many geomyths, however, contain surprisingly accurate insights into geological processes, as well as important eyewitness data from the distant past.

Lava: Magma which has reached the surface through a volcanic eruption. The term is most commonly applied to streams of liquid rock that flow from a crater or fissure. It also refers to cooled and solidified rock.

Lava bomb: Fragment of molten or semi-molten rock, 2 1/2 inches to many feet in diameter, which is blown out during an eruption. Because of their plastic condition, bombs are often modified in shape during their flight or upon impact.

Lava Flow: An outpouring of lava onto the land surface from a vent or fissure. Also, a solidified tongue like or sheet-like body formed by outpouring lava.

Magma: Molten rock underneath the ground. Magma differs from lava in that lava is molten rock on the surface of the Earth, while magma is the same rock underneath the surface.

Molten rock beneath the surface of the earth.

Magma Chamber: The subterranean cavity containing the gas-rich liquid magma which feeds a volcano.

Outgassing: The release of gases, especially by volcanoes.

Plate Tectonics: The theory that lithospheric plates move around the Earth's surface. Plate tectonics explains seafloor spreading, deep-sea trenches, and the locations of earthquakes, volcanoes, and mountains.

Santorini: also known in classic Greek as Thera; a volcanic island in the Aegean Sea, about 200 km from the Greek mainland. It erupted violently in 1650 BCE in perhaps one of the largest eruptions of the last 5000 years. [Adapted from the Volcano World website, *Encyclopedia of Geology*, and SETI.]

3.0 Kilauea

1991 Total Solar Eclipse, Big Island of Hawaii: Three “fires” were coalescing in this area of the globe. The Hawaiian hot spot rising and spewing out lava, the giant fire of the Sun, and the slow-burning chemical fire inside me and the other pilgrims. All of these fires were coming together for a major cosmic event on the Big Island, that great anomaly of the heavens, *a total solar eclipse*. To scare away the dragon which was “eating” the sun, the ancient Chinese had banged on drums, but today we were loaded with backpacks, tents, and, most importantly, multiple cameras to capture the “ingestion.”

All volcanoes are not created equal. The volcanoes in Hawaii are “shield volcanoes,” meaning that they resemble a shield that has been lain on the ground with its face up. Due to the viscosity of the underlying lava, when the lava arrives at the surface it oozes out of the ground and works its way down the side of the mountain in lava rivers and tunnels until it reaches the ocean, where it cools and hardens to form new land.

Shield volcanoes are not as dangerous as the explosive “cone” stratovolcanoes like Mount St. Helens—shaped like an ice cream cone turned upside down. There have been small explosions at shield volcanoes, with some people killed, but they are not the kind of explosions like in cone-shaped ones where half the mountain top is blown off.

One theory, the Antipodal Theory, posits that millions of years ago an asteroid hit the Earth, opposite to Hawaii, and, like a bell being struck by a hammer, set off vibrations, waves that traveled outward in all

directions, through the both the crust and the interior of the Earth, the Earth's curvature magnifying and focusing them on the opposite point of the globe, creating a hot spot which allows magma to escape upward. The Hawaiian hot spot is in the middle of the Pacific Plate, (which is really more like an upside-down bowl). These large plates (or upside-down bowls) cover the Earth's surface and are in constant motion.

The Pacific Plate is slowly rotating, and as it meets the other plates on its outer rim the resulting friction creates huge mountains, volcanoes and earthquakes, a "Ring of Fire" which moves Los Angeles a few inches closer to San Francisco every year. Meanwhile the rotating plate slightly shifts the Hawaiian hot spot and a newer volcano forms on the ocean floor, slowly growing to eventually break through the surface, like a new baby taking its first breath, spewing dark, red streams of lava and hot steam, as it joins its older brothers and sisters along the archipelago.

Mauna Kea, Mauna Loa, and Kilauea are the three siblings that make up the Big Island. Mauna Kea sometimes gets snow at its barren, hypoxic, 13,803 foot peak. Measured from the floor of the ocean, Mauna Kea is higher than Mount Everest. Eventually, over millions of years, the rain and wind will wear the Big Island down until it will be covered with lush green waterfalls, like O'ahu. Still later, all things being impermanent, it will disappear beneath the sea.

But for now, the summit of Mauna Kea makes an ideal place to observe the stars because there's less distortion caused by the atmosphere at that height. So, up through desert, prairie grasslands, cows staring blankly at me, pine trees, more grasslands, lava fields, and more grasslands, I drove. The island has 8 of the 13 climate zones—from desert to polar. At around 4,000 feet my head began to hurt. By 9,000 feet the ache was severe, and I had to return to where the ocean of air (the main character of Part 2 of this book) was thicker.

On the North Point of the Island I discovered a temple, Mo'okini Temple, built about 480 A.D. (See

photo of author.) Mo‘o are serpent-like goddesses. One oral legend suggests that the people arrived here from the Persian Gulf. According to my compass the rubble of black lava rocks was oriented to the North Star. A large flattened rock where thousands of people were ritually sacrificed to their God was nearby. The bones were used to make fish hooks and other tools. Maui and the “holy” volcano of Haleakala was just across the ocean, a few hundred meters to the north.



*The author on Mo‘okini
Temple, Hawaii.*

“Kilauea,” the volcanically active part of the Island, is pronounced with the same ease as “Honolulu,” although there is some extra *life* put into it, almost as if the word itself had a bit of smoke and fire in it. When I arrived, Kilauea Volcano had erupted nearly continuously for nine years.

I approached it from the southern tip of the island, a windy prominence known as South Point, once considered as a rocket launch site since, as the southernmost point in the United States, the spin of the Earth would give an extra boost to rockets. One night, I camped in the Hawaiian Volcano National Park. At about 2 am, I was coughing and nauseous. I had to pack up my things and leave the park, because of the sulfurous fumes, which I later found out were called “vog,” volcanic smog.

The relative age of various lava flows can be told at a glance. The newer flows still have large boulders while in older flows the large boulders have broken apart and shrubbery has started to form. In still

older flows there is only soil and green pastures. Some dark clouds appeared, and it began to rain. A baby mongoose and a bird, a nene, appeared on the roadside.

“Caution: Fault Zone, Watch For Cracks In Road.”

Steam rose several hundred feet into the air in the distance and a somber mood took hold of me. As I drove closer, cars were parked along the dirt road on each side, and people were walking toward the steam, others away from it. Everyone was somber.

I parked the car nearby a first aid station and mounted the recently hardened lava. The steam was still a mile or two ahead of me, but the lava flowed beneath me in lava tubes. It was as if a mountain stream had been frozen solid, turned black, purple, grey, and silver and we were like ants crawling across it. If not for the blue sky we might have been down the Rabbit Hole. This huge, frozen black wave chaotically twisted to the left and right and then intersected another wave. One huge, frozen wave had cracked in two—weathering had already begun.

I carefully made my way—following the markers: walking several feet, jumping up, walking, turning, jumping down, etc., over and over and over. There were no ropes and no tour guides. Park rangers merely sat and enjoyed watching the tourists pass by, ready to help in case of emergency.

From a cliff, looking down, about seventy-five feet away, I saw the bright, red liquid, flowing into the Pacific, like the blood of a wounded Earth. You could hear a large hiss as it met the ocean. The blood would disappear for a second, and then reappear stronger or maybe weaker than the last time, pulsating, and every minute or so a burst of lava exploded outward.

Everyone sat calmly or took photographs. There was no talk or discussion. In my travels around the world, I have never seen anything like this unannounced, consensual silence in a group of tourists except in a church, temple, or mosque. As the lava hit the sea, it immediately hardened and turned black as another bit of island was born. I walked closer. There were warning signs about collapsing tubes, but most people

ignored them and went right to the edge of the cliff.

From the edge of the cliff I saw someone on the black sand beach below. *There must be a way down.* Crossing over some lava tubes I came to a spot where I could scramble and slide down. From there I walked carefully to within a few yards of the liquid fire, to where I could feel the heat and watch the hot Earth's blood cool into the black rocks, some of them bobbing on the surface.

A crazy idea came to me. My swimming suit was under my shorts. Entering some 100 meters distance from the lava, I found the water was slightly warmer than usual. I worked my way out slowly through the breaking waves, doing breaststroke with my head up, so I could see everything. There were many small, black pebbles floating around me. Riptides are fast moving tides that can quickly pull you sideways so I frequently checked my position against the shoreline. There seemed to be no unusual pull in either direction.

I swam cautiously, past the breaking surf, where it was calmer, until I could look directly back at the lava entry point. About seventy-five feet from it I stopped, partially out of fear, partially because I thought people would notice and get upset. So I treaded water, holding my position, just enjoying the view of all the visitors sitting and staring out at me as the lava cascaded, spurted, and spouted out of the cliff into the sea. It was both strange and exhilarating.

Suddenly, a baffling sound came from under the water. Carefully putting my head under the surface, I was greeted by a loud, grating noise—like a huge anchor being lowered—it was the sound of the lava cooling as it hit the water. Back on shore, I wiped all the black sand off my body.

The day of the total solar eclipse came, and went. Following the advice of all the experts, I had gone to the northern part of the island, which had had unusual cloud coverage. The southern region of the island had had a perfect cloudless sky. We had sporadic glimpses of the dragon “eating” the sun as clouds drifted by

overhead, a twilight appeared, and then birds began to settle. The dragon slowly swallowed the Sun and just as slowly regurgitated it, perhaps this time scared away by all the photographers.

4.0 The Child of Krakatoa

Krakatoa, also transcribed as Krakatau, is a volcanic island in the Sunda Strait between the islands of Java and Sumatra and was mostly destroyed in a cataclysmic 1883 eruption.³⁴

1997: This particular dragon was sleeping now, but a few years earlier, it had taken the lives of several Americans. Much earlier, in 1883, in a fit of rage, it had exploded and the resulting tidal wave killed more than 36,000 people. It has played an important role in history and we will meet it again in this book. It was the primary goal of my visit to Indonesia.

As we stood at the base of the small volcano, our local guides tried to communicate an urgent message to us. Their language was difficult to understand, but their message was clear. They had just brought us across a five-hour stretch of ocean in an old fishing boat, but they knew that to go up the volcano was to risk their own lives as well as ours. Up ahead, there were few plants or animals. Mostly boulders and rocks. Scattered here and there amidst the boulders were vents which emitted poisonous sulfur gas from inside the volcano.

Our small expedition was composed of two Dutch, two Danish, and two French citizens, and myself, the lone American. I had chartered the boat from a small fishing village on Sumatra and managed to gather the others to help with the cost. We all hesitated for a moment at the guides' warnings, and then the four bravest, or most foolhardy, went on. The guides told us to be back in an hour, probably hoping to minimize our exposure to the volcano.

So in the heat of the equatorial Sun, up the lunar-like terrain, we hiked. It was an abnormally hazy day in Indonesia. A five-month-long drought had created dangerously dry conditions. Forest fires raged on the island of Sulawesi to the east, and the trade winds had blown the smoke into the Sunda strait where we were. Farther north, in Sumatra, people were wearing scarves over their faces. In less than a week, a jet would crash, killing all on board.

Meanwhile, as we climbed the side of the volcano, I could see through the haze to another island in the distance. That island was what was left of 1882 Krakatoa, before the big 1883 explosion. Two-thirds of it now missing, it had stretched across the waters to the place where we were now standing. Most of it had been blown into the sky, part of it raining down on the surrounding countryside, part of it remaining suspended in the upper atmosphere where the particles would generate unusually vivid sunsets and lower temperatures around the world for the next several years by reflecting sunlight back into space. In 1927, this "Child of Krakatoa" had risen. It was a volcanic resurrection of the kind which had happened many times and in many

places throughout the world and which had had a huge influence on mythology and religion.

On a slippery, gray, sandy-like mixture of dust and ash that had been expelled from the volcano, we walked, now and then, stopping to stare at the lava bombs. These were rocks of various sizes that had been ejected, on fire, from the volcano. As they landed, they made craters. Most of these lava bombs were small enough to lift. However, some were as big as cars. (See photo.)

White sulfur compounds lay around many of the vents that led to the interior. The eerie silence, the smoking vents, and the lava missiles began to make me uneasy. I recommended we turn back before we reached the summit. The rest agreed.

Heading back to the mainland of Sumatra, the noise from the boat's engine, chug, chug, chug, chug, was deafening. The Earth continued its slow rotation and the sea reached up to touch the Sun. I moved to the bow where one of the young guides was perched, staring out ahead. Looking at the face of the guide, I thought I saw a deep sense of satisfaction. It occurred to me that the volcano held the same fascination for him as it perhaps did for *Homo erectus* two million years ago.



*Standing behind a large lava bomb on the child of Krakatoa.
(Photo by author.)*

5.0 Mount Merapi

1997: Over 6,000 miles from Hawaii, just west of the Pacific Plate and on the Ring of Fire, is the sprawling Indonesian archipelago. Composed of 17,508 islands, it's underlying plate, the Indian-Australian Plate is slowly sinking under the Europe-Asian Plate, with the resulting friction melting the crust which then rises upward to erupt at the surface in the form of 130 active volcanoes.

In the northernmost island of Sumatra, the sixth-largest island in the world, lies majestic Lake Toba, 62 miles long and 19 miles wide. It is the result of a super-volcano eruption about 74,000 years ago, the largest known eruption on Earth in the last 25 million years. The resulting disaster may have killed off much of the human population or at least “may have forced the ancestors of modern humans to adopt new cooperative strategies for survival that eventually permitted them to replace Neanderthals...”³⁵ None of the Europeans and Americans I met in Sumatra, seeking the psychotropic “magic mushrooms” that grow around the lake, knew of this geological history.

Next, I flew south to Java, the 13th largest island in the world, and the political, economic and population center of Indonesia. From there, Hindu-Buddhist, Islamic and Dutch rulers controlled surrounding islands.

Mount Merapi,³⁶ my destination, a dangerous, cone-shaped, stratovolcano—the most active volcano in Indonesia—smolders in the middle of Java near the southern coastal city of Yogyakarta. At 9,550 feet it majestically dominates the surrounding countryside—a Divine King surrounded by ant-like devotees who farm its sides or work in a nearby city of 2.4 million.

A cone collapse in a stratovolcano occurs when the magma chamber empties during an eruption, causing the chamber to collapse creating a dramatic volcanic hazard, such as occurred at Mount St. Helens in 1980. At Merapi, large eruptions due to cone collapse occurred in 1006, 1786, 1822, 1872, and 1930. In the

1930 eruption, 1,400 people were killed by the pyroclastic flows—a turbulent mixture of hot gases and ejecta (volcanic fragments, crystals, ash, pumice, and glass shards) that can move at 50 to 100 miles an hour. If one of these flows engulfs you, it fries your lungs and you die almost instantly.

When I arrived, Merapi was ejecting a constant, pulsating lava flow, which apparently was not dangerous enough to cause an evacuation. I had signed up for a tour of the volcano, but little did I know how close to danger we were going to go. After several hours of driving up the mountain, we came to a base camp which had a cabin where we spent the first part of the night, awakening at 4 am to take a jeep into the “forbidden zone.”



The author in the forbidden zone of Merapi volcano. This ash flow was still warm a few inches beneath the surface.

Although I was initially excited about entering the “forbidden zone,” when we arrived there, my mood became more somber. We walked across ash deposits left by prior pyroclastic flows (see photo of author) which, a few inches beneath the surface, were still warm to the touch. We could not see the peak of the volcano due to cloud cover, but every 20-30 minutes, in what is called “short-term pulsing,” we would hear a distant rumbling noise as lava flowed there.

The guide told us that a pyroclastic flow in 1994 had killed 27 people who were part of a wedding

party. When I told him I was concerned about our safety, he told me not to worry. He pointed to his dog and said that the dog could tell if there was a large eruption coming. I certainly wanted to believe this, but I had my doubts. What I was fairly certain of was that if there was a large pyroclastic flow in our direction we would all die.

I don't believe in prayer. I sometimes meditate. (Some of my friends say I am "listening to God," but I say I am letting my unconscious mind work.) However, I have a Paleolithic brain (in a modern skull). When I think I am in some mortal danger, like that day on Merapi, I sometimes slide away from scientific thinking into more superstitious thinking. So that day, I am embarrassed to admit, I prayed to the Volcano God—to spare us from a hot ash flow. I don't believe that any conscious Entity saved me that day, but I wanted to do *something* besides demanding that the guide return us all to safer grounds. I like to think that these days, 25 years later, I would have resisted this temptation.

I was not the only one who trembled when the volcano trembled. At the base of the volcano are some of the grandest religious temples in the world. Borobudur, constructed in the 9th century and abandoned when Java converted to Islam in the 14th century, is the world's largest Buddhist temple. It is said to represent a "holy mountain." The second-largest Hindu temple in the world, Prambanan, is also a 9th-century temple, dedicated to Brahma (the Creator), Vishnu (the Preserver), and Shiva, (the Transformer). At Prambanan, carved monsters flow out of rock stairways, like lava flowing down a mountain.

As I stood looking at Borobudur, in the shape of a huge mound, and Prambanan, in the shape of a mountain peak, with the real, gargantuan Merapi in the distance, (see photo), it was clear to me that we puny humans, with these structures, had merely mimicked the volcano in a vain effort to somehow flatter, appease, understand, or control it. Our efforts did not succeed. In the huge 1006 AD eruption "the old cone of Merapi collapsed in a cataclysmic fissure eruption which spread a thick blanket of ash over central Java, undoubtedly destroying its fertility for many decades and completely disrupting the drainage pattern."³⁷ The

landscape around both temples is filled with rubble from buildings destroyed. The Hindu Kingdom of



*Prambanan Temple with Merapi
Volcano in distance. Photo by
Arabsalam.*

Mataram collapsed.

Nowadays, some people in the villages surrounding Merapi believe that a Spirit Kingdom lives in a Palace beneath the mountain—complete with roads, soldiers, princes, cows, etc. The Spirits of those who have lived an honorable life now live in this Palace, and they sometimes visit their descendants in dreams to give them warnings.

6.0 The Pharaohs' Volcanoes

If we examine the popular literature concerning Ancient Egypt, we find a plethora of books with unsubstantiated and extraordinary claims. Alien visitations, past lives, flying machines, genetic manipulation, nuclear power, acoustical power, Martian visitation, etc., are some common themes. A recent book explains that Egyptian religion describes an exploding planet between Mars and Jupiter.³⁸

However, some serious and useful scholarship also exists. In 1939, Sigmund Freud wrote *Moses and Monotheism* in which he states that “Jahve,” or Jehovah, was originally a volcano-god. In 1969, Oxford scholar J. V. Luce stated that certain passages in Hesiod’s *Theogony* could “be interpreted as a classic description of a volcanic eruption.” In 1973, Indiana University scholar, Dorothy Vitaliano, in *Legends of the Earth: Their Geological Origins*, strengthened the connection between geology and mythology, when she coined the term “geomythology.” Finally, in 1992, Mott Greene gave a detailed analysis of “Hesiod’s Volcanoes.” He brought Zeus solidly within the field of natural phenomenon by linking him with what is called “volcanic lightning.” This last was an important contribution that I will discuss later.

In this chapter and the next, I give a summary of the research that led me to an astonishing conclusion: *that the Great Pyramids represent volcanoes, and the Pharaoh was put inside the pyramid to be joined with Osiris, God of the Underworld.*

In 1998 there was not much information on the Internet about ancient Egypt. So I had to search through used bookstores and public and university libraries for obscure and ancient texts.³⁹ I still remember the excitement I felt when I found a used copy of Volume I of *An Egyptian Hieroglyphic Dictionary* by E. A. Wallis Budge, and then finally, a few months later, Volume II.⁴⁰

Carved on the walls of some of the pyramids and temples and colorfully painted on nobles' coffins and on papyri are some of the most ancient writings in the world. So although not properly books or texts, these writings have been compiled into texts which are called the “Pyramid Texts,” the “Coffin Texts,” the “Book of the Dead,” and others. Of course, they did not call them “religious” writings—they had no word for “religion.” They were their attempt to symbolize events surrounding them.

Keep in mind that the ancient Nile River Valley people did not have the extensive scientific vocabulary that we now possess. (The Greek word for “hieroglyphs” comes from the two words “sacred” and “carve.”) So although there is currently no word for lava, there is mention of the efflux (outflow) of Osiris, the God of the Underworld.

To begin, let's look at the etymology of “pyramid” and “heaven.”

6.1 Pyramid Etymology

Greek:

The Oxford English Dictionary (OED) gives the ancient Greek origin as πυραμίδ- (pyramid), πυραμῖς (pyromis) and mentions that it possibly derives from πυρός meaning *wheat* or *grain*—as if the pyramids were some kind of ancient granary. However, this seems highly unlikely as the pyramids were not hollow, and, there is plenty of evidence that they were tombs.⁴¹ The OED also mentions that some “ancient authors” thought that *pyramid* derives from πῦρ meaning *fire*, from which we get *pyro-* as in *pyromaniac* and *pyrotechnic*.⁴²

Egyptian:

In the hieroglyphs, *pyramid* was represented by a pyramid (or volcanic?) shape and has been transliterated by some as MR or MER, said to mean a “place of ascendance.”⁴³

However, some “alternative” Egyptologists state that the pyramid was called PR.NTR, or Per-Neter, with Per meaning *house* and Neter meaning *nature*.⁴⁴ Along this line, Budge published a paper in 1903 in which he says “Neter” means: “eternal existence, self-begetting, self-production, primeval matter.” Budge added, “... it is almost impossible not to think that the word has a meaning which is closely allied to the ideas of ‘self-existence,’ and the power to ‘renew life indefinitely.’”⁴⁵

So a pyramid could be associated with 1) fire 2) a place of ascendance and/or 3) primeval matter that has the power to “renew life indefinitely.”

6.2 Heaven

Of course “heaven” refers to the abode of God and angels (Abrahamic religions) or the Gods (Greece and Mt. Olympus), etc. Further derivations are uncertain but include:

- 1) Proto-Indo-European, *h₁k₂men*, meaning “stone, heaven.”
- 2) Proto-Indo-European, *h₂ék₂mō*, meaning “stone” or “heavenly vault.”
- 3) Ancient Greek, *ákmōn* meaning “anvil, pestle; meteorite,”
- 4) Persian, *âsemân* or *âsmân*, meaning “stone, sling-stone; sky, heaven”
- 5) Sanskrit, *aśman*, meaning “stone, rock, sling-stone; thunderbolt; the firmament.” (The English word “hammer” would have a similar derivation.)

So it appears that “heaven” originally might not have referred only to the sky, but also to stone.⁴⁶

We begin to see that both “pyramid” and “heaven” will fit within a geological framework.

6.3 The Nile River Valley

The Nile flows from the south, so as one goes further south one is going *up* into the highlands and mountains of central Africa.⁴⁷ If we follow the Nile River upstream, we progress through all of ancient Egypt. We cross into the Sudan, the land of the ancient Kush, then progress through Khartoum, where the Nile has split into its two main branches, the Blue Nile and the White Nile. We can follow the White Nile into Uganda and the Blue Nile into Ethiopia.

Either way we go, we eventually encounter numerous volcanoes, which are the result of the Great Rift Valley. This geological formation spans most of Eastern Africa and is one of the most prominent geological features on our planet. In Tanzania, this rifting system forms the high volcano Kilimanjaro, dozing these days. In Ethiopia, the rift triggers many volcanoes, including island volcanoes of Lake Turkana and island volcanoes in the Red Sea. Meanwhile, in Zaire (on the border of Uganda), rise the Virunga Mountains—famous home of the mountain gorillas.

This Rift Valley has supplied archeologists with many human and pre-human fossils. Here we find 1) Olduvai Gorge, made famous by Lewis and Mary Leakey, 2) Lake Turkana, where their son, Richard Leakey, helped find “Turkana Boy,” and 3) Hadar, where Don Johanson found “Lucy.”⁴⁸

Many ancient hominids migrated northward to the Middle East, either by following the Nile downward, crossing the Sahara during a “wetter period” between ice ages, or following the coastline of Africa northward. There were probably multiple migrations.⁴⁹ Anthropologist Brian Fagan notes that the Sahara is an enormous pump fueled by constant atmospheric changes and global climate shifts, at times receiving more rainfall than today with accompanying lakes and grasslands. Several times it sucked in human populations from the south—then pushed them out into Europe and Asia.⁵⁰

In any case, some of these ancient people arrived in what we now call the Nile River Valley, bringing with them stories of fantastic fire mountains and the underworld God. They would have wanted to preserve

this knowledge and the pyramids were probably their attempt. (Some scholars have claimed that the ancient Egyptians traveled extensively. If this is true then many other geological areas could have also influenced or reinforced their beliefs. Such areas as the African Rift Valley which includes the Virunga Range, Kilimanjaro, Ethiopian volcanoes, Red Sea volcanoes, and volcano island of Lake Turkana, the Mediterranean which includes volcanoes such as Santorini, Indonesia which includes Krakatoa and many



A typical example of hieroglyphs.

other volcanoes, the Eastern Atlantic which includes the volcanoes of the Azores, the Canary Islands, and Cape Verde, Iceland with its many volcanoes, and Italy with its many volcanoes.

We shall see later that volcanoes in the sea have importance for Egyptian myths. Santorini is a volcano that has been singled out as a possible influence on Egyptian events, including the “Exodus.”⁵¹ For it appears that like Krakatoa, Santorini also erupts periodically, most famously a catastrophic eruption that circa 1650 BCE. Evidence indicates that in the last 360,000 years it has had at least 12 large eruptions “... at least four of which caused caldera collapse.”⁵²

Although I am quite confident of my findings, the topic deserves extended research. I have surveyed much, but not all Egyptian hieroglyphs. Mostly, I have used the “Book of the Dead.” Further research would include a complete analysis of all these volcanoes along with an attempt to match them with Nile River

hieroglyphs. In addition, further analysis of the ancient patterns of ocean trading and ocean migration is needed.

As I have said, I personally visited several volcanoes. On Kilauea, I saw new land being formed and I choked on the noxious smell of sulfur compounds so typical of volcanoes. On the Child of Krakatoa I saw a new island ecosystem forming as the island builds up from the seabed to replace its killer parent which exploded in 1883 and caused 36,000 deaths in the resulting tsunami. On Merapi I had felt the regular eruption every 20 minutes, as if the Earth had a heartbeat. From the air, I saw the entire string of volcanoes from Bali up into Southern Sumatra. In addition, I studied many photographs and accounts of various volcanoes. They taught me, as I believe they taught our ancestors.

6.4 The Unification Theory of Ancient Humans

When Thomas Kuhn wrote his classic work, *The Structure of Scientific Revolutions*, he wondered how Aristotle, a brilliant thinker, could have been so wrong about certain things. In a flash of insight, he realized that he should look at the world through Aristotle's eyes.⁵³ So let us try to do what Kuhn did, look at the world as ancient humans might have seen it.

A blind man develops extraordinary powers of hearing. From the sound of someone's footsteps, a blind person frequently can tell the identity of that person. The cutting off of one sense causes the others to become more acutely aware. The ancient humans, having had no telescopes or microscopes, could not see many of the things that we can see, and were comparatively blind. However, they had the same high-capacity brains as we do, and the same powers of observation. They may have been able to see in ways that we have forgotten.

To consider the minds of our ancestors, we must imagine a completely different world than our own. A world without electricity. In this world, there were only a few sources of light: 1) Sun, 2) Moon, 3) stars

and planets, 4) fire, 5) lightning, 6) sparks from wool, flint, etc., 7) bioluminescent organisms, i.e., fireflies, 8) and lava.

Without electricity, these sources had a much greater importance in the lives of these people than they do in our world. To those of us who have never seen a volcano (especially at night), perhaps we would never think of lava as a source of light. However, to early man, who may have differentiated (evolved) in the volcanic Great Rift Valley, and could see the continuous glowing at night, this lava-fire-light must have been both attractive and fearsome.

In ancient times, people observed the following phenomena which must have engaged the curiosity of our ancestors:

1. Liquid lava turning into solid rock, which today we call a phase change, solidification, or igneous rock formation.

2. Rock breaking down into smaller particles and eventually becoming soil, which today we call weathering and erosion.

3. Lava soil supporting the growth of greenery, which we now understand is due to the influx of seeds, nutrients, and suitable conditions for plant growth.

4. Wood and other organic bodies decomposing and becoming part of the earth, which today we call decomposition, a process facilitated by microorganisms and fungi.

5. Wood and other organic materials, such as dead animals, burning and transforming into mostly invisible gases and ashes, which today we call combustion or oxidation.

6. Water seemingly disappearing into air, which today we call evaporation, a phase change from liquid to gas.

7. Water vapor in the air condensing and falling back to Earth as rain, which today we call condensation, a phase change from gas to liquid.

8. Water changing to ice, which today we call a phase change, solidification, or freezing.

While we may take these changes for granted today, it is fascinating to imagine how ancient humans might have perceived and sought to understand these transformations in the world around them for the first time.

Here is an example (of number 4) from the “Book of the Dead”:

Let not my body become worms, but deliver me as thou didst deliver thyself. I pray thee, let me not fall into rottenness, as thou lettest every god, and every goddess, and every animal, and every reptile, see corruption, when the soul has gone out of them after their death.⁵⁴

From all these observations, the ancient humans formulated the idea (somewhat correct) that the world is made of four basic things: 1) Fire, 2) Earth, 3) Air, 4) Water. (In China this was more developed: fire, metal, earth, wood, water.) The ancients also formulated the idea (somewhat correct) that these things could be transformed into one another.

Of course, it is natural to assume that all sources of light are somehow connected, and I believe this explains much apparent confusion in the hieroglyphic material. One frequently sees mixtures of various entities. For example, one sees “Osiris-Ra,” “Osiris-Horus,” and “Osiris-Geb.” One sees Seth (or Set), the God of Storms and Disorder, being put into Ra's boat. Atum is referred to as “Atum-Ra.” Alternatively, Osiris is associated with the West, and the setting Sun. Often, the newly dead noble will be linked to a God, as in “Osiris-Ani.”

In other words we can see how ancient humans could have imagined these Gods blending with the fire-light that exists beneath the ground as magma. It also explains why sometimes Ra is called the Lord of

All. As the essence of light, he would have been. This then may have been a kind of unification theory of these ancient talking apes: all things can emerge from fire or light.

The ancient writers of the hieroglyphs saw the Sun, Moon, stars and planets rotate in the sky from East to West and disappear in the West beneath the horizon. Then they saw them reappear in the East. They assumed that during that time they were beneath the earth and were *rejuvenated* in the underworld, the world of red magma. The red, setting Sun (called Atum) was linked with the red magma and lava.

For example, the “Book of the Dead” says, referring to Ra: “O thou divine substance, from whom all living things came into being ... thou maker of the things that are ... thou hast produced whatsoever cometh forth from the waters ...”⁵⁵

6.5 The Lava to Soil Breakdown

As I have said, in Hawaii, seeing the creation of land from liquid lava was one of the most profound experiences of my life. Here, I first saw the possibilities of lava origins for all landmasses. In fact, one current estimate is that 80% of the landmasses of Earth came originally from lava flows.

Basalt lava rock weathers rapidly. Some Hawaiian maps have the dates of the past lava flows printed on them (for example, 1919, 1927, 1974, etc.), and one can see the successive breakdown of these flows by gradual weathering according to the following sequence: 1) liquid magma, 2) lava flows that look like gigantic, instant-frozen, black and purple river rapids, 3) large boulders, 4) smaller boulders and rocks and finally, 5) rich, volcanic soil. The older dates, of course, had the most weathering.

6.6 The Volcanic Resurrection

Our ancestors also observed volcanoes in various stages of creation or erosion. For example, as I have also

said, on the island of Hawaii, if one starts with the Big Island and moves west through Maui, Lanai, Molokai, Oahu, and Kauai, the islands become older as evidenced by the progressive erosion by wind and ocean, so that while the Big Island (Hawaii) has a peak elevation of 13,800 feet, Kauai has a peak elevation of only 5,200 feet. Eventually Kauai will become just a coral reef and then entirely disappear beneath the sea and a new island will arise to the east of the Big Island.

Thus, these ancient scientist-priests put together (correctly) the following sequence:

- 1) lava rising up out of the sea, lake, or land,
- 2) the lava cooling to become solid rock,
- 3) the lava rock being slowly worn down into rich, fertile soil,
- 4) the rich, fertile soil nurturing plants and animals,
- 5) the volcano eventually being worn down (to a coral island or extinct cone), or the volcano exploding and destroying almost everything around it, and, in many cases,
- 6) a new volcano rising to replace the old one (as with Santorini and Krakatoa).

6.7 The Volcano Krakatoa

In the middle of the Sunda Strait, the “Child of Krakatoa” first appeared above the ocean in 1927 amid the remains of the 1883 explosion. Krakatoa may have violently erupted as many as 10 or 12 times in the last 950,000 years.⁵⁶ Each time this happened, a new volcano then grew in the place of the exploded one.

On the newly formed volcanic island, a lush ecosystem slowly blossomed forth from undifferentiated rock and ash.⁵⁷ We can imagine ancient scientist-priests, over thousands of years, observing this establishment of life on Krakatoa, Santorini, or on volcanoes at other locations throughout the Mediterranean, in Lake Turkana in Africa, in the Caribbean, or in Iceland.

Modern biologists are extremely interested in seeing how the ecosystem is reestablished on volcanic islands. They ask themselves these questions: 1) What are the first species to arrive? 2) How do they get there? 3) How long does it take them to establish themselves on the island?

However, our ancestors at first were not aware that life came to exist on these islands from the other islands. They might not have seen the arrival of a seed, which was inadvertently dropped by a bird. To them it might have seemed as if life *spontaneously* appeared on a volcanic island. It must have seemed as if this were the way that creation took place. First, an island rising from the ocean, and then life appearing magically on the island.

Tens of thousands of years or more of observations of volcanoes may have allowed ancient humans to develop a proto-science (quite accurate in some respects) that described for them the creation and destruction of life. To these people, God was the Volcano God. This God lived inside the Earth. In the Nile River Valley civilization, this God was Osiris, God of the Underworld.

Also, the ancient humans saw the huge out-gassing from volcanoes and may have guessed (correctly) that the Earth's atmosphere (Shu) came from the inside of the volcano.

6.8 The Recycling of Life

Observations of astute scientist-priests enabled them also to guess (somewhat correctly) that, besides a lava-soil phase change and a volcanic resurrection, a life *recycling* also exists. In this cycle:

- 1) Plants grow on the rich volcanic soil that arose from the depths of the earth.
- 2) Animals eat the plants on the rich lava-soil.
- 3) The animals live out their lives, die and decompose (disappear) back into rich lava-soil.
- 4) A new eruption takes place and plants and animals repopulate.



New life beginning to spread on the child of Krakatoa. Photo by author.

Thus, the idea of reincarnation or rebirth may have begun. Actually, this reincarnation (literally “again-body”) *does occur* as the biosphere recycles the various elements of the body (oxygen, hydrogen, carbon, nitrogen, etc.) into the soil, atmosphere, etc., and new bodies can then be formed from these elements (as directed by the genetic recipe). Of course embalming or mummification can delay this recycling process.

Unfortunately, reincarnation is popularly misinterpreted so that many people think their individual personality is reborn. *We now know that the personality is a result of unique genetic and environmental factors.* These genetic and environmental factors will never be the same for any two individuals. Thus, you are unique and you can't be “reborn” in this fashion.⁵⁸

The Egyptian “Book of the Dead,” in which the dead person is given instructions to prepare them for being reborn (“coming forth by day”) is a good example of the early thinking about reincarnation which later became more sophisticated in India and elsewhere. It is also an example of a society trying to ritualize and control this natural process of decay and recycling. (More on this later.)

Furthermore, these ancient humans deduced that some simple forms of life changed into “higher” forms of life. For example, in India it was thought that if one was “good” one could “reincarnate” as a “higher” life form.

6.9 Species Differentiation

Apparently a tropical volcanic island makes a wonderful natural laboratory which can inspire even modern scientists.

For example, Alfred Russel Wallace, who, independently of Darwin, derived the theory of species differentiation, was moved to hypothesize *natural selection* after visiting Indonesia and seeing its multitudinous life forms. Darwin himself wrote his classic books after seeing the differentiated life forms of the volcanic Galapagos Islands of the South Pacific. Both Darwin and Wallace had witnessed the various differentiated life forms of tropical, volcanic islands before formulating their ideas on how many species came to exist.

Perhaps the theory might have come earlier, but European thinking was hampered during the Dark Ages by a literal interpretation (in other words, misinterpretation) of the Bible, one that still exists today in religious dogma. Humans had been artificially selecting certain plants for cultivation and certain plants among those plants, for many thousands of years and a similar selection and elimination by nature of all life forms in the wild would have been the next idea.

6.10 Atum and the Primeval Mound: A Volcanic Creation?

In the creation story of the ancient Nile River Valley civilization, it talks about the First Time. This was a time in the ancient past when creation occurred. At this time, Primeval Waters extended in all directions. From out of the Primeval Waters arose the Primeval Mound (also called the First Place or Primeval Throne). Atum was the First God who created himself. R.T. Rundle Clark, a noted British Egyptologist who wrote during the late 1950s, states that the land is like a “spitting forth” from the waters, or a “spitting serpent,”

“signifying outflow or exhalation.” “O Atum! When you came into being you rose up as a High Hill ... Hail to you, O Becoming One who came into being of himself ... You spat forth as Shu, you expectorated as Tefnut.”⁵⁹

Shu is the God of the air. Tefnut is Goddess of moisture, a lioness-goddess, who may represent hardened lava, which can take strange shapes, perhaps like a lion.

Of course, these descriptions are similar to the rising of the Child of Krakatoa in 1927 in the Sunda Strait, and the rising of Surtsey near Iceland in 1963. Also, the hieroglyphs mention the Phallus of Ra, which was also probably a volcano. From the Book of the Dead: “Hail, Phallus of Ra, which advanceth and beatest down opposition ... the Phallus of Ra [which is] the head of Osiris.”⁶⁰ And from the Papyrus of Nebseni: “Now, he whose mouth shineth and whose head moveth is the phallus of Osiris, but others say it is of Ra.”⁶¹

6.11 The Cosmic Egg

Where did the Primeval Mound come from? From something called a Cosmic Egg beneath the waters.

R.T. Rundle Clark says, “The egg was invisible, for it took shape before the appearance of light. In fact, *the bird of light burst forth from the egg.*”⁶² (my emphasis)

Here are some more relevant sections from the “Book of the Dead”:

- I am the equipped Ba (soul) who is in this egg of the Addju-fish (form of Horus) I am the Great Cat who is in the Place of Truth in which the light shines forth.⁶³
- ... on the day when the sky was choked and stifled, when the Rejected One panted for breath in vivifying Him who was in the Egg ...⁶⁴
- ... it (the Egg) opens with fire, and its breath is destruction to noses and nostrils.⁶⁵
- I keep watch over the Egg ... I grow and flourish [as] it grow and flourish.⁶⁶

So the early humans probably thought that their universe (the earth and its lights in the sky) started somewhat like many things in nature—from an egg. The crust of the earth was to them like the shell of an egg. When a volcano emerged from this crust, and lava spilled out of it, it was as if the egg shell of the Earth had broken open, allowing fire/light and the atmosphere to be released and life to emerge.

6.12 Osiris (Asar): God of Geological Forces?

Not blinded by metaphysical, abstract, spiritual, mystical or extraterrestrial interpretations, it may seem obvious to some people that Osiris, the God of the Underworld, was what I have called volcanic underworld God (the God controlling lava, magma, fire-ash flows, mud-flows, lava bombs, etc.).

Although most people have heard of Ra, the Sun God, Osiris was more important. As evidence of this, Samuel A. B. Mercer, a noted Egyptian scholar, writes that in the Pyramid Texts, in the earliest hieroglyphs, the name Ra occurs more than 250 times, whereas the name Osiris appears almost 300 times.⁶⁷ E.A. Wallis Budge says of him, “... for about four thousand years he remained the great type and symbol of the resurrection ... at no time in Egypt’s long history do we find that the position of Osiris was usurped by any other god.”⁶⁸ Of course, as I mentioned at the beginning of this chapter, there seems to have been a kind of blending of the Gods into Light-Fire. Of course, as I mentioned at the beginning of this chapter, there seems to have been a kind of blending of the Gods into Light-Fire. S.G.F. Brandon notes that the kings of Egypt were associated with Osiris in death – as Osiris rose from the dead so they would be in union with him, and inherit eternal life through a process of imitative magic.⁶⁹

Furthermore, Budge notes that the earliest hieroglyphic form of the name “Osiris” was two symbols. A seat or throne and an eye. It may be that the throne refers to a volcano, and the eye to the central vent of

the volcano. In other words, the smooth surface of the Earth is punctuated by a rising mountain, which could be considered a seat or throne of a God.

Here are two relevant quotes: 1) The Two Lands flourish in vindication because of you in the presence of the Lord of All [Ra] ... [Osiris] took possession of the Two Lands even in the womb of Nut [the sky Goddess]; he rules the plains of the Silent Land ...⁷⁰ 2) May [Osiris] grant power ... to go in and out without hindrance at all the gates of the Duat.⁷¹

The “Duat” here is the Underworld. The “gates of the Duat” are the central vent or other vents leading down into the Underworld. The “Silent Land” may refer to the area beneath the surface of the Earth. This is probably one of the “Two Lands.”

In addition, it should be noted that the name, “Book of the Dead,” is modern slang. Its real name is the book of “going forth by day” (per em hru) or “going forth into the light.” In other words, the book of being reborn. The newly dead person must meet with Osiris. He must undergo the “Weighing of the Heart” ceremony, in which his heart is weighed on a balanced scale against the feather of Maat (truth, justice). Then, the hieroglyphs say, “May he [the dead person] come in freely, may he go out in peace from the House of Osiris, without being expelled or turned back.”⁷²

Moreover, in Chapter 147, it talks about the *efflux* (outflow) of Osiris. The newly dead person says to Osiris, “I have come before you, the one purified by the efflux within you ...”⁷³ Also, referring perhaps to lava flow is this excerpt from Chapter 63B, “I am that equipped oar with which Ra is rowed when the Old Ones are rowed and the efflux [outflow] of Osiris is upraised at the Lake of Flames which does not burn.”⁷⁴ The efflux (outflow) of Osiris would be the lava, of course, and the Lake of Flames is undoubtedly the lava lake in the volcanic crater, such as existed in modern times at Nyiragongo, near the source of the Nile.

Furthermore, according to Wallis Budge, the priests at Heliopolis kept a sacred object known as the efflux of Osiris in a sealed box. The Coffin Texts, Spell 1080, say: “This is the sealed thing which is in

darkness, with fire about it, which contains the efflux of Osiris.” It's likely that the priests had collected some lava (which of course then would cool to form volcanic rock).

What's more, in Chapter 151, “Book of the Dead,” we have an interesting combination of Hapy and Osiris: “I am Hapy, your son, O Osiris Ani [Ani is the newly dead scribe and it is common to connect him with Osiris as much as possible] I have come that I may be your protection and that I may knit together your head and your limbs ... I have given you your head eternally.”⁷⁵ Lava, of course, would be a way to “knit together” islands that have been separated by a volcanic explosion. The “head” here may refer to the topmost portion of the volcano. Hapy, usually translated as the God of the Nile, sounds here like liquid lava rather than liquid water.

Also relevant, here are two additional quotes about Osiris: 1) “Ho! Fear and Tremble, you Violent Ones who are on the storm-cloud of the Sky! He (Osiris) splits open the earth by means of what he knew when he wished to come thence. (Pyramid Texts, Utterance 254.)” 2) “... who were witnesses to resurrection when the corpse of Osiris entered the mountain and the soul of Osiris walked out shining ... when he came forth from death, a shining thing, his face white with heat. (Book of the Dead, Brandon Ellis translation).”

Finally, this “Book of the Dead” excerpt undoubtedly refers to a volcanic eruption: “...bring me the ferryboat ... in order to escape from that evil land in which the stars that fall upside down upon their faces and are unable to raise themselves up.”⁷⁶ The “stars that fall...and are unable to raise themselves” are, most likely, lava bombs.”

This last reference, and all the previous references, were very exciting to me, tending to confirm the theory. Like a detective, I was following a string, and was determined to follow it wherever it might lead. However, I had no idea that what I was about to find would amaze me even more, and have repercussions far beyond ancient Egypt.

7.0 Volcanic Lightning Bolts

Generally speaking, the imagery of Greek mythological descriptions, of battles between Gods and Giants owes something to volcanic phenomena.

Professor Luce, Dublin University

Before we get to the key finding of this chapter, volcanic lightning, let's examine some other ideas and observe how they fit into geological framework.

7.1 Lake of Fire

As I mentioned, the hieroglyphs mention several times a "Lake of Fire" or "Lake of Flames." In modern Africa we have the Virunga Mountains (Smoking Mountains), just west of Lake Victoria near the source of the Nile. There are eight great volcanic cones more than 10,000 feet high: Nyamulagira, Nyiragongo, Mikeno, Karisimbi, Vishoke, Sabinyo, Gahinga and Muhavura (M'fumbiro). Only Nyamulagira and Nyiragongo still are active, and eruptions and lava flows are frequent.

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In addition, one of them, Nyiragongo, usually has a liquid lava pool in its main crater, which at one time was three-fourths of a mile across and 460 meters deep. In 1977, this liquid lake of fire drained out of its base in less than an hour, causing destruction of forests, farms and roads, and killed 70 people.⁷⁷ Another volcanic lake in the Afar region of East Africa has been active for the last 90 years. It is quite possible that volcanic lakes from this region influenced the Nile River Valley settlers.⁷⁸

7.2 Island of Fire

The hieroglyphs also frequently mention an “Island of Fire.” For example, from the “Book of the Dead”: “O you who bring the ferryboat of Ra, strengthen your rope in the north wind. Ferry upstream to the Island of Fire beside the realm of the dead.”⁷⁹ Additionally, here is another excerpt from the Coffin Texts, Spell 316: “Look with your faces, O God of eld! O Primeval Ancestors! upon this spirit who comes today, taking the form of a beam of light, coming up from the Isle of Fire. “I have to raise my hand to shad myself, for fear of the fire in her mouth,” says one of the elder gods.”

Where might this be geologically? Lake Turkana is one of the shallow lakes formed as part of the eastern portion of the Great African Rift. There are three volcanic islands in this lake: North Island, Central Island and South Island.

Furthermore, there also have been volcanoes appearing in the Red Sea. Of course, “Island of Fire” could also refer to any of the many volcanoes throughout the world that the Egyptians may have seen or heard about in the Mediterranean Sea, in the North Sea, or in the Atlantic or Indian Ocean. Note this: “Osiris, the greatest of the gods. I have given unto him the region of the dead. And verily, his son Horus is seated upon the throne of the Dweller in the fiery Lake, as his heir.”⁸⁰

7.3 Natron Lake

Natron is a mineral salt found in dried lake beds. The hieroglyphs refer to a Natron Lake, and there exists a “Lake Natron” (that’s its real name) in Tanzania near the famous volcano Kilimanjaro. The lake is the result of geological forces in the East Africa Rift System. It is important to also note that the Egyptians used natron in their embalming process.

7.4 Turquoise Lake

The hieroglyphs mention a turquoise or blue-green lake, and this color of lake is frequently seen in the craters of volcanoes throughout the world.⁸¹ Yellow sulfur from the volcano gives the lakes this greenish color.

7.5 Great Lakes

The hieroglyphs mention “great lakes,” but there are no great lakes in Egypt. So this undoubtedly refers to the African Great Lakes created by the African rift system, which include Lake Victoria, named after Queen Victoria, and contributing the bulk of the water for the longest branch of the Nile,⁸² as well as Lake Albert, Lake Edward, Lake Kivu, Lake Tanganyika and Lake Malawi.

7.6 Djed (or Tet) Pillar

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I think this column or backbone of Osiris was the “volcanic needles” that have been seen at the sites of volcanic eruptions,⁸³ in which a large chunk of lava is suddenly thrust upward. Here is an excerpt from the “Book of the Dead”: “The Djed column saith: I have come quickly, and I have driven back the footsteps of the god whose face is hidden. I have illuminated his sanctuary. I stand behind the sacred Djed on the Day of Repulsing Disaster. I protect Osiris.”⁸⁴

7.7 Serpents

Wadjet was the serpent Goddess. The “Book of the Dead,” says [my comment].

The goddess Wadjet comes to you in the form of the living Uraeus [sacred snake] to anoint your head with her flames. She rises up on the left side of your head and she shines from the right side of your temples without speech; she rises up on your head during each and every hour of the day, even as she does for her father Ra, and through her the terror which you inspire in the spirits is increased ... she will never leave you.⁸⁵

Later, there is also mention of a “Primeval Serpent,” and throughout the ancient hieroglyphs there is frequent mention of serpents. These references undoubtedly pertain to magma, lava flows, earthquakes and ash flows, and even modern volcanologists sometimes describe winding lava flows as serpent-like. Also, Ra himself is shown on his hieroglyph surrounded by a serpent. (I also saw many statues and paintings of Buddha throughout Asia sitting on a lotus leaf and underneath him was a large serpent.)

In addition, here is a reference from Chapter 175 of the “Book of the Dead.” Here we see the ancient fire-light as represented by Atum transforming into a serpent under the Earth. Ani, the recently dead scribe,

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asks Atum, the red Sun-God at its setting, how long he will live. Atum answers [my comments]:

You shall be for millions on millions of years. I will dispatch the Elders [the ancient Gods of the volcano?] and destroy all that I have made; the earth shall return to the Primordial Water, to the surging flood, as in its original state. But I will remain with Osiris, I will transform myself into something else, namely a serpent, without men ever knowing or the gods seeing ... I have given him [Osiris] the desert, and his son Horus is the heir on the throne which is in the Island of Fire.

Also of note is Apep (or Apophis), the God of Chaos, who appears as a serpent in the Underworld. Ra would descend into the Underworld in the West, in the Sacred Bark, in the evening, where he would do battle with Apep, who would try to destroy Ra. However, Ra would emerge victorious in the East in the morning.⁸⁶

Furthermore, as a snake can shed its skin and grow new skin, so can a volcano explode into the atmosphere and then grow a completely new “skin” or earth-crust. So, as snakes live underground, these serpents (or dragons or snakes) are references to the underworld and the lava that comes out of the underworld.

Living in Southern California for over thirty-five years, I frequently was jolted by powerful earthquakes and their aftershocks. One cannot help but feel that there exists some powerful entity deep underground. So it is easy for me to see how ancient humans could have imagined this to be a Primeval Serpent.

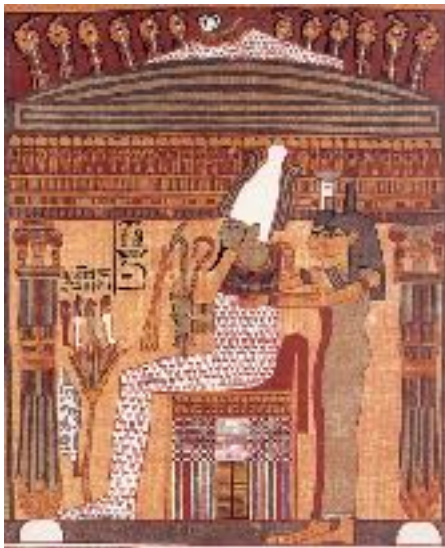
7.8 The White Crown: Volcanic Sulfur Deposits

Osiris often is shown wearing a white crown. No one really knows what this white crown represents, and one

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has never been found in any excavation. However, certain pictures of Osiris wearing a white crown look like he is under a volcano. (See image.)

In 1997, on the Child of Krakatoa in the Sunda Strait, our party explored many volcanic openings or vents, called “fumaroles.” (See photo.) The vents give off white sulfur gases, which precipitate a white, powdery substance that is sulfur, as well as sulfuric acids combined with minerals. You can see this happening during the December 2021 eruption of the La Palma Volcano.⁸⁷ (Although pure sulfur is yellow, and many volcanos generate yellow sulfur, the sulfate minerals known as anhydrides can give this powder its white color.)



Osiris wearing white crown beneath volcanic-like structure. Facsimile by Budge 1890, original artwork created c. 1300 BC.



White sulfur compounds venting from the child of Krakatoa. Photo by author.

The white deposits, lying near the vents and the crater, look like a white crown. Our ancestors may have investigated this white substance and developed knowledge of its uses. In support of this, the “Book of the Dead” says, “I am the possessor of the Wereret-crown [White Crown], the assistant of the magicians.”

An alchemist *would* be considered a magician. Also, sulfur is one of the basic ingredients of black powder (later called gun powder). Magicians, even today, frequently are associated with some type of fire-powder or flash-powder.

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Today, sulfur is considered one of the four basic raw materials of the chemical industry. I believe that those sulfur deposits, such as the white crown of Osiris, led to alchemy, which later became chemistry.

7.9 Volcanic Lightning

While researching I discovered Mott C. Greene's book, *Natural Knowledge in Preclassical Antiquity*. Mott Greene is a professor at the University of Puget Sound in Seattle, and a MacArthur Fellow. In his book, he suggests that important passages in classical Greek texts are linked with certain volcanic eruptions in the Mediterranean.

Specifically, Greene discusses Hesiod (eighth century BC), a famous Greek author who wrote a work called *Theogony* (The Origin of the Gods). In this book, there is an important battle between Zeus and the Titans, which is called the Titanomachy. The Titans had ruled the cosmos, but after this battle, Zeus and his allies ruled.

Greene shows convincingly that this battle was the huge eruption of the volcano Santorini around 1650 BCE. He discusses an important point: "the arrival of Zeus at the climactic moment."⁸⁸

I equate lightning with thunderstorms, like the ones that I saw rolling across the plains of North America when I was a child. I had no idea that lightning also could be associated with volcanoes. Even the general populace, being somewhat familiar with volcanoes from television documentaries, does not tend to associate lightning with a volcano.

So, it was a revelation to me to see the documentary "Ring Of Fire: East Of Krakatoa (1998)." Two brothers who spent 10 years traveling through Indonesia made the documentary. In the video (available online now), we see Krakatoa, in the middle of the Sunda Strait, *with a clear, blue sky overhead*. Yet, as the



*From our boat, white sulfur compounds are visible on the "child of Krakatoa."
Photo by author.*

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volcanic ash and smoke rise from the crater, we can see *lightning flashing down* into the crater of the volcano.

When I first saw this I was electrified (pun), for it was the first time I had ever thought of Zeus linked to a volcano rather than a thunderstorm. A big piece of the puzzle fell into place. Zeus, you may remember, has the weapon of lightning (and its resulting air shock wave called thunder).

The volcano-lightning phenomenon is discussed in some detail in an important article appearing in the journal *Science*, in 1965, entitled, “Electricity in Volcanic Clouds.” European and US scientists studied this volcanic lightning on the volcano island, Surtsey, which first rose above the ocean near Iceland in 1963. I have since investigated a number of volcanoes and have found that volcanic lightning occurs frequently during eruptions. For example, volcanic lightning has been observed at the eruptions of Krakatoa (1883), Vesuvius (1906), Heimaey (1973), Mount St. Helens (1980), Redoubt (1990) and at other volcanoes.⁸⁹ (You can nowadays find many dramatic photos and videos of volcanic lightning in recent eruptions online.)

Apparently, as the ash and gas are ejected into the sky by the volcano, a positive electrical energy charge is formed due to friction with the air, much as when you rub your socks across a rug. The lightning then *discharges* this energy (like when you touch a doorknob).⁹⁰

Greene says that this gives the appearance of “lightning bolts being hurled into the mouth of the crater across a distance of several kilometers.”⁹¹ Again, remember the sky is blue and there are no clouds except the rising ash cloud from the volcano.

7.10 Ancient Misinterpretation

Greene shows the correspondence as the events progress:⁹²

1. A long war has already been fought between the Olympiads and the Titans before this engagement. Premonitory seismicity.

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2. Both sides gather strength for a final encounter; Zeus's allies, the "hundred-handers," grasp massive rocks. Increased seismic activity.

3. There are terrible echoes from over the sea. First phase explosions.

4. The ground rumbles loudly. Tectonic earthquakes.

5. The sky shakes and groans. Air shock waves.

6. Mount Olympus trembles all over at the moment of contact of the opponents. Great earthquakes.

7. There are steady vibrations of the ground — like the stamping of innumerable feet running.

Earthquakes.

8. Weapons whistle through the air. Pyroclastic ejecta, massive rocks thrown.

9. Loud battle cries are shouted, reaching up to the high heavens. Explosive reports.

10. Advent of thunder and lightning signal the arrival of Zeus — a solid roll of sacred fire. Fertile fields crackle and burn. Forests roar with fire. Volcanic lightning, heat of fine-grained volcanic rocks.

11. Earth and ocean streams and barren sea begin to boil. Magma chamber breach.

12. An immense flame shoots up into the air, enveloping the Titans in a blast of hot air, apparently as a blindingly bright flash, and as prodigious heat. Phreato-magmatic explosion.

13. The sight and sound are so enormous that one would think the sky had collapsed onto the Earth and smashed it. Sound of above.

14. Arrival of wind-born dust with lightning and thunder, with a deafening uproar. Final ash eruptions.

15. Titans are buried under a cloud of missiles and bound beneath the Earth. Collapsed debris.

"In other words, at the climatic breach of the integrity of the magma chamber at Thera [Santorini], huge volleys of volcanic lightning immediately preceded the final phreatomagmatic collapse of the caldera

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with its associated heat and noise — and the end of the Titans, giving rise to the interpretation (in Hesiod) that Zeus’s intervention was decisive. The volcano exhausts itself and disappears beneath the ocean, the Titans are bound beneath the earth: end of the Titanomachy and arrival of the hegemony of Zeus.”⁹³

Today, we have workable models of friction, electricity and lightning, and we describe the events from the standpoint of those models. We know the volcanic eruption *causes* the lightning. Ancient humans saw the volcanic lightning as an independent event rather than caused by the eruptive particles. They thought that the inevitable *collapse* of the volcano (the defeat of the Titans), due to the emptying of the magma chamber, was *caused* by the volcanic lightening of Zeus. To them, it appears that Zeus had won the battle.

Greene’s astute analysis of the final events gave me the key I needed to understand an important element of the ancient Egyptian texts.

Hieroglyphs (or their translations) can be a confusing array. However, Egyptologists agree that they refer to two main battles in their past. Battle I was Osiris versus Seth. Battle II was Horus versus Seth. Seth won the first battle, and Horus won the second.

Hieroglyphs	Combatants	Winner
Battle I	Osiris vs. Seth	Seth
Battle II	Horus vs. Seth	Horus

7.11 Battle I: Osiris Versus Seth

This first battle was one of the most ancient after the rise of the Primeval Mount from the Primeval Waters. In the geological interpretation, Osiris would represent the volcano and Seth the volcanic lightning. Seth

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wins and Osiris is blown to bits and scattered as occurred in the Greek event analyzed by Greene. Mercer calls this event “one of the most central and important elements in ancient Egyptian thought.”⁹⁴

Also, Budge notes one erroneous version of this event by Plutarch (that has been widely quoted) in which Osiris is tricked into lying in a box and later cut into pieces.⁹⁵ However, even this version agrees with the mutilation of Osiris.

What’s more, Seth is usually referred to as the God of Storms. The “Book of the Dead,” says: “...for I am Seth, who sets up the storms and thunder within the horizon of the sky, like a fury.”⁹⁶ So the Osiris-Seth battle was similar to the Titan-Zeus battle. In both cases, the God of Storms (Seth or Zeus) is the victor over the volcanic forces (Osiris or Titans).

This event was undoubtedly an ancient eruption of a volcano in a sea or a lake, possibly similar to the 1883 Krakatoa eruption-explosion or ancient Santorini eruption-explosions. The “Book of the Dead” may even mention the parts of Osiris that were blown away. Chapter 18: “...it was when there was the burial of the forearms, the flanks, and the thighs of Osiris.”⁹⁷

Thus, it appears that the entire *midsection* of Osiris was destroyed. If one looks at a diagram of Krakatoa before the 1883 eruption it has a curious similarity to the V-shape of a man’s body. Remarkably, similar to the Osiris legend, it was mostly the midsection of this “body” that was blown away in 1883. (However, other hieroglyphs mention other body parts.) I am not saying that the specific volcano in question was Krakatoa. It may have been Santorini, or another, or both. Just as in the case of the child of Krakatoa, a child of Osiris appeared whose name is Horus. Isis, the sister of Osiris nurtured Horus in secret. So the new volcano, Horus, slowly grew, hidden beneath the water as a child is hidden in the womb.

Important to this event, and our geological interpretation of it, is Chapter 108 of the “Book of the Dead.” It appears this chapter of the Book of the Dead may be an accurate description of an ancient volcanic explosion. Here is the first part: [My comment in brackets.]

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As for that mountain of Bakhu on which the sky rests, [The Egyptians had a western peak and an eastern peak, Bakhu, which supported heaven. The Greek God Atlas probably derives from this.] it is in the east of the sky; it is three hundred rods long and one hundred and fifty rods broad. Sobk, Lord of Bakhu, is in the east of that mountain; his temple is of carnelian [a reddish variety of quartz]. A serpent is on the top of that mountain; it is thirty cubits long, eight cubits of its forepaws are of *flint*, and its teeth *gleam*. I know the name of this *serpent* which is on the mountain; its name is, ‘he who is in his burning.’⁹⁸

Its temple is “red” like lava, forepaws are like flint (which is a spark-producing and a fire-producing rock), it’s teeth “gleam” like lava, and its name is “he who is in his burning.” The glyphs go on with a key part:

[My comments in brackets.]

Now after awhile he [the serpent] will turn his eyes against Ra, and a stoppage will occur in the Sacred Bark [the boat that carries Ra, or disk of the sun] and a great vision among the crew [the other gods with Ra], for he will swallow up seven cubits of the great waters; Seth will project a lance of iron against him and will make him vomit up all that he has swallowed.⁹⁹

So here we see Ra, in his nightly journey through the Underworld, meeting the serpent, Apep, during their nightly battle. Ra swallows up the great waters, but then vomits it all up.

Geologists still debate the exact manner in which Krakatoa exploded in 1883.¹⁰⁰ However, one widely accepted hypothesis is the “collapse hypothesis.” In this hypothesis, the emptying of the magma chamber causes the collapse of the island, the seawater rushes in, contacts the magma, and is vaporized in

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what is called a “phreatomagmatic” explosion (phreatic = ground water, so phreatomagmatic = ground water + magma). Greene describes this as like the “explosion of a giant steam boiler.”¹⁰¹ Rupert Furneaux, in the 1964 book *Krakatoa*, presents this reconstructed scenario of the 1883 eruption:

At ten o'clock plus two minutes, three-quarters of Krakatoa Island ... collapsed into the chasm beneath. Nineteen hours of continuous eruption had drained the magma from the chamber faster than it could be replenished from below. Krakatoa's three cones caved in. The sea bed reared and opened in upheaval. The sea rushed into the gaping hole. From the raging cauldron of seething rocks, frothing magma and hissing sea spewed an immense quantity of water. Up from the volcano shot huge rocks. A cloud of dust and debris rose high in the sky ... It was blacker than the blackest night. [Also later in the text:] Sky streaked with lightning.

If we compare Furneaux's Eruption Report with the Book of the Dead Report, we see a remarkable similarity:

1. Book of the Dead Report: The serpent swallows up seven cubits of the great water. Eruption Report: The sea rushed into the gaping home.
2. Book of the Dead Report: Seth will project a lance or iron at him. Eruption Report: Sky streaked with lightning.
3. Book of the Dead Report: Seth will make him vomit up all he has swallowed. Eruption Report: Spewing an immense quantity of water; up from the volcano shot huge rocks.

7.12 Battle II: Horus Versus Seth

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For Battle II, Horus versus Seth, noted Egyptologist R. T. Rundle Clark gives this nine-step sequence:¹⁰²

1)Horus and Seth fought for supremacy. 2) The adventures of the Eye of Horus and the testicles of Seth. 3)Thoth persuaded the two contestants to take their dispute to the Council of Gods. 4) Horus was awarded supremacy and crowned king. 5) Seth became the God of Storms and was put into the boat of the Sun God. 6) Horus (or his representative) went down into the underworld to see Osiris. 7) Osiris was given the Eye or the good news that Horus was king. 8) The soul of Osiris was liberated. 9) The reign of Horus.

Here, instead of one huge, cataclysmic event, Battle II lasted some 80 years.¹⁰³ One is again reminded of the Child of Krakatoa appearing above the waters in 1927. As this new volcano erupts and continues to grow each year (about 92 years as of 2020), one can intermittently see the volcanic lightning, as the two brothers mentioned above saw it. One can understand how our ancestors could have thought of this volcanic island, or another, as a “battle” between the God of Storms, the lightning, and the God of the Volcano, the lava.

In addition, the “Eye” is seen frequently in hieroglyphs. As I have said, the Eye, like the “mouth” or “head,” probably is a representation of the crater of the volcano. In the “Coffin Texts” we find Thoth saying this: “I came seeking the eye of Horus, that I might bring it back and count it. I found it complete, counted and sound, so that it can flame up to the sky and blow above and below.”¹⁰⁴

Moreover, at one point of this second battle, Seth destroys the Eye of Horus for a time. In Chapter 112 of the “Book of the Dead,” Budge notes that Seth transformed himself into a black pig: “Horus looked at the black pig into which Seth had transformed himself, and at once received a terrible blow of fire in the eye, and through the whirlwind of fire which followed it the eye was destroyed.”¹⁰⁵ My interpretation is that the “black pig” was the black cloud of the volcanic eruption, and the “blow of fire” was the crashing of a huge lightning volley into the crater, or eye, at the same time that the crater collapsed and was blown to

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smithereens in the *phreatomagmatic* explosion that followed.

The Eye of Horus is later restored, just as we would expect of an active and growing volcano.

Chapter 17 of the “Book of the Dead” describes it [comments are Budge’s]:

The combat that took place on the day when Horus fought with Seth, during which Seth threw filth in the face of Horus, and Horus crushed the genitals of Seth. The filling of the utchat [the restoration of the light to the eye of Horus] Thoth performed with his own fingers. I remove the thunder cloud from the sky when there is a storm with thunder and lightning therein. What is this? This storm was the raging of Ra at the thunder-cloud which [Seth] sent forth against the right eye of Ra.¹⁰⁶

We again see the thunder and lightning, which easily could be the volcanic phenomenon we have discussed. My interpretation is that ancient humans thought that Seth caused the black clouds of ash and dust that rose out of the volcano, accompanied by volcanic lightning. They felt that Ra disliked this black cloud, as during a major eruption it would block out the Sun (Ra) for days. Also, it is possible that the crushing of the “genitals of Seth” refers to the fact that genitals in a male are responsible for the deep voice. This deep voice may have been the thunder associated with Seth. When Seth is defeated then, in effect, his genitals are crushed. Finally, Horus and Seth are brought before the council of Gods, and Thoth (the God of learning, writing and knowledge) intervenes on behalf of Horus. The volcano entered a period of dormancy.

7.13 The Resurrection of Osiris

As Clark mentions, Osiris is given the Eye of Horus. We have Osiris being, in essence, resurrected as Horus. Budge says, “Horus first came to Osiris, who was in the state of a dead man, and embraced him. By this

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embrace he transferred to him either his own Ka (double) or a portion of the power which dwelt in it.”¹⁰⁷ Later, “... when Osiris received it [the eye of Horus], he received into himself a soul, that is a new life, or revivification ... Osiris was made to live a second time.”¹⁰⁸

Also, in Budge’s book, *Osiris and the Egyptian Resurrection*, we have the following passages from the ancient hieroglyphs of Teta (Teta here is the newly dead person who is linked to Osiris): “Hail, thou Osiris Teta, stand up! Horus cometh ... Horus loveth thee. He hath filled thee with his Eye, he has joined his Eye to thee ... He hath given thee his Eye which flourisheth lastingly. He hath given thee thy weapon, thou has conquered all thine enemies. Horus has filled thee wholly with his eye ...”¹⁰⁹ Horus, the new volcano, has his “Eye,” the active flaming crater, which possibly was believed by the ancient humans to be now connected to Osiris, who represented the God of the volcanic forces and magma beneath the Earth.

Finally, the “Book of the Dead,” Chapter 183 (Faulkner translation) says:

[Atum or Ra] has stopped the raging tumult for you [Osiris], and the Two Lands are peacefully reconciled before you ... The throne of Geb has been allotted to him [Horus] ... The kingship of Geb has been given to you [Horus], for he is your father who created your beauty ... You [Osiris] have appeared as lord of the Two Lands ... Life is with you, food follows after you ...¹¹⁰ The “Two Lands,” Upper Egypt and Lower Egypt, I will discuss shortly.

Although the Christian resurrection has been interpreted as the yearly return of the Sun, Budge suggests, and I agree, that it was derived from the resurrection of Osiris—a volcanic resurrection.

7.14 The Tsunami

The flood that is mentioned in the “Book of the Dead” usually is thought to be the yearly flooding of the Nile. However, nowhere in the “Book of the Dead” is the word “yearly” mentioned, or the word “annual,” or

any other similar word. As geologist Dorothy Vitaliano says, "... the annual flood could never have been anything but benign on the whole. Its failure to materialize would have been the disaster to commemorate in legend."¹¹¹

However, there are many references to some sort of catastrophic event. Chapter 18 specifically discusses this event. Dr. Goelet merely states that part of this chapter refers to "an event or ritual in the mythological past."¹¹² However, let us see if it makes more sense from a geological viewpoint. Look at these eight passages from that chapter:¹¹³ [My comment in brackets.] 1) "... on that night of the Evening Meal, on that night of battle, at the moment of guarding of the rebels [Seth and his allies], and on that day of destroying the enemies of the Lord of All [Ra]." 2) "... as to 'that night of the Evening Meal,' it is dawn at the burial of Osiris." 3) "... on that night of Isis spending the night awake, mourning over her brother Osiris." 4) "... which is in Abydos [ancient town sacred to Osiris] on that night of the Haker-festival [festival celebrating the death and birth of Osiris] when the dead are counted and the Blessed Spirits are chosen ... " 5) "... the council who judge the dead on that night of making an accounting of their dead." 6) "... the hacking up of the earth of Busiris [city sacred to Osiris] on that night of hacking the earth with their blood and vindicating Osiris against his enemies." 7) "... in the presence of the Great Council [council of Gods] ... on that night of secreting of forms." 8) "As to 'that night of secreting of forms': it was when there was the burial of the forearm, the flanks and the thighs of Osiris."

The references to a "battle," the "hacking up of the earth," the "burial" of Osiris, the "accounting of their dead," the "secreting of forms," make one think of a volcanic explosion. My interpretation is that this event of Chapter 18 was an ancient explosion of a volcano. Possibly, it was a volcanic island in Lake

Turkana, Santorini, Krakatoa, or another. So the flood could have been a tsunami caused by the explosion (as happened in 1883) or a tsunami caused by an underground earthquake (as happened in 2004).

7.15 The Unification of the Two Lands

The “Unification of the Two Lands” probably does not refer to a political unification of North and South Egypt, as is traditionally thought, and at least one Egyptologist, Jane Sellers, agrees with me on this.¹¹⁴ Although she thinks it refers to astronomical phenomena, I think a geological interpretation is much more likely. Here is a relevant passage from the Memphite Theology. Geb is the God of the Earth:

[Geb ... commanded] that the Nine Gods gather to him. He judged between Horus and Seth; he ended their quarrel. He made Seth king of Upper Egypt in the land of Upper Egypt, up to the place in which he was born ... And Geb made Horus king of Lower Egypt in the land of Lower Egypt, up to the place in which his father was drowned which is “Division-of-the-Two-Lands.” ... That was the division of the Two Lands.

Geb, as the God of the Earth, separates Seth, of the atmosphere and the heavens, and Horus, of the magma and the underworld. Although Narmer is the king who is said to be the founder of the First Dynasty and the unifier of Egypt, Narmer’s name is written as a “Horus name” with the falcon symbol rather than as a “personal name.” Meanwhile all the King Lists put Menes as the first “human king,” and use his “personal name.”¹¹⁵ Making a God into a human, anthropomorphizing, is common.

7.16 Phoenix (Bennu-Bird)

The seagoing Phoenicians took their name from the mythical bird, the Phoenix. (In ancient Egypt, the Phoenix was referred to as the Bennu-bird.) One Phoenix lived at any one time and it lived for a very long time. The Encyclopedia Britannica says, “No ancient authority gives it a life span of less than 500 years; some say it lives for 1461 years (an Egyptian Sothic Period): an extreme estimate is 97,200 years.”

A purple-red color, the bird was said, “... to burn itself on a funeral pyre and to rise from its ashes in the freshness of youth and live through another cycle of years.”¹¹⁶ Its miraculous rebirth and its connection with fire have led scholars to associate it with the Sun.

However, volcanoes, like this Phoenix, have periods of dormancy and rebirth. The purple-red colors are the colors I saw when trekking over the lava in Hawaii and Indonesia. The regeneration fits with the theme of a volcano rising from its ashes. The Phoenix was very likely not the Sun, as is usually taught, but a volcano.

7.17 Ankh

The ankh is commonly thought to represent a sandal by many scholars. (See image.) Let us examine it from the “volcanic perspective” and see if it makes more sense. Here is some information on the Ankh:

The symbolic representation of both Physical and Eternal life ... It is also a symbol for the power to give and sustain life. The Ankh is typically associated with material things such as water (which was believed by Egyptians to regenerate life), air, sun, as well as with the Gods, who are frequently pictured carrying an Ankh. The Egyptian king is often associated with the Ankh also, either in possession of an Ankh (providing life to his people) or being given an Ankh (or stream of Ankhs) by

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the Gods ... It is usually worn as an amulet to extend the life of the living and placed on the mummy to energize the resurrected spirit ... It is usually held to the nose of the deceased king by the Gods to represent the breath of life given in the after-world.¹¹⁷

Thus, the ankh can be easily interpreted as representing a volcano, with the bottom vertical part representing the magma underneath the Earth, and the horizontal section representing the surface of the Earth, where the magma hardened into lava and thereby allowed life. The upper loop could represent either: a) the upper part of the volcano, b) the atmospheric outgassing, or c) the apparent loop of the Sun across the sky. The “spirit” and “breath of life” mentioned here will be discussed in the next Part.

The ankh unifies Upper and Lower Egypt, the magma below the Earth, and the sky and Sun above. It was probably part of the unified theory of the ancients. (We will find something quite similar in the “soma” of ancient India.)

7.18 Summary

I did not have to search widely to find all these references. In looking at the “Pyramid Texts,” the “Coffin Texts,” the “Book of the Dead,” and other references, I was overwhelmed by the number of what seem to be geological or volcanic references.

These 18 points summarize the findings of the last two chapters.

1. AtumRa: Traditional Meaning: at “sunset” (reddish Sun goes to underworld to be recharged by red magma). Geological Meaning: atmospheric particles bend light to make reddish color; Earth spins away from its home star.
2. Primeval Mound/Primeval Waters: Traditional Meaning: creation myth. Geological Meaning:

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volcanic island.

3. Phallus of Ra: Traditional Meaning: (unknown). Geological Meaning: A volcano & its lava outflow.
4. Osiris: Traditional Meaning: God of the Underworld. Geological Meaning: volcanoes, earthquakes.
5. throne of Geb (Earth): Traditional Meaning: (unknown). Geological Meaning: mountain or volcano.
6. efflux (outflow) of Osiris: Traditional Meaning: (unknown). Geological Meaning: lava flow.
7. Duat, Netherworld, Silent Land: Traditional Meaning: living place of Osiris. Geological Meaning: magma beneath the earth.
8. Lake of Fire: Traditional Meaning: place connected with the underworld. Geological Meaning: lava lake (possibly Nyiragongo).
9. Isle of Fire: Traditional Meaning: place connected with the underworld. Geological Meaning: volcanic island in a sea or lake (Lake Turkana?).
10. Turquoise Lakes: Traditional Meaning: (unknown). Geological Meaning: volcanic lakes that sulfur turns blue-green.
11. Djed or (tet) pillar: Traditional Meaning: backbone of Osiris. Geological Meaning: volcanic needles.
12. Serpents: Traditional Meaning: mythical monsters. Geological Meaning: magma, lava flows.
13. White Crown of Osiris: Traditional Meaning: Symbolic of Upper Egypt. Geological Meaning: white sulfur compounds at volcanic vents.
14. Red Crown of Osiris: Traditional Meaning: Symbol of Lower Egypt. Geological Meaning: magma beneath volcano.
15. Seth (or Set): Traditional Meaning: God of chaos, storms. Geological Meaning: volcanic lightning.
16. Horus: Traditional Meaning: Son of Osiris. Geological Meaning: reappearance of volcano after explosion from under the sea or lake.
17. The Unification of the Two Lands: Traditional Meaning: political unification of South and North Egypt. Geological Meaning: the underworld and sky unified after an eruption as the Earth's crust.
18. Pyramids: Traditional Meaning: place to transform pharaoh into Osiris. Geological Meaning: represents

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symbols of volcanoes.

Ancient Egypt	Traditional Meaning	Geological Meaning
Atum	Ra at "sunset" (reddish Sun goes to underworld to be recharged by red magma)	atmospheric particles bend light to make reddish color; Earth spins away from its home star.
Primeval Mound/ Primeval Waters	creation myth	volcanic island
Phallus of Ra	(unknown)	A volcano & its lava outflow
Osiris	God of the Underworld	geological forces, volcanoes, earthquakes
throne of Geb (Earth)	(unknown)	mountain or volcano
efflux (outflow) of Osiris	(unknown)	lava flow
Duat, Netherworld, Silent Land	living place of Osiris	magma beneath the earth
Lake of Fire	place connected with the underworld	lava lake (possibly Nyiragongo)
Isle of Fire	place connected with the underworld	volcanic island in a sea or lake (Lake Turkana?)
Turquoise Lakes	(unknown)	volcanic lakes that sulfur turns blue-green
Djed or (tet) pillar	backbone of Osiris	volcanic needles
Serpents	mythical monsters	magma, lava flows
White Crown of Osiris	Symbolic of Upper Egypt	white sulfur compounds at volcanic vents
Red Crown of Osiris	Symbol of Lower Egypt	magma beneath volcano
Seth (or Set)	God of chaos, storms	volcanic lightning
Horus	Son of Osiris	reappearance of volcano after explosion from under the sea or lake
The Unification of the Two Lands	political unification of South and North Egypt	the underworld and sky unified after an eruption (as crust)
Pyramids	place to transform pharaoh into Osiris	represents symbols of volcanoes

7.19 Conclusions

I am aware that what I am proposing here is a paradigm shift from:

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A) The Nile River civilization developing solely from local sources, in which early man was concerned with magical and seemingly incomprehensible chants to guide the dead person by way of mysterious stone monuments into an abstract heaven with abstract Gods, to:

B) The Nile River civilization traveling to or being influenced by peoples or legends from the volcanoes or geology of the Great Rift Valley and/or other geologically active areas, in which early man was concerned with the guiding of the dead person, via a pyramid structure, which mimicked a volcano, into a “rebirth” like new lava, and with Gods that represented real things such as volcanoes, lava, the lights in the sky, volcanic lightning, storms, the air, etc., but possibly later became mere abstractions and part of rituals. The most important events were battles between the Earth or the Underworld (Osiris) and Sky (Seth). We will see these Earth-Sky battles played out in many major myth throughout this book.

Undoubtedly, the stars also had their influence on the Nile River Valley people. Through certain alignments in their buildings and pyramids, and in their writings, we know they recognized and venerated these heavenly bodies. I have chosen not to emphasize astronomy in this book because it is the equally important geological influences that have been largely unrecognized.

Why did someone not make the connection between geology and the ancient Nile River Valley civilization before this? Three reasons:

1) The hieroglyphs were translated in the early part of the 1800s, and became firmly established. If you read a book about the ancient Egyptian religion published in the 1800s or early 1900s, it differs very little from a book written today. Meanwhile, the modern science of volcanology did not get started until after the eruption of Mt. Pelée in 1902 in Martinique.

2) Egyptologists and geologists both face a very competitive job market. They have little time to examine anything outside their fields.

3) Modern Egypt makes billions of dollars yearly on their tourist industry. They are reluctant to

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embrace anything new that might upset this income. There are many who embrace and encourage the “mystery of the pyramids.”

It was never necessary for us to believe outlandish theories such as aliens coming from another star system. It was not necessary for us to gather data on Egypt by going into a trance, “channeling,” remembering “past lives,” or searching for a mysterious “Hall of Records” (as described by Edgar Cayce). What was needed was a multidisciplinary approach.

To understand the source of Nile River mythology we needed to go to the source of the Nile River. We needed to go to the African Rift Valley, one of the greatest natural features on the face of this planet. Without this rift system the Nile River would not exist. The uplifting caused by the geological forces created the mountains. When the moist air rises over these mountains, we get condensation and rain. This rain feeds the rivers and lakes, which flow together and slowly work their way down the longest river in the world.

These volcanoes at the source of the Nile River system, and/or other volcanoes, were remembered by being carved into stone symbolized by the huge pyramids of Giza, and the volcanic recycling that occurs was imitated by the mummified Pharaohs who wait “to come forth by day” (per em hru), from the magma, in whatever shape they wish.

The mummified Pharaohs wait for their Ba (“soul”) to come to reanimate them. They wait for their Ka (“spirit”) to reanimate them. (More on the Ba and Ka later.) However, their atoms slowly disintegrate into the surroundings, despite the best efforts of the ancient embalmers and modern scientists. The atoms become again part of the living, circulating mass of the Earth’s biosphere. The Pharaohs have slowed down Mother Nature, but not beaten her.

Finding volcanoes and geology to be so important in the mythology of ancient Egypt, I guessed that I would also find geological references in other mythological writings throughout the world. So I next looked at the Bible, and again I was stunned at what I found.

Volcanic Lightning Bolts

8.0 Middle Eastern Myths

...and Jehovah gave thunder and hail, and the fire would run down to the earth, and Jehovah kept making it rain down hail upon the land of Egypt. Thus there came hail, and fire quivering in among the hail.

Exodus 9:22-23

In just the last 10,000 years, there have been 11 active volcanoes in Turkey, three in Iran, 28 in Syria and in Arabia.¹¹⁸ This count doesn't include the highly active volcanic area of the East African Rift Valley near present day Ethiopia, Eritrea, Djibouti and the Red Sea. However, as I have mentioned, early knowledge of volcanoes may have also spread from many areas. So the people of the Middle East had plenty of volcanic material to observe.

8.1 Angels

In this section, I'll present evidence and use logic to show that Middle Eastern "angels" are what geologists call lava bombs. A lava bomb is a piece of lava, small or large, that is thrown out of the volcano and flies through the air to land on the side of the volcano. The word "angelos" comes from a word meaning "messenger."

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Small lava bomb on Krakatoa. Photo by author.

A temple painting on the island of Bali shows the “Supreme Deity” of this volcanic island. (See image.) Bright red flames encase the God as he falls to Earth. This image was the first clue for me that angels might be what geologists call lava bombs. Of course, the stories were made more human-like. The flying fiery lava was transformed into a person with a shining halo and wings.



The supreme God of Bali encased in a lava bomb. Photo by author.

The word “angelos” is related to “urn,” so we see a possible connection with cinder urns and burning. Also, there is a folk legend in which children are given a cold cinder in their hands to protect them at night

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(much like an “angel” might protect them). Thus, at one time these lava bombs or angels were considered “messengers” from the pit of lava, the abode of Osiris and other Gods.

Satan, the chief angel closest to God, was cast down into the pit of fire. Originally, Satan undoubtedly was a volcanic mountain. This would put him “closest to God,” at least the God of fire, life, death and resurrection under the Earth’s crust, like Osiris.

As we read through Malcolm Godwin’s book *Angels*, we note the strong resemblance of the medieval ideas of heaven and hell and angels to volcanic activity. It is as if travelers visited the various volcanoes of the Mediterranean,¹¹⁹ or had visited other volcanoes, and were describing them. He describes Lucifer-Satan: “Bearer of Light ... Dragon of Dawn ... Prince of the Power of Air ... the first to separate himself from the Divine source.” “He shares with the serpent the ability to shed the old dead skin and arise as if newborn.” (Like the volcanic resurrections of the Phoenix, Krakatoa and Santorini.)

Additionally, angels are said to be in three Triads (three groups of three). The first triad consisting of the Seraphim, the Cherubim and the Thrones. All of these triads could be different classifications of lava and embers and ash, in an intricate semantic hierarchy.

Godwin description reads a lot like a volcano:

Entities radiate outward from His Presence, some being close to the center while others more further and further away from the Divine source of Light and Love ... The highest Triad is made up of the Seraphim, the Cherubim and the Thrones. These are in direct communion with the Divine Unity and receive God’s unfiltered Illumination. The next Triad orbiting God is composed of the Dominations, Virtues and Powers who receive Divine Illumination from the first Triad and then in turn transmit it to the lowest triad — the Principalities, Archangels and Angels. These then convey it to us mortal humans ... Thought slows down as it moves from the center and becomes Light, which in turn

decelerates to become Heat which condenses into matter.¹²⁰

Furthermore, in Revelation 20:1 we read:

And I saw an angel coming down out of heaven, having the key to the Abyss and holding in his hand a great chain. He seized the dragon, that ancient serpent, who is the devil, or Satan, and bound him for a thousand years. He threw him into the Abyss, and locked and sealed it over him, to keep him from deceiving the nations anymore until the thousand years were ended. After that, he must be set free for a short time.

Being “bound” probably refers to the volcano not erupting. Many other cultures had similar “bindings.” Also, again Satan is the volcano. The passage goes on to talk of the devil being thrown into the “lake of burning sulfur.” Then the dead are judged to be either resurrected or thrown into “the lake of fire.” This, of course, is similar to the Egyptian story and is a primitive attempt to understand the Earth’s natural processes and to assign a fitting moral ending to the story.

Also, the *Koran* mentions two Archangels: Michael and Gabriel or Micha-el and Gabri-el. The word “el” comes from the Sumerian and means “brightness” or “shining.” They also are mentioned in the Old Testament.

Thus, it appears that our legends of glowing angels and the glowing halo are attempts to preserve memories of the fiery rocks, lava bombs that “fly” out of the volcano: “angelos” or messengers from God.

8.2 Genesis

“Genesis” means the origin, the creation, or the source. It is possible that *Genesis* of the Bible is the same creation story as is told in all the other myths of the world.

The seven days of creation in this story may stem from our ancestors witnessing a volcano rising

from the sea of lake—how quickly the barren lava turned into fertile soil and the appearance of trees, plants birds. We probably thought this was the way things came into being and we recorded it in our “sacred” stories.

The story of Noah and his Ark was a sacred historical record. Perhaps, like most history, to warn that a similar devastation could occurring in the future. (As I mentioned, a similar destruction story also appears in the Egyptian hieroglyphs.)

8.3 Exodus

You may have heard of the idea that the Exodus of the Egyptians was influenced by the volcanic eruption of Santorini in about 1628 BCE. This idea is not supported by most volcanologists, so I will give it only a brief mention. Two volcanologists summarize how the events in Exodus could have been caused by certain natural events:¹²¹ 1) the “darkness which may be felt” by falling ash; 2) the “waters ... turned to blood,” by the wealth of rust-red iron oxide in the volcanic dust which fell into the rivers; 3) the “thunder,” by the flashes of static electricity produced by friction among the ash [volcanic lightning]; the hail by the crystallization of ice around the volcanic particles; 4) the “frogs” by the tornadoes following upon the eruption which, as they passed over lakes, sucked up frogs along with the water; 5) the “death of the first-born” and the “ulcers” (boils), by the famine which followed upon the destruction of the harvest and the pollution of the water after the volcanic ash had fallen upon them; 6) the proliferation of flies and the pestilence visited upon livestock may be connected with the rotting corpses of animals which had died of starvation; 7) lice and locusts may be said to have taken advantage of the destruction of the frogs, fish and birds killed by polluted water, which had habitually preyed upon them.

8.4 Judgment Day

Judgment Day was undoubtedly a volcanic explosion or some other violent geological act. Many volcanoes erupt repeatedly. Whether the Judgment Day story stems from Krakatoa, Santorini, or an undersea earthquake, such as the one that killed over 200,000 people in 2004, is not clear.

In Isaiah 27:1 we read, “In that day, the LORD will punish with his sword, his fierce, great and powerful sword, Leviathan the gliding serpent, Leviathan the coiling serpent; he will slay the monster of the sea.¹²² Here we see the “serpent,” or the volcano, and the “sword,” the volcanic lightning that seems to destroy the volcano in the phreatomagmatic explosion.

Psalm 74:12-14: But you, O God, are my king from of old; you bring salvation upon the earth. It was you who split open the sea by your power; you broke the heads of the monster in the waters. It was you who crushed the heads of Leviathan and gave him as food to the creatures of the desert.¹²³

Psalm 18:6-15: I cried to my God for help. From his temple he heard my voice; my cry came before him, into his ears. The earth trembled and quaked, and the foundations of the mountains shook; they trembled because he was angry. Smoke rose from his nostrils; consuming fire came from his mouth, burning coals blazed out of it. He parted the heavens and came down; dark clouds were under his feet. He mounted the cherubim and flew; he soared on the wings of the wind. He made darkness his covering, his canopy around him — the dark rain clouds of the sky. Out of the brightness of his presence clouds advanced, with hailstones and bolts of lightning. The LORD thundered from heaven; the voice of the Most High resounded. He shot his arrows and scattered the enemies, great bolts of lightning, and routed them. The valleys of the sea were exposed and the foundations of the earth laid bare at your rebuke, O LORD, at the blast of breath from your nostrils.

Again we see God as the destroyer of the volcano that rose from the sea. There are many more references to volcanoes in the Psalms, some of which I have put in an appendix.¹²⁴

Lava bombs, volcanic outgassing, volcanic thunder, magma flow, volcanic earthquakes, eruption ash, volcanic ash cloud, volcanic lightning, magma, sulfuric outgassing, volcanoes, lava flows, calderas, and volcanic fertile soil. The Bible has them all.

8.5 The Tree of Life

The Cherubim were, according to legend, stationed near the Garden of Eden, to guard the Tree of Life. Magma rises from underground like a root, to branch forth as lava and from there to break down into rich soil that nourishes the inevitable plant and animal life. As I said, our ancestors observed this volcanic process and thought life came from the volcano, rather than from the seeds carried by birds. So a “tree of life” probably represents a volcano.

Here is part of *Genesis* 3:21-24 on the “tree of life” (not the “tree of *knowledge*” that was mentioned earlier in *Genesis*):

And the LORD God said, ‘The man has now become like one of us, knowing good and evil. He must not be allowed to reach out his hand and take also from the tree of life and eat, and live forever.’ ...

After he drove the man out, he placed on the east side (or placed in front) of the Garden of Eden cherubim and a flaming sword flashing back and forth to guard the way to the tree of life.¹²⁵

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Here we see lava bombs (cherubim) and volcanic lightning (flaming sword). Here we see God being concerned that man does not become immortal like the Sun, Moon and the planets, that can regenerate by eating magma (the food of the Gods—more on this later) as they pass through the underworld when they dip “below” the horizon. So the “tree of knowledge” probably represented a volcano that taught our ancestors about sulfur (which led to alchemy and then chemistry) and observations of the volcano led to the holistic and pervasive fire-earth-water-air model. More on the Tree of Life later.

8.6 Jehovah

Jehovah is the God of the Old Testament and the Torah. The Hebrew God YHVH (also transliterated as YHWH, JHVH, JHWH, Yahwe, Yahveh, Yahve, Jahveh, Jahve, Jahweh, and Jahwe) was the unpronounceable sacred name of God or Jehovah. YHVH or later “Yaveh” or later “Jehovah,” may be the same as the island, “Jawa” that later became “Java.” “Java” or “Jawa” supposedly means “rice.” However, on my trip to Indonesia in 1997, I found that Java could mean “fertility.” This fertility may refer to the rich volcanic soil.

In addition, Jehovah seems to be referred to many times with volcanic-like characteristics. For example:

Exodus 9:22-23: “and Jehovah gave thunder and hail, and the fire would run down to the earth, and Jehovah kept making it rain down hail upon the land of Egypt. Thus there came hail, and fire quivering in among the hail.”

Exodus 19:18: “And mount Si’nai smoked all over, due to the fact that Jehovah came down upon it in fire; and its smoke kept ascending like the smoke of a kiln, and the whole mountain was trembling

very much.”

Deuteronomy 4:33 we have: “Has any other people heard the voice of God speaking out of the middle of the fire the way you yourself have heard it and kept on living?”

There are no volcanoes along the Sinai Peninsula. However, perhaps the “voice of God” was the volcanic outgassing of carbon dioxide, water vapor and sulfurous gasses along the geological fault that runs through the island of Santorini and then south along the length of the Sinai Peninsula. This fault may have been stirred by the famous eruption on Santorini around 1650 BC.

Also, there may have been more travel than we are aware of in ancient times. The Bible talks of Solomon’s fleet bringing gold from Ophir. Scholars are unsure of the location of this Ophir. However, in Sumatra, I noticed there is an Ophir Mountain that still produces gold. This would fit with ancient sea travel between the Orient and the Occident that Fuller claims goes back at least 10,000 years.¹²⁶

In any case, Jehovah was originally a volcano and keeps his volcanic characteristics throughout the Exodus of the Hebrews from Egypt. Sigmund Freud concurs.¹²⁷ As I stated earlier, in *Moses and Monotheism*, he writes, “Jahve was certainly a volcano-god.”¹²⁸ He believed that the volcanic mountains on the western border of Arabia were the influential ones, and that Moses was the mediator between the volcano-god and the people.

Finally, the *Book of Genesis* says that God created man “in his own image.” A scientifically minded person would not normally think of God as looking like *Homo sapiens*. So perhaps this puzzling phrase simply means that man (as well as all living things) was created from the lava-soil-dust of the Volcano God. Certainly upon viewing anuk Krakatoa, the child of Krakatoa, and seeing the ecosystem establishing itself there, one would begin to think that somehow living things were created out of the dust and soil of the volcano.

8.7 The Book of (Geological) Revelation

John's *Book of Revelation*, in the Christian New Testament manuscript, which describes a supposed worldwide cataclysm, is filled with volcanic imagery. However, to some people of Europe, who had never seen a volcano explode, especially one explode like Krakatoa, this book has been interpreted as a metaphorical description of the might of the Invisible God. Let me give some samples:

Revelation 8:8: "And something like a great mountain burning with fire was hurled onto the sea. And a third of the sea became blood."

Revelation 9:2: "And he opened the pit of the abyss, and smoke ascended out of the pit as the smoke of a great furnace, and the Sun was darkened, also by air, by the smoke of the pit."

John goes on (16:1) to talk of "seven angels" who pour their "seven bowls of anger of God" onto the earth. Then, among other things, (16:18) "lightnings and voices and thunders occurred and a great earthquake occurred such as had not occurred since men came to be on the earth, so extensive an earthquake, so great." He later says, (17:9) "Here is where wisdom comes in: *The seven heads mean seven mountains ...*" [my emphasis] We can see here what could easily be references to an ancient volcanic destruction. These seven mountains were perhaps seven large, active volcanoes of Java, Sumatra, or the Virunga Range in Africa.

Predictions of catastrophe could be echoes from past volcanic explosions or geologically induced tsunamis. Our ancestors, the talking apes, and later the talking and writing apes, were probably trying to warn us about the next volcanic explosion. It is probable that, *we didn't get the message*.

When the magma chambers beneath Krakatoa emptied, the caldera collapsed, and this collapse is what caused the huge explosion and the 36,000 deaths in 1883. When the tectonic plates shifted in nearby

Sumatra in 2004, a massive tsunami was triggered which killed 225,000 people.

These catastrophic events were despite all the fundamentalist Christians, Moslems and Jews, etc., who insist on the sacred nature of their writings, who insist on the importance of their writings, and who are even willing in some cases to die for these writings. Are these religious extremists fiercely loyal to mis-interpretations of their writings? Perhaps the correct action should be for them to be loyal to a different interpretation: “The volcano is going to explode again! So beware and be ready to evacuate!” Or: “There is going to be another big tsunami someday so let’s be ready for it!”

8.8 The Cross

As I said in an earlier chapter, the ankh was a symbol for regeneration and enduring life, which corresponds with a constantly regenerating volcano. Although some think that the Christian cross derives from astronomy and astrology, I think it more likely that it derives from the ankh of the Nile River Valley, and originally, but long forgotten, represented a volcano rising above the land or ocean. In fact, the cross symbol is also used in several pagan religions.

The caduceus is a stick that was carried by Mercury, the messenger of the Gods. This symbol is similar to the cross and ankh, though which came first I am not sure. The two snakes around the center pole could represent the magma flowing up from below, and the wings on the top could represent the flying potential of the lava as lava bombs. Also, as we saw earlier, the messenger of the Gods was the lava bomb. (Also, the caduceus is a symbol of the medical profession, so we can see the origins of medical knowledge dating back to volcanic sulfur.)¹²⁹



Caduceus drawing by author.

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A volcano can represent resurrection, life, the creation of life, fire, knowledge, etc. Did the periodic and real resurrection of a volcano become the resurrection of a man? Or, as an aside, was Jesus merely resuscitated and then escaped the Roman empire, where he was in danger of his life? Saying he would “come back,” did he go to India, where it was safer, and become “Saint Issa,” and where he may have also spent his earlier eighteen “lost years?” Although there are several books and one BBC documentary advancing Jesus as “Saint Issa,” there are also several books that refute, debunk, it.¹³⁰

Getting back to my point, was the Judgment Day of the ancient text not a host of winged angels led by Jesus in a chariot, to raise the dead, but rather, the volcanic explosions and tsunamis that the early humans witnessed and tried to warn us about? Perhaps, more realistically, will “host of angels” will come forth, *as lava bombs that pepper the countryside*, and will the dead “rise again,” not as individual personalities; but rather as *billions of atoms* recycling into the atmosphere and soil, as the volcano spews forth all the atomic and molecular remnants?

Although the controversial “historicity of Jesus”¹³¹ is beyond the scope of this book, it would not be surprising if Christianity assimilated earlier myths, such as the Osiris resurrection, into the historical Jesus. Perhaps all the crosses that are visible in predominately Christian countries should remind (some of) us of the 36,000 people who died at Krakatoa in 1883, the 225,000 who died in 2004, and the people who may die in the volcano eruptions that are still to come, such as the huge eruption waiting to happen beneath Yellowstone Park.

8.9 The Leviathan

I would be remiss if I didn't mention the Leviathan.

In Job 41:1–34 it is described thus: “His sneezings flash forth light, and his eyes are like the eyelids of the dawn ... Out of his mouth go flaming torches; sparks of fire leap forth ... Out of his nostrils comes forth smoke, as from a boiling pot and burning rushes ... His breath kindles coals, and a flame comes forth from his mouth ... He makes the deep boil like a pot ... Behind him he leaves a shining wake.”

In Isaiah 27: the LORD will punish with his sword, his fierce, great and powerful sword, Leviathan the gliding serpent, Leviathan the coiling serpent; he will slay the monster of the sea. Here we see the Judeo-Christian-Islamic Sky God in a battle with the Earth God, as we saw in ancient Egypt, and we will see other cultures.

8.10 Mesopotamian Religion

In ancient Sumer, Akkad, Assyria and Babylonia we find two important battles relevant to our discussion.

Firstly, in the “Babylonian Epic of Creation” we read about Marduk, the storm God, in a fierce fight with Tiamat, a sea Goddess, also described as a serpent or dragon. Marduk makes a bow and arrow. He then “places lightning before him” and fills his body “with tongues of flame.” Tiamat cries “aloud and fiercely” and “all her lower members” tremble beneath her. Her innards are “distended” and she opens “her mouth wide.” Marduk sends an arrow which pierces “her belly” and tears open “her entrails.” Later, after binding Tiamat, he smashes her skull, cuts her arteries, and lets the North wind carry up her blood.¹³²

Secondly, we read about the seven-headed sea-dragon Lotan being killed by Baal Hadad, the storm god. Some scholars think that this battle is related to the Leviathan being defeated by Yahweh in the Christian Bible and battles in many other parts of the world, some of which we will discuss in the next chapter.

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9.0 Global Myths

The Aztecs, Mayans and Quechuas offered human sacrifices to volcanoes, and until recently so did the peoples of many other volcanic areas.

Dorothy Vitaliano, Geologist

9.1 Ring of Fire

Southern California is part of the “Ring of Fire.” The Ring creates the volcanoes and earthquakes of Central America, South America and Chile, the many earthquakes in California, the volcanoes of the Pacific Northwest, including Mt. Saint Helena and Mt. Rainer, the volcanoes and earthquakes of Alaska, the volcanoes of the Kamchatka Peninsula in Siberia, the volcanoes and earthquakes of Japan, the volcanoes of the Philippines, and so on around the Ring.

I have experienced several earthquakes of more than 7.0 on the Richter Scale. It is a terrifying experience to be in bed at night, on the third floor, and suddenly feel the floor and walls start to shake violently. You feel like there’s a living monster beneath the Earth. In the next few weeks, church attendance climbs in the city. It was these earthquakes in Southern California that first interested me in geology and volcanoes.

Historically, humans and volcanism have always coexisted. In Italy, human footprints were found in volcanic ash dated at 350,000 years ago.¹³³ In Africa, footprints have been found dated at 3.6 million years old.

Just since the last ice age (in the last 10,000 years) there have been “5,564 identifiable eruptions by the 1,343 known volcanoes.”¹³⁴ Volcanoes are noticed especially on flights from the U.S. to Asia that pass over Alaska and Kamchatka. Commercial aircraft have often encountered volcanic ash in flight, sometimes resulting in loss of engine power.¹³⁵

9.2 India

India is not far from Indonesia, whose extensive volcanic activity has been mentioned. Also, there are several volcanic islands between Indonesia and India that were undoubtedly noticed by early seafarers, especially during a large eruption that produced a rising ash cloud seen for many miles. Furthermore, additional island volcanoes are in the Indian Ocean near Madagascar.

Regardless of which particular volcanoes or geological phenomena influenced them, when the ancient texts of Hinduism are read from a geological standpoint they make sense. Do an Internet search on “Vimānas” and you will be amazed at how these geological descriptions have been misinterpreted as spaceships. For example, here’s a description of Arjuna’s chariot: “The chariot had all necessary equipment. It could not be conquered by gods or demons, and it radiated light and reverberated with a deep rumbling sound ... its form, like that of the sun, could not be precisely discerned.”¹³⁶ The light, the sound and the vague form all point to a lava bomb not a spaceship.

It’s worth detailing some things about the battle between Rama (the volcanic lightning) and ten-headed Ravana (the erupting volcano), as it so closely parallels our chapter on Ancient Egypt and Mott

Green's analysis of Greece. [My comments will be in brackets.]

The Battle Between Rama and Ravana¹³⁷

Conches and trumpets were blown [volcanic rumblings], and the sound generated terror in the hearts of the opponents ... Ravana had ten heads [volcanic vents] which he had obtained as boon for his special worship of God ... It was also suggestive of long life, every head was compatible with life. Rama and Ravana hurled missiles at each other ... When one head of Ravana rolled down, it was replaced by a new one! If one arm of Ravana was cut, it was replaced by another! [volcanic regeneration] ... Ravana flew high in the sky and started attacking Rama and his men with arrows and maces [lava bombs], and dropped magical fire [pyroclastic flows] and stones [lava bombs] ... Arrows and missiles [lightning bolts] made no impact on Ravana in the least ...

The day turned into night [the eruption cloud covered the Sun], and both the armies retreated to their respective camps [a lull in the eruption] ... Vibhishana ... recalled how he once had faintly overheard the weakness in the body of Ravana — and that weak spot was his umbilicus (middle abdominal region) [central vent], not head, nor heart, nor neck! If Rama could hit the arrowhead in that localized spot, the life-sustaining nectar [magma, more on this later] would spill and Ravana was sure to die.

Thus, armed with the special knowledge, next day, Rama put an end to Ravana's life with the arrow in his naval [volcanic lightning to the central vent and the climactic explosion]. The mightiest king on the earth [the volcano] fell [volcanic collapse]. This brought to an end clanging of weapons [volcanic noise] and associated bitterness and ill feelings. The injured Ravana was counting his last breaths [sulfuric outgassing] ...

In this story, we see once again the volcanic lightning destroying the volcano, as in the case of Hesiod's Mediterranean volcanoes and the Egyptian descriptions.

Global Myths

Some additional pertinent information about Hinduism is contained in the book *Mythology*,¹³⁸ edited by Cavendish. I will paraphrase it in the next section, and I will use it to develop my theory regarding Soma. [My comments again are in brackets]:

Hindu texts mention the “navel of the earth” [as blood flows to the new born baby through the umbilical cord so does lava flow to the earth through the volcano]. The “golden seed” of the god Prajapati developed into a “golden egg” which split in two [underwater lava appears to split open like an egg].

Prajapati was not completely immortal. Half (the hair, skin, flesh, bone and marrow) was mortal, and the other half (mind, voice, breath, eye, and ear) was immortal. [This is partially correct in that the body at is about 65% oxygen. This will be more fully discussed later.]

Vritra is a great serpent that lies coiled about the world-mountain at the navel of the earth, holding back the waters. The sun was held fast in the underworld night [volcanic ash blocks out the Sun].

Indra, the king of the Gods, [corresponding to Seth, Zeus, Rama and volcanic lightning] pierces Vritra, a serpent or dragon, and lets loose the cows (symbols of wealth and fertility) and releases the sun. Indra is also said to have cut off the wings of the mountain, which were flying about and causing great destruction [lava bombs].

Tvashtar is often said to be Indra’s father. Indra kills Tvashta, as he had been hiding the Soma, the elixir of immortality. The Gods are said to have obtained immortality by drinking Soma.

Thus, I believe that Soma was originally not some plant or mushroom as is generally believed, but, originally, was magma and lava. The lava seems to give immortality by forever rejuvenating or resurrecting

the volcano.

In further support of this:

1. In Hymn XCI we read: “These herbs, these milch-kine (milk cows), and these running waters, all these, O Soma, thou hast generated. The spacious firmament hast thou expanded, and with the light thou hast dispelled the darkness.”

2. This is quite similar to the Horus-Kills-Osiris myth and may have the same origin.

3. After drinking Soma [magma] the Gods could live their full life span of a thousand years [the time until another violent eruption].

4. “Soma” is related to the word “to press out.” The Indo-European root word is related to “swelling” and “swollen.” The swelling volcano seemed to press out the liquid food of the Gods.

5. Soma is frequently compared to a cow. Indra milked this cow. *So the volcano was like a cow's teat.*

6. The heavens of Indra are thought to need the sacred food from the cow's teat [or volcano]: “Who milketh out this mighty Pair, the Earth and Heaven, like mother kine [cow]. All-bounteous art thou in carouse. Who in a moment mightily floweth around these two world-halves: All-bounteous art thou in carouse.”¹³⁹ Later, “Hath he [Indra] not, purified, impregnated the kine [volcano] who longs to meet their Lord, the kine who yield the shining milk [magma]?”¹⁴⁰ So, we can imagine Indra, in the sky, sucking nourishment, *the shinning milk*, from the volcano, or cow's teat. “All-bounteous art thou in carouse”¹⁴¹ refers to the fact that plants eventually grow out of the soil that comes from Soma [lava].

As I have said, in ancient times, we were looking at the worlds of Heaven and Earth and trying to describe them as best we could. If you read the *Rig Veda* from a geological viewpoint, it makes sense. However, as I have also said, *first we must try to see the world as we saw it then.*

9.4 Tibet

Mandala is a key idea from Tibet that can be easily grasped when using geology: The mandala is “a schematized representation of the cosmos, chiefly characterized by a concentric configuration of geometric shapes, each of which contain an image of a deity or an attribute of a deity.”¹⁴² The one I own, while quite complex, essentially has a central red fire, which is surrounded by a temple, and which is finally surrounded by the blue ocean. It is prevalent in Tibet. To me, it describes the earth’s land mass, created by volcanoes, surrounded by the ocean.

Also of note, Bucky Fuller notes that all the great rivers of Asia, which initially provided fresh drinking water for humans, begin in Tibet. Thus, Tibet is a kind of Source. We could have followed these fresh water rivers up to this Source. Fresh water was vital to them. Of course, we brought with us the knowledge we had learned of seamounts that emerged from the ocean to become volcanoes.

To us, the mandala was the unfolding of the cosmic order; in other words, lava making land and life. Mandala was not a psychological construct until Jung tried to make it one. Originally, “Before the meditating person arrives at the gates, she must, however, pass the four outer circles: the purifying fire of wisdom, the vajra [thunderbolt of one of the Gods] circle, the circle with the eight tombs and the lotus circle.”¹⁴³

Additionally, in Tibetan art one can see many serpents beneath the ground and many fiery demons. These, over time, have merged with the more recent, more dignified Buddha images. Like in Christianity, the ancient volcano worship was merged with a human.

9.5 North America

In their book, *When They Severed Earth from Sky: How the Human Mind Shapes Myth*, the authors describe a certain Native American myth which sounds like a volcanic eruption:

In this account, the Chief of the Below World came up from inside the earth and stood on top of the mountain. He wanted to marry the beautiful Loha. However, he met the Chief of the Above World and the two chiefs began a “furious battle.” The Chief of the Below World “spewed fire from his mouth. Like an ocean of flame it devoured the forest on the mountains and in the valleys.” The Chief of the Above World drove the Chief of the Below World into his home and “the top of the mountain fell upon him. When the morning sun rose, the high mountain was gone.” Afterwards, rain fell for years and eventually filled the big hole left by the mountain.

Geologists have discovered that 7,675 years ago there was a mountain about 14,000 feet high between Mount Shasta and Mount Saint Helens. There was a catastrophic eruption and a caldera collapse which resulted in today’s beautiful Crater Lake in Oregon.¹⁴⁴

9.6 Middle and South America

The Aztec and earlier Toltec writings have been translated without considering a geological interpretation. However, as with the ancient Nile River Valley people, when we apply a geological perspective to the earliest source material, we can see references to serpents, volcanoes, volcanic lightning, and lava bombs. For example, the pyramid at Chichen Itza in the Yucatan is oriented so that at the equinoxes, in the spring and fall, the sunlight and shadows create the “image of a serpent slithering down the northern staircase of the pyramid.”

In addition, the architecture and art of the area reflects the volcanic nature of the region. Go into any

museum with artifacts from this region of the world and you will see many bizarre looking “demons” that are most likely symbolizing the twisted and hardened lava, and you will also see many artifacts concerned with incense burning that symbolize the smoking volcanoes.¹⁴⁵

Quetzalcoatl and Tezcatlipoca: Two main Gods were Quetzalcoatl and Tezcatlipoca. There was a continual feud between Quetzalcoatl and Tezcatlipoca, with each feud ending with the beginning of a new epoch. So there are some similarities to the battle between Seth (volcanic lightning) and Osiris (underworld volcano) in Egypt. However, it's not so clear a delineation as in Egypt.

After AD 900 the Mayan people of Guatemala revered him as a lightning god.¹⁴⁶ Quetzalcoatl comes from the word “quetzal,” which is a colorful bird with a very bright, red breast, and “coatl,” which means serpent. So “Quetzalcoatl” is usually translated as “feathered serpent.” Of course it could also be translated as “flying serpent” which would fit well with dragons and lava bombs.

Quetzalcoatl was known to have created fire for humanity. In one well-known story, Quetzalcoatl is tricked by Tezcatlipoca and exiles himself. He is put into a stone chest and sets himself on fire. His ashes rise up to the sky, and then his heart rises up and changes into the star that appears at dawn. Here we see again how our ancestors connected the fire under the earth with the fire in heaven. He goes to live in the realm of the dead and acquires darts. After eight days a great star appears. Later, he apparently strikes certain groups of people with his darts.¹⁴⁷

In addition, “Quetzalcoatl ... was the wind ... And when the wind rose, when the dust rumbled, and it cracked and there was a great din, became it became dark and the wind blew in many directions, and it thundered; then it was said: [Quetzalcoatl] is wrathful.”¹⁴⁸

Tezcatlipoca perhaps comes from tezca (mirror) + tle (fire) + poca (smokes).¹⁴⁹ This is usually translated as “smoking mirror,” or “shining smoke.” Of course “smoke” could refer to the smoke of the

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volcano and shinning smoke might be due to volcanic lightning. The “mirror” refers to obsidian, volcanic glass, which is frequently found in portrayals of Tezcatlipoca.

Tlaloc: Another God with similarities to Seth was the Tlaloc, who controlled rain and lightning/thunder (among other things). Mount Tlaloc, a sacred mountain in central Mexico, was once an active volcano which had a major eruption about 36,000 years ago, and was the primary earthly dwelling place of Tlaloc. But unlike Seth, Tlaloc ruled over an after-life location called Tlālōcān which was thought of a paradise and later a netherworld “where the ingredients for storms are kept, the winds, mists, rains, thunder, and lightning ... and the smoke ones, who make the ... smoke of death that issues forth onto the surface of the earth.”¹⁵⁰

Huītzilōpōchtli: Yet another God with similarities to Seth was Huītzilōpōchtli, the God of War and the Sun who is symbolized by an eagle. He wields a lightning-like weapon, Xiuhcoatl, a fire serpent, with which he pierces his sister in the chest.¹⁵¹ In addition, on one famous sculpture, Teocalli (Temple) of the Sacred War, coming from the mouth of Huītzilōpōchtli we see the symbol for the Aztec war-cry, Atlachinolli. Atlachinolli, in Nahuatl, means atl (water) tlachinolli (that burns). One way to describe lave or even lightning would be “water that burns.” This “sacred war” could be the same one we see in many cultures: the apparent battle between the Earth and the Sky.

On the flag of Mexico today you will see an eagle devouring a snake. The geological interpretation of this, with the eagle symbolizing the sky and the snake symbolizing the earth, sky vs. earth, volcanic lightning vs. the volcano, although overlooked today, is fitting.

On the back of the Teocalli (Temple) of the Sacred War (see image) we see an eagle, and coming from its mouth we also see the war cry Atlachinolli, water that burns. Below that, although partially eroded, it has been suggested that prickly pear cacti, which have bright red flowers, are growing out of some kind of



earth monster. However, geologically it looks like the earth monster is vomiting something. So we can see here the attempt to communicate this dramatic geological transformation using the eagle as a symbol for the sky, the cacti for the lava bombs, and the earth monster for the volcano.

The eagle was the symbol for the sky because it was the most powerful bird, just like the lion was the most powerful land animal in Egypt, the tiger was the most powerful land animal in China, and the jaguar was the most powerful land animal in Mesoamerica.

There seems to be a reoccurring theme: we developed our proto-science and then passed it along orally (or later by writing) and declared it to be very important (sacred). The culture then passed it along in a more abstract and robotic fashion, making children memorize it, until finally we lost the original meaning. Is it the nature of civilizations to eventually become divorced from the origins of their knowledge?

9.7 China

Like elsewhere in the world, China¹⁵² has plenty of myths with geological themes—battles, immortality, resurrection, fire, floods, chaos, dragons, and snakes:

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Creation: A Chinese legend concerns creation: P'an-ku forming from a cosmic egg. P'an-ku grew for 18,000 years at the rate of about 10 feet per day. This is same order of magnitude as the growth of a volcano. From this the earth was made as well as the sky. This is somewhat correct as most of the continents formed from lava, and the outgassing of steam and gas created the atmosphere. The five great mountains come from his body, the rivers and seas from his blood and fluids, and the soil from his flesh.¹⁵³ "Vegetation grew from his hair, and his teeth gave us precious jewels [diamonds are frequently found near volcanoes]. P'an Ku created order out of chaos."¹⁵⁴

Shu and Hu: Another legend from China is told by Chuang-tzu, in the Third Century: Shu, the Emperor of the Northern Sea and Hu, the Emperor of the Southern Sea create the known world from Chaos. Their names together, shu-hu, mean lightning.

Chuang-tau used these two words purposefully, one source believes, to "denote the truth that when the illumination from light strikes chaos, it leads to the creation of life and the restoration of order."¹⁵⁵ Here, we see another possible ancient awareness of volcanic lightning.

Gong Gong: Also known as Kang Hui, Gong Gong a Chinese monster and water god, who has red hair and the tail of a serpent or dragon. He is destructive and causes catastrophes such as great floods. He is accompanied by a dragon named Xiang Liu who has nine heads. In the end of all the stories, he is killed or sent into exile after a battle for the Throne of Heaven with another God, most notably *Zhu Rong*, the God of Fire and of the South.

I think you can see here the similarities to the many other myths around the world. Gong Gong is similar to Osiris, the Egyptian God of the underworld, Zhu Rong is similar to the Seth, the God of the storms.

Xiang Lui, with his nine heads, represents the volcanic vents. As in the other myths, thanks to the

volcanic lightning appearing during an eruption, the Sky God appears to defeat the Volcano God which becomes dormant. The “great floods” are probably similar to the great tsunami of 2004 that killed so many on the seashores of the Indian Ocean.

Unable to accept his defeat, Gong Gong banged his head against Mount Buzhou. Mount Buzhou was one of the four pillars that supported the sky. “Half of the sky fell which created a gaping hole and the earth itself was cracked...”¹⁵⁶ The axis of the earth shifted such that the western region of China became higher than the eastern region. This probably attempts to explain what we now know as the geological plate of India crashing into the underbelly of Asia and creating the highest mountain range in the world, the Himalayas, and causing so many devastating earthquakes in China, shifting the rivers and resulting in great floods.

Guixu: It (the Returning Mountain) is “located under the sea and containing five divine mountains.”¹⁵⁷

Penglai Xiandao: This means Immortal Island also known as Mount Penglai. This where the Eight Immortals of Taoism go to have a meal. According to legend, Xu Fu was sent by the first Chinese emperor to find the elixir of immortality. He failed but tried again. He never returned from his second attempt.

Buddha Images: Finally, throughout South East Asia you will frequently see statues or paintings of the Buddha meditating while seated on a large coiled up dragon (sometimes called a snake).

Chinese Dragon: As early as 300 BC there are references to what are called “dragon bones,” (which were, of course, dinosaur bones). In China representations of the dragon are ubiquitous. It was the most powerful ancient creature, and its image could only be worn on the clothes of the Emperor.

At the very top of many Chinese temples sits at least one Dragon. According to the *GuanZi*, a famous text, the dragon can fly among the clouds or hide in water. According to the *Shuo Wen Jie Zi*, a 2nd-century Chinese dictionary, it can form clouds, turn into water, glow in the dark, or change color to blend in with surroundings as an effective form of camouflage. I think you can see the volcanic imagery.

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Equal and opposite to the Dragon you will often find the Chinese Phoenix. The Chinese Phoenix does not have the same connotations as the Western Phoenix which involves its destruction and resurrection. It is mainly considered the king of the birds and later it became feminine so it could be paired with the Dragon as its queen.

In Mandarin, a Dragon, *long*, is masculine and a Phoenix, *feng*, is feminine. The word *longfengtie* means: marriage certificate. While *longfeng-chengxiang* means: the Dragon and the Phoenix are symbols of good fortune. The *longgong* is the palace of the Dragon King at the bottom of the Eastern Sea.

In China, the tiger is the king of the beasts, not the lion. The tiger, crouching low to the ground, represents the greatest earthly power. The tiger represents *yin* (earth, darkness, female) and the dragon *yang* (heavens, light, male).¹⁵⁸ Yin and yang are the two complementary and opposing forces of the universe. The *longhudou* is a fight between the Dragon and the Tiger or a fight between powerful contenders.



Yin and Yang with white being Yang. (Public domain image from Wikipedia.)

So it seems in ancient China, like elsewhere, we have a battle between the Sky and the Earth.

Hainan Volcanic Field: One winter holiday, about 2014, while on break from teaching at Xiamen University, I put a tent into the back of my car and headed south, toward Hainan Island, for some warmer weather.¹⁵⁹

While in Hainan I discovered the Hainan Volcanic Field. This field includes fifty-eight small cones. Nowadays they are mostly covered with growth, and you might not even notice them unless you were told to where look. I climbed down into the largest cone, which took about ten minutes, and experienced the lush greenery and viewed some small caves.

However, these cones have been active for about 2.5 million years, and there were two recent small fissure eruptions, in 1883 and 1933. So these volcanoes would have definitely been seen by early Chinese

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people. Zhu Rong, the God of Fire and the South, may have been inspired by these volcanoes or others further south in Indonesia. He has been said to have descended from the Yellow Emperor.

Guishan Island: Taiwan was connected to China 10,000 years ago, before the sea level rose dramatically at the end of the last ice age. There is a large stratovolcano next to Taiwan which emerges from the ocean as Guishan Island just off the coast. It is the only active volcano in Taiwan, with fissures that emit steam and other unpleasant gases such as carbon dioxide, sulfur dioxide, hydrogen chloride, and hydrogen sulfide—similar to what I experienced on the Big Island of Hawaii. This island also would have influenced the early Chinese.

Ring of Fire: Of course the Ring of Fire exists off of China's East Coast and ancient fishermen, explorers, and traders would have seen the many active volcanoes of Kamchatka, Japan, the Philippines, Indonesia, and perhaps even many others around the globe and brought stories back to China.

Earthquakes: China is no stranger to earthquakes. India is very slowly being smashed up against the underbelly of Asia, which results in the largest mountain range in the world, the Himalayas. On the other side of this mountain range China frequently shakes. In 1556, the deadliest earthquake of all time, killing 830,000, occurred in Shaanxi Province. As recently as 1976, in Hebei Province near Beijing, 242,000 were killed.¹⁶⁰

The Yellow Emperor: In my study of ancient mythology I repeatedly saw the following: 1) the emergence of Gods representing some aspects of nature, 2) an anthropomorphizing of these Gods, 3) as the civilization grows a forgetting of the original representation, 4) sometimes a king, emperor, pharaoh, etc., claiming to be the God or to represent the God.

So I suspected that the Yellow Emperor was originally just the Sun God, as in Aztec mythology. Later, I discovered that his name, Huang Di, could also be translated as “Yellow God.” “In older accounts, the ‘Yellow Emperor’ is identified as a deity of light ... and thunder...”¹⁶¹

Middle Kingdom: To reiterate a point, the “Middle Kingdom” of China, although thought by many people to represent China being situated in the geographical center of the Earth, it actually represents the Kingdom being *between* the heavens and the underworld.

9.8 Norse Mythology

Norse mythology had Three Planes of Existence. Midgard, which means “middle area” was the area where humans dwelt. Asgard was the abode of the Gods and Valhalla, where brave warriors went when they died, and Hel was the underworld.

Thor was the God of Thunder and Lightning, the same as Seth, Zeus, Tezcatlipoca, and Rama, and Indra, and he does battle as volcanic lightning against the Midgard Serpent. Thor was the volcanic lightning of the Vikings which they saw in Iceland and elsewhere. The seafaring Vikings witnessed the extensive and continuous volcanic activity along this mid-Atlantic ridge, which is a spreading ridge.

The myth of Ragnarök is well known.¹⁶² Here are some excerpts [with comments of mine in brackets.]:

... the wolf will swallow the sun [black volcanic ash will block the Sun] ... The Stars will disappear from the heaven ... the whole surface of the earth and mountains will tremble ... The sea will lash against the land because the Midgard Serpent is writhing in giant fury trying to come ashore. The wolf Fenrir ... his eyes and ears will blaze with fire. The Midgard Serpent will blow so much poison [hot ash and sulfuric outgassing] that the whole sky and sea will be splattered with it.¹⁶³

In addition: “... the earth rises up from the sea again, and is green and beautiful and things grow

without sowing.”¹⁶⁴

9.9 Greece and Rome

As I mentioned in an earlier chapter, the Greeks had Zeus as their volcanic lightning and the Titans as volcanoes. We met Mott Greene earlier, in the chapter on Egypt, and presented his theory that the mega-eruption of Santorini around 1650 BCE is detailed in Hesiod’s *Theogony*. In his book, *Natural Knowledge in Preclassical Antiquity*, Greene also goes into considerable detail concerning a second eruption immediately after Santorini.

He notes that if myth is but literature, as many commentators have suggested, then this second eruption does not fit. “A drama may have but one climax ... There is something Sisyphean and un-lord-of-the-universe in Zeus having to unpack the thunderbolts twice in succession to vanquish the same sort of adversary.”¹⁶⁵ Of course, if the myth represents the actual sequence of events in the natural world, then we cannot quibble with the ending. Greene goes on to provide evidence that this second event was an eruption of Mt. Etna in Sicily. For example, Etna has many parasitic cones (secondary or side vents). In Book 12 of the *Theogony*, Hesiod says, “A hundred snake heads grew from the shoulders of the terrible dragon, with black tongues flickering and fire flashing from the eyes.”¹⁶⁶

So again a battle wages:

[Zeus] thundered hard and strong, so that the earth and broad sky above, Sea and Ocean Streams, and the Tartarus region below the earth, all rumbled with the awful sound. Great Olympus quaked under the divine feet of its royal master as he rose up, and the earth groaned also ...

The heat from both sides, from the thunder and lightning of Zeus and from the fiery monster

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[lava jets] penetrated the violet deep and made the whole earth and sky and sea boil. The clash of those immortal beings made the long waves rage around the shores, round and about, starting a convulsion that would not stop.¹⁶⁷

Green also notes that shallow-focus earthquakes occur when the magma begins to rise up through the central vent from the reservoir miles below. Around Mt. Etna “jets of lava as high as 200 meters have been observed.” Enormous amounts of gas are released leading to volcanic lightning.

When Zeus had risen to the peak he took his weapons, thunder and lightning and the smoking thunderbolt, and jumped on his antagonist from Olympus and struck. He blasted all those prodigious heads of the monsters and dealt him a flogging until he was tamed. Typhoeus fell down crippled, and the monstrous earth groaned underneath. Flame streamed from the once powerful potentate, now struck by lightning in the dim clefts of the rocky mountain where he fell. Large tracts of the monstrous earth were set on fire by the prodigious heat and melted like tin heated in moulded crucibles by skilled workmen, or like iron, the strongest metal softened by the heat of the fire in some mountain cleft, even so did the earth melt in the flame of the fire thus kindled.¹⁶⁸

Greene says that while “literary” and other interpretations regard this as an imitation of the battle with the Titans, “... the text provides a one-for-one correspondence between the battle events and the eruptive signature of a known volcano, entirely distinct from any other in the Mediterranean world.”¹⁶⁹ In other words, according to Greene, this passage confirms that the volcano is Etna.

We will now leave Mott Greene’s analysis, and discuss a different Greek god, Prometheus, who was “one of the Titans, a gigantic race, who inhabited the earth before the creation of man.”¹⁷⁰ He created humans

from clay, and he also brought the fire of the sun down to earth for them.

As the myth goes, Zeus punished Prometheus for giving fire to man, was bound, and his liver was pecked out each day by an eagle, but then regenerated at night. If you have seen a volcano, you know that the dried lava looks somewhat like liver. Also, as I said earlier, the erupting volcano that ceases to erupt would seem to be somehow “bound.” The “eagle” may represent air or water erosion on the side of the volcano, while the “regeneration” refers to the lava flow, like the volcano Kilauea that I saw in Hawaii or the volcano Merapi that I saw on Java.

In another legend, Prometheus saved the human race from extinction by warning his son, Deucalion, of a great flood. Deucalion survived by taking refuge with his wife in a chest. (This was similar to the story of Noah in the Christian literature.) I suggested in an earlier chapter that the “warning” was probably the shaking and rumbling that volcanoes undergo for several months before they violently erupt. The flood was probably the tidal wave caused by the exploding volcano.

Next, let’s examine the myth of Phaethon (the word is derived from “to shine”) as told by Ovid in *Metamorphoses* in 7-8 AD.¹⁷¹ Phaethon, as the son of the Sun, Helios, wants to take his Father’s chariot, which moves the sun across the sky. Helios is displeased and severely warns Phaethon but eventually agrees. When the horses of the chariot run wild, the bewildered Phaethon lets go of the reins. The “earth bursts into flame ... The meadows turn white, the trees are consumed with all their leaves, and the scorched corn makes its own destruction ... Great cities are destroyed with all their walls, and the flames reduce whole nations with all their peoples to ashes. The woodlands burn, with the hills.”

Then Jupiter, “the all-powerful father of the gods climbs to the highest summit of heaven, balancing a lightning bolt in his right hand threw it from eye-level at the charioteer, removing him, at the same moment, from the chariot and from life, extinguishing fire with fierce fire ... Phaethon, flames ravaging his glowing

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hair, is hurled headlong, leaving a long trail in the air, as sometimes a star does in the clear sky, appearing to fall although it does not fall.” Phaethon dies.

This myth is frequently misinterpreted as advice to a father about giving in to the son’s wishes. However, we can clearly see here the similarities between the story and those of ancient Egypt. The search for a Unified Theory of nature would make us wonder about the connection between the Sun and lava. We intuitively felt they must be connected and so developed a cognitive map of what happens during a volcanic eruption (the wild chariot ride) when lava bombs are flying everywhere. Osiris/Horus and the lava bombs are represented by Phaethon and Seth is represented by Jupiter. Just like Seth, Jupiter saves the day by hurling lightning.

Although some writers interpret this as a comet description, and I think this is possible, this is not the best interpretation. I think the “glowing hair” is not a comet’s tail, but the hot ashes that trail behind lava bombs (tracers) as they streak through the air.

Also, Ovid (43 BCE-17 AD) tells the story of a great flood that Jupiter sent to destroy mankind. Only Deucalion and his wife Pyrrha are saved. His description sounds like a volcanic explosion followed by a tidal wave. The volcanic tidal wave is made to seem like rain at times, but at other times it appears to be clearly a great wave.

Before we leave the Greeks and Romans, here are some comments on Ambrosia and the Chimera:

Ambrosia: This was the food of the gods. The word “ambrosia” literally means “immortality.” What our ancestors saw as immortal were the regenerating volcanoes. Ambrosia was undoubtedly magma and lava. This was what “regenerated” the volcano and thus what made the Gods seem immortal. So “Ambrosia” was the ancient Greek equivalent of Indian “Soma.”

Chimera: A monster with the head of a lion, body of a goat and the tail of a dragon (or sometimes said to be a serpent), it breathed fire and devastated the land of Lycia (in the southwest corner of Asia Minor) until Bellerophon killed it.¹⁷² He “was able to capture and tame the winged horse Pegasus, with whose help he was able to slay the Chimera, by riding on its back across the sky and beheading the creature.”¹⁷³

Here we see Bellerophon replacing Zeus or Seth and “riding the back” of the volcano, and “beheading it.” After it explodes, a volcano appears beheaded. (This was similar to Mt. Saint Helena exploding in Oregon in 1980. If you look at pictures, before and after, it looks similar to a beheading.) Furthermore, a possible etymology that has been suggested for Bellerophon: Βελλεροφόντης from βέλεμνον, βελόνη, βέλος (projectile, dart, javelin, needle, arrow, bullet).¹⁷⁴

9.10 Mithras

Little is known about Mithras, a God, as this was a secret cult. Most of what we do know comes from archeological remains found in the many temples that were built throughout the Roman Empire during the same time Christianity was expanding. Mithras apparently was born from a rock, sometimes with a snake encircling the rock, with a sword in his right hand and a torch in his left hand.¹⁷⁵ Instead of slaying a dragon, we see him slaying a bull, and afterwards he shared the meat of the bull with the Sun God (of the Late-Roman period).

9.11 Arabia and the Quran

There is a black stone in Mecca called Ka’ba. Here’s some information about it: “The wall of the Ka'ba, the

holiest shrine of Islam at Mecca contains a black stone that has been reported to be of meteoritic origin. A silver band holds the stone, which measures 16 by 20 cm together. Legend has it that the angel Gabriel gave the stone to the patriarch Abraham who built it into his house. The stone passed to the prophet Mohammed who built it into the wall of the Ka'ba."¹⁷⁶ Of course, if an "angel" gave it to him, then it may be a lava bomb, not a meteor fragment, but either could be true.

From the holy book of Islam, the Quran, we can read volcanic imagery. For example, in Surah 99, "The Earthquake" 177, we read, "When the earth is shaken to her (utmost) convulsion..." and "... the earth throws up her burdens (from within)." Also from the Quran, Surah 101, "The Calamity, The Stunning Blow, The Disaster," we read, "The (Day) of Noise and Clamour ... (It is) a Day whereon men will be like moths scattered about, And the mountains will be like carded wool ... (It is) a Fire Blazing fiercely! In addition, in Surah 69, The Reality, we read, "... they were destroyed by a terrible Storm of thunder and lightning!" and "Then, when one blast is sounded on the Trumpet ... And the earth is moved, and its mountains, and they are crushed to powder at one stroke ... And the sky will be rent asunder, for it will that Day be flimsy ..."

9.12 Summary

In this chapter, I gave additional evidence for the proposal that volcanism and geological phenomena were one of the two most important considerations in the establishment of ancient science-religion. A much more detailed analysis and reconstruction could be done, but as I said earlier, my aim is to provide an overarching theory. I am highly confident that this theory is correct.

This geological interpretation can be applied to the "mythologies" of the ancient Mayans and Aztecs, the Chinese, the Indians, the Norse, the Greeks, Babylonians, the Jews, the Christians, the Moslems, the alchemists and others. My research suggests that ancient people all over the world observed geological

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phenomena such as volcanoes and formalized this knowledge in their “myths,” which were really a proto-science.

The legend of the “Flood,” contained in many ancient traditions, undoubtedly derived from something like the tsunami that killed 36,000 people in 1883 at Krakatoa, or 225,000 people in 2004, also originating in Indonesia. In a more ancient volcanic explosion, a person (perhaps named Noah) may have correctly interpreted the pre-explosive rumblings of the volcano as meaning that it was about to explode and so he built a ship with a cover. (In the 1883 volcanic explosion of Krakatoa, the volcano rumbled for months before its final climatic explosion.)

By this point in my research, I had realized that geology could be a unifying principle in mythology, just as evolution is a unifying principle in biology and atomic theory is in chemistry.

10.0 Geomythology

Finally, no formalistic analysis of mythology, however polished, brilliant, time-tested, and attractive should ever be used to devalue the content of a myth until all possible avenues to a message of some sort being transmitted by that content have been exhausted.

Professor Mott T. Greene

10.1 Mythological Surveys

The book, *Eden in the East*, by Oppenheimer, reviews the myths of the world:

“After the watery chaos, separation—usually of the Sky from the Earth—is the next most commonest theme in cosmogonic [world origin] myths.”¹⁷⁸ The author calls this the “Creation Story of Separation” and documents its use in the

Americas, Africa, Europe, Jew/Arab/Phoenicia, Mesopotamia, Central Asia-Siberia, Indo-Iran, Japan, China-Tibet, Southeast Asia, Indonesia, Melanesia, Micronesia, Polynesia, and Aboriginal Australia.

Oppenheimer says there are 10 recurring motifs in these stories (some occurring more frequently in



Ankh drawing by author.

certain areas than others): water-dragon, light, creative word, separation of heaven and earth, parricide, use of body (to build the earth, etc.), creative wind, sevens, creator incest, and cosmic egg.¹⁷⁹ Oppenheimer does not realize it, but most of these fit nicely within a volcanic paradigm.

The “water-dragon” would be the rising volcano such as Santorini or Krakatoa. The “light” is the light that appears from the volcano and is the unified light of the universe. The “separation of heaven and earth” is the volcano creating the land and the atmosphere (outgassing) and appearing to create the lights in the sky. “Parricide” we have seen in the Osiris-Horus myth, in which the newer, younger volcano appears to have “killed” the older one. The “use of the body (to build earth)” is obvious in several of the volcanic myths I have presented. (The “creative wind” will be discussed extensively later in this book.) The “cosmic egg” we have discussed as the shape created by underwater lava flows.

Here’s a creation story from the ancient Finish *Kalevala*, which uses the cosmic egg motif: From the cracked egg’s lower fragment, Now the solid earth was fashioned, From the cracked egg’s upper fragment, Rose the lofty arch of heaven, From the Yolk, the upper portion, Now became the sun’s bright luster; From the white, the upper portion, Rose the moon that shines so brightly.¹⁸⁰

Oppenheimer also discusses the “Waters of Life,” which might best be thought of as the “liquid of life,” which would be the magma and lava, not water. (I think it's probable that many translators have erred by using “water” instead of “flowing liquid” in their translations of ancient texts from around the world.)

Finally, in Oppenheimer’s book, he discusses the “Tree of Life.” Nowadays, the “Tree of Life” has an extensive Wikipedia page as well as a “World Tree” page on *Britannica*. I will mention geological aspects from a few cultures:

In Hinduism, the Puranas texts mention a “divine tree.” Demigods decide to churn the “milky” ocean to obtain Amrita the elixir of immortality (Amrita being a synonym for soma, mentioned previously).

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A very exciting archaeological discovery in the 1990s at Sanxingdui in Sichuan, China, was of a large bronze “sacred tree” dating from an incredibly long time ago of 1200 BCE. At its base is what could be a dragon, and at the top is a bird-like creature, which perhaps is a phoenix.

In Norse mythology, Yggdrasil is an immense sacred tree in center of the world around which everything else exists. Níðhöggr is a dragon who lives at the roots of the tree.

In Iranian mythology, there are icons resembling a tree or plant, which is called Haoma. Haoma is equivalent to the word soma from India, and also related to life and immortality.

What look like world trees are also portrayed in Mesoamerican cultures of the Mayan, Aztec, and Olmec cultures.

In *Hamlet's Mill*, another fairly comprehensive survey of the world's myths, we find the authors linking a whirlpool with the Tree of Life. “The basic scheme works in many parts of the world...it is as if the particular waters hidden below tree, pillar, or mill's axle waited only for the moment when someone should *remove that plug*.” (My emphasis.) The authors of *Hamlet's Mill* give many examples: Rama is going to shoot his magical arrow into the sea, where there is a hole in the ocean leading to the underworld. The water in that hole is called the Water of Life. Unfortunately, the authors did not have enough knowledge of geology, or the science of geology was not sufficiently advanced, for them to recognize the connection with volcanoes. Much of *Hamlet's Mill* can be reinterpreted as describing volcanic and geological processes.

Nowadays, with our modern knowledge of geology, we can reinterpret many other classical myths, but as I said once before, this book is not meant to be an exhaustive survey. My purpose here is to show you that the myths are there, waiting to be correctly interpreted.

Finally, let's return to Mott Greene to end this section:

“We should learn to accept more freely what the sources report to us, since it is largely due to their uncritical repetitions that much of the material of interest ... has survived.

None of the ruling theories of mythology—literary, functionalist, structuralist, Freudian, Jungian, ritualist—is of much help with this aspect of mythic texts, and all such theories hold the study of myth hostage to opposed camps of specialists engaged in a power struggle over the origins and nature of human thought in a way which can obscure the literal sense of the texts. If we cart off the freight of excessive theory and take the texts at their words, we can ... perhaps come to a better understanding of the approach to natural phenomena that characterized Greek thought in the period down to 500 B.C.

Anyone who studies this material has an obligation to gain some knowledge of geology, geomorphology, volcanology, and a host of allied sciences...if he or she wishes to have access to the text's message.”¹⁸¹

10.2 The Earth-Sky Battle Mytheme

A mytheme is a fundamental unit of a myth, somewhat analogous to a gene for biology or a meme for culture.¹⁸² What I call the Earth-Sky Battle Mytheme is a recurring theme in various mythologies where a battle takes place between gods or entities representing the earth and the sky. This battle is often followed by additional conflicts and/or a resurrection. It is perhaps the one of the most important battles of mythology and religion. Here is a partial summary of what we have discussed so far, showing probable mythological identities for Earth, represented by volcanoes, earthquakes, magma, and lava, and Sky, represented by volcanic lightning: Egypt: Earth (Osiris), Sky (Seth). Greece: Earth (Titans), Sky (Zeus). India: Earth (Ravana or Vritra), Sky (Rama or Indra). Central America: Earth (Quetzalcoatl), Sky (Tezcatlipoca). Crater Lake: Earth (Chief of Below World), Sky (Chief of Above World). Scandinavia: Earth (Midgard Serpent/

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Jörmungandr), Sky (Thor). Rome: Earth (Phaethon), Sky (Jupiter). China: Earth (P'an Ku, Gong Gong), Sky (Zhu Rong). Middle East (Babylonian): Earth (Tiamat), Sky (Marduk). Middle East (Canaanite): Earth (Lotan), Sky (Hadad). Middle East (Abrahamic): Earth (Satan, Leviathan), Sky (God, Yahweh).

Region	Earth	Sky
Egypt	Osiris	Seth
Greece	Titans	Zeus
India	Ravana or Vritra	Rama or Indra
Central America	Quetzalcoatl	Tezcatlipoca
Crater Lake	Chief of Below World	Chief of Above World
Scandinavia	Midgard Serpent (Jörmungandr)	Thor
Rome	Phaethon	Jupiter
China	P'an Ku, Gong Gong	Zhu Rong
Middle East	Satan, Leviathan	God, Yahweh
Middle East	Tiamat	Marduk
Middle East	Lotan	Hadad

The new volcano appears to create life. However, we now know that seeds are brought by flying birds or drift to the island on the wind or ocean.

There are probably many more myths from various parts of the world, such as Africa, Central Asia, etc., that also describe this battle. Some of these myths may refer to one early incident (at Krakatoa, Santorini, or elsewhere) or many repeated incidents, or many separate but now blended incidents. However, certainly early humans, living in Africa's Great Rift Valley, observed the volcanoes and codified this knowledge. In addition, there may have been some exchanges between the various cultures by sea and/or land.

Do your own investigation. Get a geological text and read it alongside the ancient myths. Look for words like "fire," "light," "creation" (such as a mound rising from the sea), "explosions," "thunder,"

“serpents,” “underworlds,” “flying,” “arrows,” etc. Beware of translation errors. Later renditions of the myth usually have become more human-based, anthropomorphic, stories rather than the earlier, nature-based ones.

Thus, to us early humans it seemed like both the Sun and the Fire under the ground (magma) were eternal. We saw the warm red blood of an injured animal or human and we saw the hot red lava of a volcano, and we felt that the volcano could give us eternal life. We developed a unified theory, such as “Fire-Earth-Water-Air” or even more condensed: *all things come from fire*. However, we eventually found that this didn’t predict well enough, so we searched more, and this was the beginning of alchemy, which was not completely satisfactory either, and so then we developed chemistry, and the search continues for even more comprehensive and accurate theories.

Certain religions try to slow or halt the recycling process by modern mummification and burial. They probably think this will allow the person to rise up again at the Judgment Day. However, the Judgment Day is really a volcanic explosion followed by a volcanic resurrection. It is said that Judgment Day will be accompanied by a “host of angels,” which are, as we said, most likely, originally, merely the lava bombs.

10.3 Planetary Impacts

Recently, attention has been given to the effects of planetary impacts, thanks largely due to the probable large comet or asteroid that struck the Earth 63 million years ago, and which may have resulted in the demise of the dinosaurs and the rise of the mammals. Also, the Jupiter impacts of comet Shoemaker-Levy 9, in July 1994, increased concern for this threat.

As a result, NASA is searching for Near-Earth Objects (NEOs) and cataloging their orbits.¹⁸³ A conference of 77 scientists from the US, Europe, and Japan in 2002 recommended, among other things, that (my emphasis):

1. the future collision of an asteroid or cometary nucleus with the Earth with catastrophic effects is, without intervention, *inevitable*.
2. ... numerous space missions will be required to acquire a relevant and adequate basis of knowledge on which to base the future development of a reliable collision mitigation system.
3. ... estimates of the time necessary to acquire a relevant and adequate basis of knowledge on which to base the future development of a reliable collision mitigation system is measured in decades.

“We recommend that government and international policy makers act now to formulate and publish an agreed upon chain of responsibility for action in the event that an Earth-threatening object is discovered.”¹⁸⁴

This is not very encouraging, but it is a beginning. In addition, the B612 Foundation has as its goal “to significantly alter the orbit of an asteroid in a controlled manner ...” If they can demonstrate this, then it may be possible to deflect an incoming asteroid or comet just enough so that it misses Earth. In other words, if we act now, we may prevent a very large catastrophe.

10.4 Future Volcanic Catastrophes

A similar, also inevitable, catastrophe is brewing from volcanoes. When the huge magma chamber beneath Yellowstone Park eventually explodes, as it will do, that will be a “Judgment Day.” Will we be prepared?

In 1902 the officials of the Caribbean island of Martinique issued a report to the inhabitants of St. Pierre, just before the eruption of Pelée.

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The report stated that "there is nothing in the activity of Mt. Pelée that warrants a departure from St. Pierre." It concluded that "the safety of St. Pierre is completely assured." The report eased the public's fears, and gave hope to city officials who were particularly anxious that voters remain in the city to cast their ballots for an election that was to be held on May 11.¹⁸⁵

Of the 28,000 inhabitants of the city on the day of the eruption and the pyroclastic flow, superheated toxic gases moving at hurricane force speeds, only three survived.

One was an Afro-Caribbean man who had gotten into a bar fight the night before the eruption and was placed into a jail cell with stone walls that was partially underground with only a single vent. He joined Barnum & Bailey's circus as "the man who lived through Doomsday."¹⁸⁶

In that eruption, there was no "Noah" who listened to nature (God), and took people and animals to safety. What happened was that "Governor Mouttet [sent] in troops to patrol the road to Fort-de-France, with orders to turn back refugees who were trying to leave."¹⁸⁷

In his book, *Catastrophe*, David Keys examines historical data regarding the period of about 535 AD: the plague, climate data from ice cores, climate data from historical references, the barbarian invasions of Rome, the Roman collapse, the rise of Islam, and changes in Western Europe, the Orient, and the Americas. He provides voluminous evidence that a climatic catastrophe occurred in this period, which resulted in the complete restructuring of the geopolitical face of the globe. His book is one of a few which connects earth science to its climatic and political consequences.

In brief, he suggests that volcano Krakatoa violently erupted in 535 AD, and that this explosion caused particulates to be suspended in the air which blocked solar radiation and triggered colder weather and crop failure. This colder weather also resulted in an increase in the rodent population in central East Africa.

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The expanding rodent population carried the plague virus to the Mediterranean and Europe by way of trade. *He suggests that this caused the collapse of the Roman Empire and the resulting restructuring of Europe.* He also suggests that this weather change resulted in similar catastrophic changes throughout the world leading to rise and fall of various empires, resulting in the political structure we have today.

According to Keys, there are several possible catastrophic mega-explosions that could occur in the future.

1) Yellowstone National Park, United States. This is a huge magma chamber. It erupted 2 million years ago, 1.3 million years ago, and 630,000 years ago. If this pattern continues then we are due for another eruption.

2) Long Valley/Mammoth Lakes, California, United States. This has become “progressively less stable” over the last 20 years. Last major eruption 700,000 years ago.

3) Naples, Italy. Another vast caldera that is becoming increasingly restless. It had a mega eruption 37,000 years ago.

4) Rabaul, Papua, New Guinea. Major eruptions 1250 and 3500 years ago.

I would add to these:

5) Merapi on Java,

6) many potential large eruptions in Alaska, and many in

7) Mexico.

Keys says our current political and scientific systems are unprepared to deal with them. “If any one of them was to explode, world climate would be plunged into chaos, precisely as it was in the sixth century... [it] would destabilize the economic and geopolitical status quo, leading to a second resynchronization of history.”¹⁸⁸

Of course, geological activity such as the shifting of tectonic plates beneath the ocean floor can create

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an underwater earthquake and a resulting tsunami. So with the periodic explosions and resurrections of Krakatoa, the underwater earthquake-generated tsunamis of Indonesia, the periodic explosion and resurrection of Santorini in the Mediterranean, one can see why the ancients were preoccupied with floods, judgement days, resurrection, and the building of great pyramids to symbolize these activities.

Can scientists somehow devise a method of reducing the particulate matter after a mega-eruption? Can we somehow collect the particles or induce them to fall sooner to the ground? Will a mega-eruption somehow prevent global warming? Are we going to have to have another mega-eruption before we take any preventive measures?¹⁸⁹ Does the Earth need these eruptions to be “alive”?¹⁹⁰ Should we use geoengineering to inject sulfur into the atmosphere, like a volcano, in order to cool the planet?

11.0 Synthesis of Part II

11.1 Human Evolution

Life could have formed at the bottom of the oceans near the *hydrothermal vents* that release hot chemicals into the cold ocean—taking advantage of the non-equilibrium thermodynamic energy gradients there—before tapping into the huge temperature differences between the sun and space.

Certain forms of life were selected to survive over others because they were better adapted to the surrounding environment and thus had a reproductive advantage. Meanwhile over 99% of all species that have ever lived have failed to successfully adapt to their environments. At some point primates called lemurs evolved. These lemurs evolved into other primates which were our ancestors.

The Aquatic Ape Hypothesis, not currently endorsed by the majority of scientists and generating a lot of controversy,¹⁹¹ states: the primates were forced into the sea, and eventually, over perhaps a few million years, those that had 1) the most erect posture for keeping the head above water, 2) little hair for ease of swimming, 3) a subcutaneous layer of fat (found in no apes but found in other aquatic mammals such as sea lions, whales, etc.), 4) a hand similar to the American raccoon, 5) speech complexity comparable to that of the dolphins and whales, etc. were selected as being more fit to this new environment. This hypothesis was put forth in 1960 by Sir Alister Hardy¹⁹² and later elaborated upon by Elaine Morgan in *The Aquatic Ape*

and other books. Morgan mentions that evolutionary process might have occurred in the Red Sea near Ethiopia.

Philosopher Daniel Dennett sees no reason why that this process could not have happened. "... when I have found myself in the company of distinguished ... experts, I have often asked them to tell me ... why Elaine Morgan must be wrong about the aquatic theory. I haven't yet had a reply worth mentioning, aside from those who admit, with a twinkle in their eyes, that they have also wondered the same thing."¹⁹³

In 2019, *The Waterside Ape: An Alternative Account of Human Evolution* gave additional evidence. Peter Rhys Evans, an author or co-author over 200 scientific publications, is uniquely qualified to discuss the theory, especially how human speech evolved, since he is an expert in ear, nose and throat. He notes that: 1) our larger brain (thanks to brain-specific nutrients in seafoods), 2) voluntary breathing (breath-holding while diving for shellfish, etc.) and 3) suction feeding on soft-slippery seafoods may explain why humans, as opposed to other hominoids, developed both a tongue-bone descended in the throat as well as closed tooth-rows and a globular tongue, without transverse ridges as in apes, *all of which allowed for the pronunciation of consonants*.¹⁹⁴

During the ice ages of the last two million years the ocean level repeatedly sank, leaving large areas of land exposed. Early primates may have wandered into these areas. When there was a large-scale geological event, such as Krakatoa in 1883 or the tsunami of 2004, this may have provided some selection pressure for those who were best adapted to water.

11.2 Seafaring Humans

Records of our early travels are not so easily discovered since our bamboo and wooden rafts (and later boats) do not preserve like stone preserves. Archeologists, somewhat in error, call this early period the "stone age."

Also, since land preserves things better than salt water, archeologists have primarily studied land peoples and all our history is somewhat skewed because of this. We also have the popular misnomer “cave man” which doesn’t capture the seafaring and shipbuilding capabilities of these people. In reality, we were hunters, gatherers, *and* fishers: hunter-gatherer-fishers.

So, during this time, we eventually learned how to build rafts and to navigate from island to island or from island to mainland. To us the world was *obviously* curved and was *obviously* a sphere, as we could see every time we left one island and went to the next, how the island would slowly “sink” below the horizon.

About 50,000 years ago we had a similar brain capacity as we do today. It would have been easy for us to develop a technology of stellar navigation, ocean current navigation, and even a simple trigonometry. Some of this lore exists today as our Polynesian chants and navigation charts, an elaborate and intricate system of knowledge and navigation. I confirmed this when I was in Hawaii and visited ancient archeological sites and talked with one of the few remaining Kahunas.¹⁹⁵

11.3 Volcanoes

The “Big Island” of Hawaii contains 53 of the 54 possible ecosystems. It was amazing to drive around this Island and see surroundings identical to those I had experienced where I grew up in the Midwest. Here, as I said earlier, I first began to see the importance of geological origins for all life as I visited the volcano of Kilauea and stood a few feet from the hot lava as it flowed into the ocean, where it cooled, and, like water freezing, solidified to form rocks.

We had tens of thousands of years of using our high capacity brains in which to observe and travel among the volcanic islands. These observations included volcanoes breaking through the surface of the ocean or large lakes (such as Lake Turkana in East Africa), and it may have resulted in the Biblical story of a

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seven day creation. We undoubtedly witnessed a gradual florescence from the undifferentiated gray rock and ash.

To most of us, the Old World of Africa, Europe and Asia was our entire universe. So when we saw the huge outgassing of volcanoes we hypothesized (mostly correct) that the atmosphere also came from the underworld. We hypothesized (incorrectly) that the stars and other heavenly bodies also resulted from volcanic ash and gas being spewed upward—along with the rising of our ancestors’ “spirits”.

Our observations allowed us to develop a naturalistic cosmology (Part I), a geomythology (Part II), and an empirical spirituality (coming in Part III). This proto-scientific-spiritual framework, a common ancestor, described for us the creation and destruction of life. To us, the primary God was the God living *inside* the Earth where the Gods of the Sun, Moon, and Stars took their nourishment from the underworld God when they “went beneath” the horizon each night.

Seeing a volcano rise up out of the sea, life blossoming forth, the volcano slowly disappearing into the sea, and a new volcano rising up, may have inspired us to conjecture the cycle of the Hindu pantheon: Brahma, the creator, Vishnu, sustainer, and Shiva, the destroyer. This cycle of creation, preservation, destruction, and then creation again, may have led us to conjecture that all things, people included, are born from the lava and gases that spew forth, and then returned to the earth perhaps to be reborn again. Reincarnation was perhaps our primitive and inaccurate version of evolution.

Furthermore, one theory, not accepted by most mainstream scientists, says that we invented and refined a technology (now called geopolymerization) which enabled us to *pour* large stone blocks in place, enabling us to build structures such as the Great Pyramids. In 1982, a French materials scientist, Joseph Davidovits, first published his claim that the Great Pyramids include many examples of artificial stone, made from a process which today is called geopolymerization. This theory is still very controversial, however, Davidovits and his son have continued to provide evidence in additional publications and video

demonstrations.¹⁹⁶ In 2006, an independent and highly cited scientist at Drexel University, Michel W. Barsoum, was the first to examine this theory using electron microscope observations. Barsoum and his research group found tiny nano-structures within the stones that do not exist anywhere in nature. "Therefore," Barsoum said, "it's very improbable that the ... stones that we examined were chiseled from a natural ... block." They also discovered the presence of silicon dioxide nano-spheres in one of the samples, further confirming that the pyramids stone samples were not natural.¹⁹⁷ Some scientist still dispute the idea that the pyramids were an early kind of poured concrete. After reading much of the evidence, I suspect that many of the lower blocks in the great pyramid were carved and hauled, but that many of the upper blocks were poured.

Pyramids in Egypt were designed to send the Pharaoh into the company of Gods. Since we believed that God lived deep inside the volcano, we built pyramids to represent the volcano. This was an attempt to preserve our knowledge, control nature, and prepare us for our next life. So when the Pharaoh died he was put into the center of the volcano and although no Pharaohs remains have been found in the pyramids, after forty centuries it is a safe bet that tomb raiders took them. In any case, it appears that most pyramids constructed in the old world and the new world were an attempt to represent one of the most creative and destructive powers we had ever seen—volcanoes emerging from the underworld.

At first, we passed along our worldview orally, as stories, and later we passed it along in rhymes, which made for easier memorization of these stories. Later, we developed a pictorial-type language and carved it into stone, or we used reeds to make wedge-shaped characters in soft clay which later hardened. Our Judeo-Christian and Islamic religions probably derive from these early observations and stories.

In due course, alchemy emerged. The word "alchemy" derives from the ram-headed god of Egypt, Khnum, and perhaps earlier from "kemit," which means black soil, which probably came from the black volcanic soil. Furthermore, the alchemic "philosophers' stone" was described as a "stone that was not a

stone.” It was thought to be capable of being turned into gold, and it was also called the elixir of life or the elixir of immortality. Finding the philosopher's stone was known as the *Magnum Opus* (Great Work). Although it was never turned into gold, and no one achieved him mortality, it certainly stimulated a lot of early research. Unfortunately, many Chinese emperors and nobles apparently died trying to prolong their life with various alchemic concoctions.¹⁹⁸

In alchemy, *prima materia* (first matter, probably lava) was the matter required for the creation of the philosophers' stone. It existed among the most “foul things.” Today the rich copper-gold ore deposits in eastern Indonesia¹⁹⁹ (which come from magma) are melted and then the gold and copper is skimmed off the top. The sulfurous gases escaping from the many volcanic vents in Indonesia are foul smelling.

Seeing all the volcanic islands and the magma spewing forth from vents, winding down the side of the volcano, we were probably reminded of the curving undulations of a snake. This, and the fact that snakes live underground, and shed their skin in a kind of re-birth, stimulated the persistent legend of an underworld serpent or dragon that could be reborn. The fire that the volcanoes occasionally belched forth became the fire-breath of the sea serpent and dragon. (The Chinese Dragon was more similar to a snake than the Western Dragon. These days it is found coiled up beneath a seated Buddha.)

The fiery “lava bombs” of the volcano became angelic messengers. The supreme deity of Bali (as early as 30,000 years ago a part of Java) is pictured in human form, surrounded by flames, hurling down through the sky towards the earth.

We also observed, with great grief, the volcano take the lives of our brothers and sisters and cousins. We incorrectly conjectured that the Volcano God needed human lives and we eventually decided to give the God what it wanted in the hopes that it would be appeased. In some places this took the form of highly elaborate ritualistic sacrifice in which our fellow humans were thrown into craters and lakes of lava which was still being practiced on some parts of Sumatra when Europeans arrived there in the 1600s.

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A volcano often rumbles and spouts ash for several months before its final explosion. To certain local people the underworld God was communicating. Possibly one individual correctly interpreted the rumblings as the fact that the volcano was about to violently explode. He might have built a ship with *cover* (the Hebrew word for ark means a “floating palace”) as he knew that the ash from the explosion would be dangerous. To this day, in Southern Java, one village every year sets afloat small ceremonial houseboats into the Indian Ocean as part of a religious festival.²⁰⁰

A flood legend is found in the sacred texts of the Egyptians, Babylonians, Hebrews, Christians, Moslems, and many other cultures around the world. It was probably considered “sacred” because it was an attempt to keep this knowledge alive. “Judgment Day” was nothing more than a violent volcanic eruption, tsunami, or asteroidal or cometary impact.

The “myths” of the Greeks, Romans, Egyptians, Mayans, etc., were likely attempts to describe volcanoes and perhaps to provide a unified theory of light. The light from lightning, anthropomorphized as Seth, Zeus, Thor, Rama, Tezcatlipoca, etc., was a part of this theory. This unified the light in the Heavens (the Sun, Moon, Jupiter, Stars, etc.) with the light on earth (magma-lava, fire).

These myths provide a record of the accumulated observation and knowledge of at least tens of thousands of years. They were also an attempt to explain the creation of land and life on the land. They are a kind of anthropological and geological history.²⁰¹

There was travel between the Occident, a word derived from “the fall” (of the sun) (i.e., Europe and Africa), and the Orient, a word derived from “the rise” (of the sun) (i.e., Asia and Indonesia). So Europe and Africa were “the land of the setting sun,” while Indochina, Indonesia, Japan, and China were “the land of the rising sun.” This territory was the “Old World,” and one could sail from one part of it to another by way of the Middle East and India.

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Occident	Orient
Europe and Africa	Indochina, Indonesia, Japan, China
Land of the setting sun	Land of the rising sun

The Old World as seen by early humans.

In Mexico and Central America, the Earth is geologically similar to Indonesia and the Sunda Plain.²⁰² One of the most interesting moments in history occurred when the Spanish Christians came to the New World and met the Aztecs. The Spanish had a religion that had become almost completely removed from its geological beginnings. This religion met a religion that was still, incorrectly and destructively, connected to volcanoes.

About this same time, experimentation had begun to replace authoritarianism. Galileo had turned his telescope toward the “heavens,” and later Newton, Dalton, Darwin and others had made advances in understanding motion, the atom, and life. The Scientific Renaissance in Europe had begun.

I returned home from my journey to the opposite side of the world and it slowly dawned on me that there was another connection, besides geology, to be made. A connection which was to me even more astounding and perhaps more important: empirical spirituality.

PART III: The Air Around Us

And I thought sitting up awake in the African night that I knew nothing about the soul at all. People were always talking of it and writing about it but who knew about it? I did not know anyone who knew anything of it nor whether there was such a thing.

Ernest Hemingway (*True at First Light*)

Man found that he was faced with the acceptance of 'spiritual' forces—that is to say, such forces as cannot be apprehended by sight, and yet have undoubted, even extremely strong effects.

Sigmund Freud

12.0 The Chemistry of the Soul

A modern biologist knows things about biology that Darwin didn't know; a modern mathematician knows things about mathematics that Archimedes didn't know; a modern physicist knows things about physics that Newton didn't know; a modern astronomer knows things about the stars that Kepler didn't

know. Likewise, when you finish reading this part of the book, you may know things about the “soul” and “spirit” that all the great religious leaders of the past didn’t know. This list includes, but is not limited to: Abraham, Moses, Buddha, Pythagoras, Socrates, Plato, Aristotle, Zarathustra, Jesus, Mohammed, Confucius, Lao Tse, Siyyid 'Ali-Muhammad, Madame Blavatsky, Krishnamurti, Mary Baker Eddy, Ellen G. White, Joseph Smith, Gandhi, Billy Graham, Sun Myung Moon, the Pope, the Dalai Lama, Maharishi Mahesh Yogi, Carlos Castaneda, Edgar Cayce, Rudolf Steiner, and L. Ron Hubbard.

12.1 Tyler’s Theory

Edward B. Tylor, in *Primitive Culture*, stated that the minimum definition of religion was belief in spiritual beings or “spiritualism.” However, because the word “spiritualism” was associated with a popular cult at the time, he chose the word “animism.” He believed that animism was found in all primitive cultures and he presented an impressive array of evidence to support that fact, drawing on the wealth of knowledge available to him from all parts of the globe. Tylor thought when we ancients dreamt of someone already dead, we thought they still existed somewhere.

Since the dream disappears after awakening, like water evaporates, perhaps we believed our dead ancestor was in the air.²⁰³

12.2 The Human Spirit: Blood and Oxygen

Blood is defined as 1) the vital principle; life. 2) a person or group regarded as a source of energy, vitality or vigor. The spirit is defined as 1) *spritus* a breathing, 2) the vital principal in humans, animating the body, 3) the incorporeal part of humans, 4) a divine, inspiring, or animating being or influence.²⁰⁴ We, as *Homo erectus*, evolved around 2,000,000 years ago, possibly in Africa. By 1.8 million years ago we were spread throughout much of Africa and Asia. In small hominid tribes we gathered food, hunted, fished and

scavenged. We probably began to communicate using gestures, grunts and noises to represent various things, events and ideas. According to the current best estimates of archeologists, we began to bury things with our dead sometime between 350,000 to 60,000 years ago.²⁰⁵ Later, we buried our dead with human-made items (tools, pots, ornaments, etc.). Apparently, we expected the dead person to somehow live again and use these artifacts.

Then around 100,000 years ago, we evolved into *Homo sapiens*. We cared for our elders, as they had knowledge of the surrounding environment. They knew which fruits, nuts, berries and mushrooms were safe to eat, etc. We had a similar mental capacity that we have today—a similar brainpower. We would have wanted to know what *motivates* man and woman. What gives him or her life? What is life?

Let us imagine ourselves in Africa around 100,000 years ago ...

When one of us was wounded (perhaps they were gored by the horn of an angry rhino, perhaps pierced by a spear), we saw the body pump out red liquid. We saw that when the person lost a certain amount of the red liquid, they would weaken. We also noticed that when the wounded person lost too much of the red liquid, they would die.

Let's imagine two friends, Ayo and Obi:

My name is Ayo. I want to speak-gesture to you about what happened to me. Yesterday, Obi and I were hunting. He was cut big—hunting a boar with me. Red-liquid flowed out of him and he became still.

He was lying on a flat rock and the red-liquid made a pool. Obi became completely motionless. Obi has been friend to me for many years and I cannot leave him. I find it hard to think about life without him. I stare at the red-liquid that has poured out of him onto rocky ledge.

As the sun moves, it slowly disappears into air, leaving behind only a red stain. Later that day I start to walk very slowly back to our camp. I have seen this thing before in others. I have also butchered many small animals. But never has someone so close to me died.

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I tell Old One of tribe. He is my mother's mother's brother. He calls it the "red-life-liquid."

He tells me that *that-which-makes-one-move* left his body the red-liquid. Then, *that-which-makes-one-move* left red-liquid and went in air. Obi's *that-which-makes-one-move* now lives in the air.

In my head, I see that the *red-life-liquid* is necessary for life. I want to teach about it. The Old One taught me about it. Maybe I might have saved Obi if I had known more about it. How to stop it from flowing out? The Old One showed me how to press against the body, and where to press to make it stop.

I have seen water disappear into air on a hot day. I have seen water on a cold morning form a white mist that rises up into the air and disappears. I know that the *red-life-liquid*, that allows me to run, jump and make love, can disappear somehow into the air. I decide there is *something mysterious in air* that gives animals and us life. I ask Old One about this. He calls it *invisible-life-giver-in-air*. I see that *invisible-life-giver-in-air* is Obi. I call it Obi's *invisible-life-giver-in-air*. I later shorten this to Obi's "sspuihh."

When a new baby is born its *invisible-life-giver-in-air* enters the baby. But where does it come from? It comes from some greater invisible life-giver. Perhaps I can call it *Great-Sspuihh-Maker*. Or simply *Great Spihrit*. I see that Great Spihrit contains the Spihrit of all ancestors.

The *Great-Spihrit*, which lies above ground, above the earth, never ends anywhere. It goes up. The *invisible-life-giver-in-air* goes up to Sun and Stars and Wandering Stars, the Heavens, where it is perfect and forever. I sometimes give food to ancestors. I a kill pig for them and burn it. I sometimes burn incense for them and Obi. It smells good and keeps them happy.

Today, oxygen-carbon combustion is what makes the body move. The oxygen burns the carbon fuel from the food we eat. Blood is composed mostly of water molecules (about 90%), which is made of hydrogen gas and oxygen gas. These water molecules (H₂O) are constantly bouncing and jostling against each other. The ones on the surface of a liquid bounce away from the remainder, into the air. This natural

process, called evaporation, continues until there are no more water molecules left, or the air is saturated with them.

Today, we know that the atmosphere does not continue on UP, but that Earth’s gravity hugs it jealously close, such that if Earth were the size of an apple, the atmosphere would be as thick as the apples’s skin. So the vast majority of space is devoid of air and oxygen. It is only in the last few centuries that our modern atomic theory (thanks to Dalton, Mendeleev, Rutherford, and others) has developed sufficiently for us to understand this process in detail. The early humans did not know about atoms, the cyclical array of elements, or molecules such as H₂O. They just saw *the red-life-liquid* disappear into thin air.

Today, we say that oxygen molecules in the air are taken into the blood stream at the lungs and are carried to the tissues. In our more accurate (but more complex model), there is not some organized unit (composed of oxygen molecules) that can be used by only one person. So prehistorically we, roughly speaking, called oxygen *that-which-makes-one-move*. In modern times, we call it *spirit* or *life-force*, or speaking strictly scientifically, *oxygen*.

prehistoric	modern	scientific
that-which-makes-one-move	spirit or life-force	oxygen

Eventually, each primitive culture developed some idea of the “spirit.” This is often popularly stated as proof that the spirit exists, and may derive from Tylor’s work. “How else could all these people come up with the same idea?” is the thinking.

Given the great time span involved and the importance of blood, I suspect that each tribe of ancient humans, whether in Asia, Africa, Europe, or later North and South America, saw and observed the *obvious*: the *red-life-liquid* pouring out of a wounded human (or animal) and then disappearing into the air. Using logic, they conceived of the idea of a disembodied spirit. They passed this information on to the next generation orally. Eventually, some of them would find a way to write their findings in a primitive picture

language.

12.3 The Human Soul and the Search for Oxygen

“Soul” is defined as “the principal of life, feeling, thought, and action in humans, regarded as a distinct entity separate from the body, and commonly held to be separable in existence from the body.” It is also “the animating principle; the essential element or part of something.” Note the similarities to “breath” which is “to live, to exist; life, vitality.”

Now, imagine yourself again observing fellow humans from the eyes of ancient Ayo. Besides the *red-life-liquid* that sustained and animated humans, what other most obvious sustaining factor would you see?

You would observe that living people take in and give off Something in the air. You would observe that dead people *do not* take in and give off that Something, and you might see a person drowning, being strangled, inhaling too much smoke, etc. You would deduce (correctly) that this something, whatever it is, is also vital for life. You might have given it a name such as the *life-giver-in-the-air*. You would have communicated orally to your children about this something in the air that gave life to all animals.

Perhaps you would have thought, “That which gives life and motion to us is inside us, and all around us. When we die, that Something must be outside us. That Something (from the ancestors or the *Great Soul-Maker*) must then go into a baby to give life and motion to it. That Something then must be always alive, always around us and never-ending.”

Most, if not all, of our primitive cultures around the world observed this process and developed the idea of an immortal “soul.” Of course, this is not evidence that an immortal disembodied soul exists, but rather evidence of the observational and deductive power of *Homo sapiens* and perhaps even *Homo erectus*.

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As with the spirit, the ancient people (incorrectly) anthropomorphized this soul, and, as with the spirit, the soul became a personal unit.

Joseph Priestley (1773-1804) is hard to classify. He was a science experimenter, political theorist, founder of Unitarianism, friend of Benjamin Franklin, materialist philosopher, and, most importantly for our discussion, the discoverer of oxygen.²⁰⁶ In Priestley's book, *Experiments and Observations on Different Kinds of Air* (1774–1786), he described it as “dephlogisticated air.”

Meanwhile, in 1783, the brilliant Frenchman and natural philosopher, Antoine Lavoisier did various clever experiments weighing and measuring the volume of air of various substances that were heated or burnt, and he discovered that there was Something in the air that was necessary to the burning process and it combined with the substance burned.²⁰⁷ He showed that the older phlogiston theory was wrong. Lavoisier was also the first to do modern experimental work on animal respiration. He was beheaded during the French revolution. When he pleaded with the judge for a few days to write up the results of his experiments the judge said, “The Republic has no need for savants.”²⁰⁸ Said a friend, “It took but a moment to cut off that head which a hundred years would be unable to replace.”²⁰⁹ About a year and a half later, Lavoisier was declared innocent by the French government and later a statue was built.



Hand sketch engraving of some of Lavoisier's equipment. Credit Madame Lavoisier.

Today, in atomic theory, of the 118 or so chemical elements discovered thus far, oxygen is element number 8. By using the energy of the Sun (photosynthesis), plants build up large carbon chains. Oxygen enters our bodies through the lungs. Red blood cells “carry” this oxygen to the cells, where it “burns” (breaks

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apart) these large chains of carbon, releasing this stored solar energy for use by the body. In the process, the oxygen combines with the carbon to form carbon dioxide (CO₂), which is then expelled by the lungs.

The “burning” is similar to the burning of petroleum, the burning of wood, and even the rusting of metals. This CO₂ might then get taken up by a plant, which uses the C, carbon, and energy of the Sun (photosynthesis), to start the cycle again. In short, in our new model, we take in oxygen and give off CO₂. Plants take in CO₂ and give off oxygen. It is a marvelous cycle.

So, it wasn't until Priestly and Lavoisier that we began to fully understand the nature of fire. For millennia, the “soul” was just the “invisible-life-giver-in-the-air” which we now know as oxygen. Oxygen in the atmosphere is a gaseous molecule, O₂, that constitutes 21 percent of the atmosphere by volume, and is essential for plant and animal respiration. Respiration is the sum total of physical and chemical processes in an organism by which oxygen is conveyed to tissues and cells. The products of respiration are carbon dioxide and water. So, in one sense we can see what the “soul” is, and what it is doing, but on a much more detailed level before.

Cremations are done in the range of 760-1150 Celsius,²¹⁰ and some forest fires reach temperatures of 800 C. We may have seen accidental cremations in a forest fire in which a body burned to bone fragments



Cremated human remains, with offerings. Photo by Tom Oates.

and ashes—about 5% of the original. Later, of course, we began to purposely cremate. (See photo.)

Through accidental or purposeful burning of animal bodies (including human bodies) the ancient

humans learned that these bodies, besides containing the red-life-liquid, are composed of a few ashes, and what? Again, they undoubtedly assumed it was the *invisible-and-formless-life-giver-in-the-air*.

12.4 Invisible Rocks: Quartz Crystals

Besides invisible oxygen in the air which sustains life, there is another invisible substance—quartz. Imagine the amazement of an ancient ancestor finding a rock, or breaking open a rock, and finding pieces they could see through. Everything solid around them, such as the soil, the trees, the mountains, the boulders, the other humans, the animals, etc., could not be seen through. This was a great puzzle for us large-brained talking apes to figure out.

So quartz crystals were important in history. Besides their practical use as tools, they became associated with healing properties in various ancient cultures around the world including the Egyptian, Greek, Indian, Tibetan, and Native American, as well as the modern “New Age” spiritual movement.²¹¹ In prehistory, quartz can be found in tomb cemeteries in Ireland: at Newgrange, a monument built around 3200 BCE and at Carrowmore, a large group of megalithic monuments built in the 4th millennium BCE.²¹² The Irish word for quartz was *grian-chloch* (sun-stone).

In modern times it was found that crystals, in general, have some unusual electrical properties. In response to mechanical stress they can generate an electrical charge.²¹³ This has a multitude of applications including inkjet printing, high voltage electricity, quartz clocks, and scanning probe microscopes.

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Since I practice secular meditation, I have on occasion used quartz as something to focus on. I think that any healing that occurred was due mostly to the meditation, but I did find the quartz more interesting to focus on than some other objects, and I began to think about how the ancients would have viewed a quartz crystal and that atoms are 99% empty space.

12.5 Spiritual, but not Religious

We seem to understand what is meant when someone says that they have a “soul” or “spirit.” People say, “I am a spiritual being,” or I am “spiritual but not religious.” They seem to find it helpful to say this. Why?

Element	% in living things by mass
Oxygen	65%
Carbon	19%
Hydrogen	9%
Others	4%
Nitrogen	3%

A remarkable 74 percent of living things are composed of oxygen and hydrogen by mass. Sixty-five percent is oxygen. Oxygen is also the most abundant element in the Earth’s crust making up 47%. Quartz is 53.26% oxygen. To break it down, our bodies are 65% oxygen by mass, 19% carbon, 9% hydrogen, 3% nitrogen, and 4% other.

One might wonder why we just don’t float away. The answer is that oxygen has weight. A 150 pound person is 97.5 lbs of oxygen! The blanket of air surrounding the Earth, as well as the oxygen inside you, is held there by gravity, which is why the moon no atmosphere. So you weigh much less than if you were, like a statue, all iron in which case you would weigh about 1350 lbs, or gold, 2,976 lbs, or the most dense natural material, osmium, in which you would weigh an astounding 3,486 lbs. However, you weigh much more than if you were all hydrogen, 0.0126 lbs, or only 2 tenths of an ounce! In this case you would be lighter than air

and float away. Half way between hydrogen and osmium we would weigh about 1,743 lbs, so at only 150 lbs, we are much closer to hydrogen than to iron, gold, and osmium.

When one is under too much stress, or working in an unnatural way (for example, staring at a computer screen for hours each day, instead of running, walking, jumping, or scanning the horizon for potential food, predators, prey and mates) certain muscles contract (depending on the circumstances and person) and the blood does not flow well (circulate) into that particular area of the body, especially to the smaller tubes called capillaries. Numbness and disease can result.

When one sleeps, hikes in the woods, swims in the sea or a lake, meditates, or sits quietly in a church or temple, the muscles have a chance to relax again or to be used in the environment in which we evolved, and the blood can reach into the previously blocked areas. One “feels better,” as normal, healthy circulation returns. Healing can occur. In a like manner, we make comments about our “soul.” We say, “A drive in the country is good for my soul.” Scientific translation: “On a drive in the country, I get away from the poisonous fumes (smog) of the city, and I can breathe in the oxygen given off by the abundant greenery of the country. I experience the natural green environment in which my genes evolved.”

Also, during the last part of the 19th century many people, including some very reputable scientists, thought that there might be a fourth dimension—the dimension of spirits. There was a popular movement, and even people like Conan Doyle, creator of the ultra-rational detective Sherlock Holmes, became a spiritualist. People were routinely attempting to contact spirits through mediums, and scientists were trying to test spiritualists.

Much of the confusion started with a political satire called “Flatlanders.” Some people interpreted this book as a science book. They thought it proved the existence of more than three spatial dimensions. The argument given was that an ant crawling on a piece of paper is an example of two dimensions. However, let’s

put that ant on a globe. Although the ant is only aware of two dimensions, we can see three. It was then said that perhaps someone could adopt a perspective beyond ours, and see other dimensions of which we are not aware.

This whole argument is nonsensical when you realize that the ant (or whatever real thing you want to use) lives in a “3-D world.” Just because he is walking on a piece of paper does not mean he is not aware of the 3-D world around him. That piece of paper is 3-D—if you look closely at it. It has a thickness.

12.5 God in the Air

We often hear, “God is everywhere in the air.” By seeing the world from ancient eyes, we can easily see how they could develop this idea of “God” from or alongside of their invisible “soul” and “spirit.” Earlier, we talked about the Soul-Maker and the Spirit-Maker. These, of course, would eventually have been simplified into the word “God.” Alternatively, in some of our traditions they were recycled. So, either 1) the soul comes from “God” and then returns or goes to hell or 2) the soul is recycled (as in India or Scientology).

We thought that even the person’s personality and desire was made of “soul.” (Today we know that these are a result of the interaction of genes and the environment of the person.) This strengthened the belief that, “the soul (or spirit) resides in the body.” Today, of course, we say that the body is mostly composed of water, which upon burning would turn into water *vapor* and carbohydrates that would become carbon dioxide gas (CO₂), hydrogen gas, oxygen gas, and the few remaining ashes of carbon. So, in a sense we were right. The body is about 65% oxygen by mass. The “soul,” as oxygen, does exist in the body.

With the process of cremation (burning the body) they tried to help return the “soul” or “spirit” to the air or heaven where it could join the other ancestors, be recycled, or rejoin the Great Spirit. As with the “spirit” and the “soul,” the “Great Spirit,” or “God,” turns out to be something material in the scientific

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model: oxygen, water vapor and perhaps some other gaseous elements.

Thus, although we saw the same basic element (oxygen) that inspired us to generate the ideas “God,” “soul,” “spirit,” there were many different twists and turns which led to many of the differences that we see in religions today.

I recently found a passage in Freud’s *Moses and Monotheism*, written many years ago, that discusses “breath” and the “soul” in which he says that “... it was the movement of air that provided the image of spirituality ... Observation found the breath of air again in the human breath ... The idea of soul was thus born ... science, coming so much later, had enough to do in disestablishing the former state of affairs and has not yet finished the task.”²¹⁴

We’re trying ...

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... atmospheric air is not an element, that is, a simple body, but a mixture of several gases. Approximately a quarter of atmospheric air is composed by...eminently breathable air and three-quarters, of noxious and harmful air.

Anton Von Lavoisier (1743-1794)

13.1 Disappearance

We once had small brains, but over the years nature selected larger brains and eliminated smaller ones. Our larger brains allowed us to think and wonder, and so we wondered about flames. Flames seemed magical. We took a solid piece of material, such as a strong tree branch, that could be used to make a spear and kill a pig, or to make a sturdy shelter, put that tree branch in a fire, and it suddenly almost completely disappeared. All that was left was a handful of grey ash. *Where had the branch gone?* Had it somehow gone into the air? We also saw that even bodies, of both humans and other animals, when burned by a forest fire, would somehow disappear into the air. Where had they gone? Even if someone in our tribe died naturally, or an animal died

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Decomposing pig. Photo credit Wikipedia.

naturally, their bodies would once again somehow seem to magically disappear, which we now know as *decomposition* by bacteria, in which the oxygen from living things is released as carbon dioxide and water. (See the photo of decomposing pig.)

13.2 Alars

We learned, by trying many different things, that by rubbing wood together just right, or striking a certain rock just right, that we could start fires. What was once only controlled by our Gods, was now in our hands. So we sat around our campfires at night, watching the tiny points of light progress across the “heavens,” as the flames in the fire danced, bobbed, and quivered.

Meanwhile, in the distance, out beyond the safety of the campfire, we could hear the roars, screams, and grunts of large animals, that were, thankfully, scared of our fire. So while some of us stood guard, and fed the fire all night, we could sleep peacefully and dream. We dreamt that our ancestors were spirits living in the air, along with the spirits of animals, trees and rocks. A few of us dreamed about fire. And some dreamed that one day, when we died, we would rise up and fly across Heaven like our Gods. We didn't want them angry with us, so we would *burn animals* to feed these spirits. Or, we would burn nice smelling plants to keep them happy. The place of burning was a flat rock we called an “altar.”

13.3 Alchemists

After thousands of years, our brains became even larger, and our language became more complex. We tried to summarize what we had observed: 1) branches, which grew out of the *earth*, could be made to disappear into the *air*, 2) *water* could come out of the *air*, as rain, 3) *water* in a bowl, could sometimes disappear into

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the *air*, and 4) rocks, which made up the *earth*, could form from the flowing river of *fire* that came down from the mountain and cooled. We decided that there were four main elements that made up everything, and these elements could change into each other. These elements were *fire*, *earth*, *air*, and *water*.

We continued to combine various things together to see what would happen. We would try and see, try and see, and when we found something interesting, we would share it. Using things from the earth, we learned to make various inks, dyes, and paints, which allowed us to change the color of our clothes or decorate our bodies. Using our knowledge of fire and earth, we made pottery and small statues. Some of us climbed up and into the fire-mountain and took stole some yellow powder (today we call it sulfur) and tried many different things with it, and eventually made an exploding “fire-powder.” We called them magicians.

Over the years many new elements were discovered such as those beautiful, shinny, yellow rocks, that we loved so much, which today we call gold. We also discovered copper, lead, silver, iron, carbon, tin, mercury, and zinc. Using our knowledge of fire, we learned how to purify tin, lead, and copper. With fire, we learned to combine tin with copper, and so made a much stronger material, bronze. Later, we learned how to purify iron. Some of us thought that perhaps someday, like the God of the Fire-Mountain, they could even make gold or become immortal. We called them alchemists.

13.4 Early Experiments

Only relatively recently, in our long history, have we discovered the nature of the “mysterious” substance in the air that gives life and energy. One of us, in the second century BC, a Greek, Philo of Byzantium, did experiments with an inverted glass (cupping glass) and candle flames and water, and found that the water rose in the glass when the candle burned. When the candle went out, it was clear that something in the air had disappeared as the candle burned.

Then for about 1500 years, in Europe, there was not much discovery for a long time, as people there

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A diagram from Pneumatics by Hero of Alexandria. Photo credit: Wikipedia

just read what the ancient Greeks had written, and we forgot to “try and see” things for ourselves. It was called the Dark Ages of Europe. Although we no longer killed and burned animals we still had the altars in our churches and we still burned incense.



Altar of Santa Cecilia. Photo credit: Magnus Manske.

Then, one day, one of us in Italy, Galileo, dropped a wooden ball and a metal ball, both the same size, from a large tower and found they hit the ground at the same time. Although he did not do *exactly* this, he did something like this using inclined planks. This was an important event because one Greek, Aristotle, had said that the heavier ball would hit first. So we learned that the Greeks could be wrong.

A famous experiment by Robert Boyle, from the 1660s, Experiment 41, demonstrated the reliance of living creatures on air. Boyle, a devout churchgoer, placed a large variety of different creatures, including birds, mice, eels, snails and flies, in the vessel of the pump and studied their reactions as the air was removed.²¹⁵ In the painting (the full painting not shown here), you can see both the dead bird and the various emotional reactions of the spectators. Over the next couple of centuries, an understanding of vacuums, steam,

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*A closeup of painting of Experiment 41.
Photo credit: Wikipedia.*

and atmospheric pressure allowed the industrial development of steam pumps, steam engines, steam locomotives, and steamships.

13.5 Modern Experiments and Theory

In the late 1600s and early 1700s, many more scientific experiments were done on air. Priestly in England showed his experiment on “a new kind of air” to Lavoisier, in France, and Lavoisier did further experiments—with metal. Lavoisier wanted to find out if a metal would gain weight or lose weight as it rusted (burned).²¹⁶ He and his wife did the experiment several times, in a sealed container, and each time they found that it weighed more. Something was going from the air into the metal. Today we call this “oxygen.” These experiments helped to bring about the law of Conservation of Mass. In Lavoisier’s words, “Nothing is lost, nothing is created, everything is transformed.”

Another important event happened in 1869 when a Russian scientist, Mendeleev, noticed some interesting patterns in the way elements acted, began to make a chart them, and was able predict new elements. Afterwards, even more elements were found and placed on the chart, and the chart was improved. Nowadays, there are 118 elements on the chart. Oxygen is element 8, and nitrogen is element 7. As far as we know, almost everything in the universe is made from the elements on this chart.²¹⁷

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Next came the most important discovery, the *atomic theory*. This theory was developed from about 1800 to 1925. Scientists from England, Italy, Germany, Denmark, and France contributed to this theory, including Dalton, Avogadro, Thomson, Rutherford, Plank, Einstein, Born, de Broglie, Schrödinger and others.

13.6 Atomic Theory

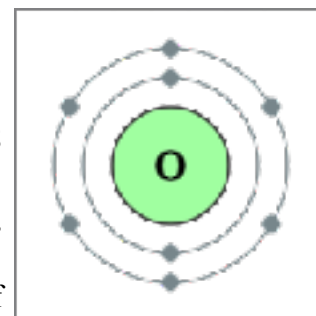
Very simply, this theory states that everything in the universe is made of very small atoms which are always jiggling. These atoms sometimes combine together to form molecules. Oxygen is an atom; carbon dioxide is a molecule.²¹⁸

The atoms are further made up of protons, neutrons and electrons. We could say that because of their structure and their electrons, some of these atoms “like” to stick together with atoms of another substance. (This is called bonding.) For example, two atoms of element 1 (hydrogen), and one atom of element 8 (oxygen), will stick together and make water, H₂O.

We now know that plants and trees take in element 6 (carbon) and element 8 (oxygen) from the air (as carbon dioxide), and they also take in water, and then, using the energy of the Sun, they build the larger particles that make up the wood of the tree.

Once again, because of their electronic structure, we say that element 6 atoms (carbon) in the tree “likes” to stick together with element 8 atoms (oxygen) in the air. However, they have to be close enough together. If they get just a little bit close, they move away from each other, but if they get close enough, they will *snap together* to make water vapor, and release energy. How do we get them close enough? It takes a bit of energy, which is called the *activation energy*. Where can we get this bit of energy?

Originally we obtained it from friction or from a spark. This spark started some of the particles in the



Electron Shell configuration of oxygen with eight electrons (eight protons not shown). Image by Greg Robson, Wikipedia.

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wood jiggling more rapidly than usual, so that some of the element 6 (carbon) came close enough to element 8 (oxygen), and they *snapped together* and released energy. That released energy starts the *other* particles of the wood jiggling more than usual, which gets them close enough to *snap together* with element 8 (oxygen), and the process spreads in the wood resulting in *flames*.

13.7 Four Amazing Things

There are four amazing things about all this:

1) The energy from the Sun is trapped in the wood, plants, animals, or gasoline, and later it is released as energy.

2) We humans, and most other animals, get our oxygen from trees and other plants, while the tree and other plants can get some carbon dioxide from us and other animals. So animals and plants are giving each other some of what they need to live.

3) This same burning process, using oxygen in the air, and substances similar to wood, is what occurs both inside your body and inside gas-powered cars. (Your body uses *fat* or *sugar* instead of wood, and the car uses *gasoline* instead of wood, but both of these substances are similar to wood.) If we change the statement “making wood” a little, so that it uses “sugar” instead of “wood,” we get: sugar + oxygen = carbon dioxide + water vapor + energy. It doesn’t need a spark, because your body is already “burning.” The energy comes out as heat for the body and as muscle motion for the body.

4) We usually think of a tree as getting most of its mass from the ground, but the tree is mostly made of wood, which is mostly carbon and water. The tree gets this carbon from the air (as carbon dioxide) and although it gets its water from the ground, this originally came from the air too, as rain. So most of the mass of the tree comes from the air.

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So, we eventually realized there are no ghosts or spirits in the air. Even so, many of us, not knowing science, still burn incense for our dead ancestors to smell.²¹⁹ Which reminds me of a story. A Chinese man and an American man were at graveyard. The Chinese man put some food on the grave as a sacrifice to his ancestors. The American man put some flowers on the grave. The American man said, “Do you really think your ancestor can eat that food?” The Chinese man replied, “I think about the same as your ancestor can smell those flowers.”

14.0 Universal Energy

... Since [1900] ... social scientists have sought the psychological Rosetta stone that might clarify the deeper truths of religious reasoning.²²⁰

E. O. Wilson

I predicted that the other myths of the world would have also generated models of oxygen that would be embedded in their most sacred texts. Let us see if that prediction is correct. Let's see if we can find part of that Rosetta stone that E. O. Wilson talks about above.

14.1 Qi, Nirvana, and Tao

Chi or Qi, which is called the “vital energy” in the ancient Chinese teachings, means “breath”! “Tai chi,” the slow moving exercise, means, “highest breathing,” and “qi gong” literally means “skill at breathing.” Some current publications translate “qi” as “energy” or “vital energy” or “universal energy” or “vital energy that circulates round the body in currents.”²²¹ Unfortunately, some of us think that they are getting some kind of special, mystical energy.

In Buddhism *nirvana* is “the ineffable ultimate in which one has attained disinterested wisdom and compassion. A transcendent state in which there is neither suffering nor desire, no sense of self, and the

subject is released from the effects of karma. It represents the final goal in Buddhism.”²²²

Let us look deeper, into the etymology of the Indian word “nirvana:” 1) nirva- be extinguished + nis-out + va- to blow.²²³ 2) “extinction, disappearance” (of the individual soul into the universal), literally “to blow out, a blowing out,” as a fire ceases to burn. (We can see *nirvana* in the modern day *vent*, *wind* and *windows*.) Again we see the early fascination with breath, the invisible-and-formless-life-giver-in-the-air. Perhaps the “fire of passion” in the “enlightened” person ceases to burn

Of course, we now know that someone who has no desires or passions would be dead. In my lifetime, I have met several Buddhist monks. All of the monks had some kind of desire, no matter how small, even if it was only a desire to convert other people to Buddhism. Although, one Buddhist teacher explained to me that there is a difference between a “craving” and a simple “desire.”

In the Buddhist writings, which were composed hundreds of years after Buddha’s death, he is described as a “perfectly enlightened being.” Of course, it’s probable that these writings were exaggerated by followers, as this would improve their own social standing. So, in my mind “perfect enlightenment is in the same category as the Christian “heaven.”²²⁴

Continuing with our analysis, we humans noticed that something in the air gave us motion, energy and desire. (Now we know that DNA and the environment interact to invoke desire.) We felt that when a person died, that person would, as I said, “become one” with the great spirit and they would attain “disinterested wisdom and compassion.” The oxygen represented *compassion*, as it surrounded us and seemed eternal and unconditionally loving. However, it also seemed disinterested.

We see “spirit” also expressed in the *Tao Teh Ching*. I believe the Tao was also originally what we now call atmospheric oxygen. Here are some excerpts from the ancient text. Notice the similarities.

It is the nature of the Tao, that even though used continuously, it is replenished

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naturally, never being emptied, and never being over-filled, as is a goblet which spills its contents upon the ground. The Tao therefore cannot be said to waste its charge, but constantly remains a source of nourishment... The Tao ... has no form, it is neither bright in rising, nor dark in sinking, cannot be grasped, and makes no sound ... The creative principle unifies the inner and external worlds. It does not depend on time or space, is ever still and yet in motion; thereby it creates all things, and is therefore called 'the creative and the absolute'; its ebb and its flow extend to infinity ... The Tao creates, not claiming credit, and guides without interfering.²²⁵

It is interesting that the earliest mention of gunpowder is in a Taoist book from the Ninth Century.²²⁶ *The Classified Essentials of the Mysterious Tao of the True Origin of Things* lists thirty-five “wrong or dangerous” formulations, including one formulation that says never to mix sulfur, arsenic disulfide, saltpeter (potassium nitrate) and honey, which are essential ingredients of explosive fire-powder.²²⁷ I think the Tao was more than an abstract metaphysical teaching, but rather another early attempt to understand the natural world and what we call oxygen.

Of course, we thought that “oxygen” extended out into space. We had no way of going there as we do now. In our limited perspective, we thought the “spirit” or “oxygen” was infinite. The *Tao Te Ching* urges us to act as “oxygen” acts. Oxygen nourishes, yet it is dispassionate. It is not violent, yet it survives eternally (or at least for a very long time).

14.2 Reiki

In Japan, there is a healing system known as Reiki. “Reiki ... is derived from *rei*, meaning "free passage" or "transcendental spirit" and *ki*, meaning "vital life force energy" or "universal life energy”.²²⁸ It doesn't take a rocket scientist to see that Reiki undoubtedly referred to atmospheric oxygen. Nowadays, it still has its esoteric, “metaphysical” meaning.

14.3 Prana and Maya

When I studied the “Great Religions of the World” at the AF Academy in 1971, I learned, in India, we humans used the word “Atman,” for “breath” and the “soul within,” while we used “Brahman” for the “soul outside.” We said that nirvana was, “salvation through the union of Atman with Brahma.”

The union of Atman (oxygen in the body) with the Brahman (oxygen outside of the body) is in some sense what we do while breathing and more completely at death by cremation, in which our body's 65% oxygen, along with some other gases, is released into the atmosphere. However, the oxygen atoms do not stay together in our soul, but are spread in a trillion, trillion different ways into the biosphere. Unless we are cryonically frozen or continuously medically rejuvenated, we eventually all end up as atoms recycled into the biosphere. We continue to exist but in a highly disordered state.

In our ancient Indian text, *Mahabharata*, we wrote, “Through the breath called Prana a living creature is enabled to move ... Prana is the living creature, the universal soul, the eternal Being. Thus the living creature is, in every respect, caused by Prana to move about and exert.”²²⁹

What we now call oxygen seemed to us ancients to be universal. Our universe was limited, however, to the surface of the earth. We had not yet performed experiments in the laboratory; we had not yet traveled deep under the sea or out into space. For us, “oxygen” was indeed a “universal energy.”

We said “Maya” was “the doctrine of the unreality of matter.”²³⁰ The Sanskrit word means “illusion,” “but that does not just mean that it is imaginary. Instead, since it is what we can see, we must deal with it and

live within it.²³¹ Today we know that *air* is “matter,” but back then *matter* was rigid, worldly objects we could grasp, while *spirit* was Invisible and untouchable. Also, remember that oxygen composes 47% of the Earth’s crust.

In other words, we saw that when we were cremated we became ashes and spirit, and we deduced that *rigid* things (wood, rocks, bodies, etc.) were mostly made of the Invisible. Some of us, the early alchemists, perhaps having seen volcanoes and gotten clues to the underlying nature of matter, were able to see that these hard things could be translated by fire into the Invisible. So, we Hindus were able to say that matter was an *illusion*, and we were somewhat correct in this.

Notice the similarity to our teachings from the Tao, in which we urged others to remember that we are mostly made of the Invisible. Why strive after material things only to find later that we return to the Invisible? We believed that to be more balanced and aware we should remember Tao is the eternal reality and everything else is transitory.

So we early Hindus and Buddhists often focused on breathing to get closer to the underlying reality of all things.

14.4 Psyche

The word “psych” comes from the Greek word “psyche,” by which we meant breath, life, spirit, or soul. Also, in Greek, “pneuma” literally means that which is breathed or blown, which in Stoic thought it meant the vital spirit, soul, or creative force of a person. In ancient Greek, both “psyche” and “pneuma” were originally pronounced with the initial “p” sound, a voiceless bilabial plosive, or a puff of air.²³² P l a t o wrote, “And in the centre [of the body] he put the soul, which he diffused throughout the body, making it also to be the exterior environment of it.”²³³ Also in Plato, we read about Socrates in his last hours. Notice the similarity to the *Tao Teh Ching* and other stories: “... while we are in the body, and while the soul is

mingled with this mass of evil, our desire will not be satisfied, and our desire is of the truth ... if we would have pure knowledge of anything we must be quit of the body, and the soul in herself must behold all things in themselves.”²³⁴

The similarity to the Tao, Hinduism, Christianity, etc., is not proof of the existence of the soul, but proof of the observational power of humans everywhere to deduce the existence of the Invisible—what today we now call oxygen.

14.5 Ancient Egypt and the Ka

I think we used the word “Ka” to refer to what we today call oxygenated blood. “Ka,” was “a spiritual entity, an aspect of the individual, believed to live within the body during life and to survive it after death,²³⁵ and “the vital energy that both sustains and creates life.”²³⁶

We thought that “each has his own Ka ... The Ka’s, generally, are the ancestors, and to beget a child is to forge a link with them.”²³⁷ Also, “If a great man is presiding over the meal his humor will be according to his Ka “²³⁸ “For your son belongs to the generation of your Ka.”²³⁹

Furthermore, “The Ka could eat food, and it was necessary to provide food for it ...” The Ka was also connected with the muscles. “It [Ka] was from one point of view regarded as the source of muscular movement and power, as opposed to ‘Ba,’ the will or the soul which set it in motion.”²⁴⁰

Budge wrote, “This abstract personality could move freely from place to place, separating itself from, or uniting itself to, the body at will, and also enjoying a life with the Gods in heaven.”²⁴¹ This makes sense if we remember that blood can evaporate.

In Christianity, the word “bless” means to consecrate or to make sacred. “Bless” originally meant in Old English, “bledsian,” or “to make sacred with blood.”

14.6 Ancient Egypt and the Ba

About the Ba, we said that it was closely associated with the Ka ... “and it was one of the principles of life in man. It revisited the body in the tomb and re-animated it... it could take any shape that it pleased ...”²⁴²

This certainly fits well with atmospheric oxygen, which, as a gas has the “spontaneous tendency to become distributed uniformly throughout any container.”²⁴³ In the Nile River Valley we represented the soul, or Ba, symbolically as a human-headed hawk, since a bird could also move through the air like oxygen.

This *invisible-and-formless-life-giver-in-the-air*, which we called the Ba, went in and then came out again. If one tried to keep it out, or tried to keep it in, one died. We ancient humans in our scientific search, observed the *invisible-and-formless-life-giver-in-the-air*, and named it Ba. Thus “Ba” was just our early attempt to describe what we now call “oxygen.”

14.7 Judeo-Christian Cultures

Genesis 2:7 says, “... the Lord God formed the man from the dust of the ground and breathed into his nostrils the breath of life, and the man became a living being.” This is, of course, a reference to the oxygen that animates us.

At our evangelical churches, when we stretch our arms out to the ceiling, as we sing “Let Jesus into your heart,” our arms are in position to let the maximum amount of oxygen into the lungs. No doubt, we get some health benefits from standing and singing in this position. So in our churches nowadays, we link Jesus to the volcanic resurrection as well as to oxygen. To our fire and brimstone (burn-stone) radio-evangelist preachers, Satan is rigid matter (the physical plane of desire), while Jesus is the soft, flowing Invisible oxygen. That involuntary and explosive expulsion of air through the nose and mouth, a sneeze, is often met with “God bless you,” as probably we feared for our companion’s spiritual health.

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Furthermore, the consonants YHWH all have a “breathy” and “open” nature much like the wind, which is felt everywhere but not seen. It could be interpreted as a metaphor for the omnipresence, subtlety, and transcendence of God. “Allah” may be a similar onomatopoeia.

In the next chapter, we will synthesize the key ideas and insights from Part III, exploring how the concepts of “spirit,” “soul,” and “universal energy” in various religious and philosophical traditions can be understood as early human attempts to grapple with the vital role of oxygen in sustaining life.

15.0 Synthesis

The Astonishing Hypothesis is that “you,” your joys and your sorrows, your memories and your ambitions, your sense of personal identity and free will, are in fact no more than the behavior of a vast assembly of nerve cells and their associated molecules.²⁴⁴

Francis Crick

15.0 Enlightenment

Using the “oxygen as soul” idea, we can better understand the meaning of “enlighten,” (to give spiritual light to). It might be difficult for some of us to accept the fact that “invisible spirituality” might be primarily mostly unconscious inhalation, at the bottom of an ocean of oxygen, which allows the *burning* of complex carbon molecules, molecules formed earlier by plants interacting with the *light* from a huge nuclear fusion reactor—our Star. We are being *enlightened* with every breath we take!

15.1 Eternity

To us ancient humans, in our limited perspective, oxygen always was present. We ran, worked, played, and yet there was always plenty of the Invisible which *breathed us*. If we tried to hold our breath, we

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passed out and then kept on breathing. So we could take control of our breathing but only for a limited time and in a limited range, and then the Invisible Something, what perhaps could be called the Interconnected Web of all Existence, took back control, trying to keep us alive, despite ourselves. To us ancients, oxygen seemed powerful, controlling, loving, and unlimited, *unconditionally nourishing*, and hence we developed the idea of *unconditional love*. We thought the Invisible Spirit nurtured everyone, and the Sun shined on everything.

We know now that atmosphere oxygen, although essential, is not eternal.²⁴⁵ For oxygen has not always been abundant in the Earth's 4.6-billion-year history. Without the Great Oxidation Event, a dramatic rise of oxygen in Earth's atmosphere some 2.3 billion years ago, there would be no humans, dinosaurs, fish, or rabbits—just microorganisms.²⁴⁶ For whatever reason, “oxygen was able to build up in the atmosphere, causing perhaps the most dramatic shift in the history of life on the planet. Before that happened, the amount of oxygen in Earth's atmosphere was about one ten-quadrillionth of the amount present today ...”²⁴⁷ The exact mechanism of why oxygen became more abundant at this time, after two billion years, is still being debated.

At first the blue-green algae and bacteria existed. For 1.6 billion years they had a monopoly, “Then in a short time, a whole series of radical changes took place and the boundaries of life exploded outwards. One of these changes was the coming of oxygen.”²⁴⁸ Oxygen made possible the new, more complex cells and the air-breathing animals. “At about 500 million years ago, multicellular life explodes onto the scene.”²⁴⁹ The colonization of land and air required oxygen. Energy can be produced eight times more efficiently with oxygen than without.

Unfortunately, water contains very little oxygen available for use by animals. On the other hand, when water meets land, at the land-water interface, there are higher concentrations of oxygen as at freshwater rivers that stream into the ocean. So life took advantage of the abundant oxygen at this meeting

place and eventually also of the abundant oxygen on the land.

Although oxygen can rise, it can also fall. There is a possibility we could have a runaway greenhouse effect (as on Venus), and once again there would be no oxygen to support our kind of life. Also, we now know that the sun is not stable. In about 4 billion years, our Star will finish its life cycle, grow to become a “red giant,” evaporate our oceans, and then collapse to become a “white dwarf” star.

15.2 Faith

Before the agricultural revolution (ten thousand years ago), when we were still hunter-gatherers, we killed animals, saw the blood flowing out and the last gasping breath. Then we discovered that certain foods, such as grain, could be stored for long periods, and was not toxic if cooked. A complex system of labor division emerged and flourished—the class systems had begun, with shoemakers, farmers, butchers, undertakers, rulers, and priests, and our knowledge became separated from its source—nature, and was carved in stone or otherwise recorded. The ancient teachings no longer made sense to us. So we were told *to have faith*.

In ancient times, sometimes a volcano would not explode for long periods of time. This, combined with the availability of the unconditionally nourishing Invisible Spirit, we interpreted as *grace*: “the influence or spirit of God operating in humans to regenerate or strengthen them.”²⁵⁰

Today, we know that we have been *selected* by nature because of certain genetic characteristics that had value in past environments. Those of us who were not “selected” would not feel that God had much grace, but then they were no longer around. So “God’s grace” was built into the system. Huston Smith was somewhat correct in his “perennial philosophy,” a philosophy of optimism due to “God’s grace.”

However, we do not know if our particular genes will be eliminated from the gene pool by various, sometimes violent acts of nature. Although we can take solace in the fact that many identical genes exist in other humans, and that our energy, as atoms, continues on.

15.3 Sacrifice

We thought that the Great Spirit, Souls and Spirits of the dead lived in the air. We would sometimes offer burnt offerings to them. A burning animal disappeared into the air. We believed this burnt animal could feed our ancestors' spirits—a *sacrifice*. Burning *incense* (from the Latin “to set on fire”) we thought would appease the spirits. An *altar* derives from the Latin *adolere*, “to ritually burn.” An altar was where we made sacrifices so the “spirit” of the sacrificed could join the “spirit” of our ancestor.

Burning was making something “holy” because it was putting it into the realm of the spirit, uniting it again with where it came from. When fire burned something, we said it “devoured it.” So by burning things we thought we were feeding our Gods. By feeding Them we hoped to bring favor on ourselves. However, today we say we are recycling atoms and molecules—chemically changing the elements from one form to another. Complex carbohydrates are breaking apart into CO₂ (carbon dioxide gas), O₂ (atmospheric oxygen), and H₂O (water vapor).

15.4 Three Planes of Existence

We early humans usually divided the world onto three planes such as 1) Heaven, Earth and Hell, 2) Upper Egypt, Egypt, Lower Egypt, 3) the Middle Kingdom of China, 4) Asgard, Midgard, and Hel of the Norse, and 5) Trailokya Survase²⁵¹ (Three Planes of Existence) of Buddhism.

Up was good to us because those who were taller were generally more powerful and survived better. *Up* was good because the life-giving Sun and Invisible Spirit were up. *Up* was good because life-giving water fell from above. *Up* was good because the life-giving fresh water rivers came from higher up. *Up* was good because the beautiful stars and planets were up. *Down* was bad because of the burning fire

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there. *Down* was bad because the lava pits gave off poisonous sulfur gasses. *Down* was bad because when you succumbed, you fell down. In some of our religions, *down* became associated with evil and the “devil.” If you were bad, you went *down* to hell, and if you were good, you went *up* to heaven.

Of course, now we know that there is no “up” or “down” except locally. These words are like the words “sunrise” and “sunset.” They represent somewhat false models of reality. There is “in” and “out.” *In*, towards the center of the spherical Earth, and *out* away from the center of the spherical Earth. Airline pilots talk correctly about going *in* for a landing, not *down*.

There is no “devil” at the center of the Earth. Everyone’s atoms upon death are separated and recycled, sometimes slowly, sometimes rapidly, into the Earth’s biosphere.²⁵² Some atoms may go *in* and some may go *out* depending on the particular nature of your end-stage disordering.

Before Galileo and Newton, we thought the Earth was imperfect and the Heavens were perfect. The Stars didn’t *change*. They were always present, always shining, and always the same. (Except for the few “wandering stars,” or planets that did not follow the pattern of the others.) The Earth *changed*. Rocks crumbled away. People died. All material things eventually weathered, corroded, or decomposed into the soil or the Invisible Spirit. Only the Stars were forever.²⁵³ So the air “above” ground contained the Invisible Spirits of our ancestors. “Above” *that* were the lights of the heavens. When they died the spirits went “up” to this perfect Heaven or down to hell. The Earth was the plane of passion, of desire, and of lust. This is where we spent our lives building empires and cities only to later have them crumble.²⁵⁴

Galileo showed us that the Heavens were not so perfect. There were mountains on the Moon, spots blemishing the face of the Sun, and several moons orbiting around Jupiter. The “Heavens” seemed more like our ordinary, imperfect world! Newton’s law of gravity, one simple law, described quite well, but not perfectly, the motion of bodies in the Heavens *and* on Earth. It showed that the motion of the Moon was the same as the falling of an apple. The Heavens and the Earth were the same.

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We now know that the “Heavens,” where we are embedded, can be places of cataclysmic change, with comets and asteroids swinging through our solar system and crashing into planets,²⁵⁵ with stars, emptied of their fuel, metamorphosing into novas or supernovas like the grandest ever finality of a cosmic fireworks display, and with the immense gravity of Black Holes shredding nearby stars before devouring them.

Because these heavenly changes often happen on such a slow scale compared to our human lives, the heavens can seem calm and beautiful (and perfect) compared to the death, war, and suffering on earth. Thus, some of us decided that it was better to emulate the yielding, nurturing and eternal Invisible Spirit and the perfect Lights in the Heavens.

15.5 Fasting

It is a natural instinct of animals to not eat when they are sick, but we have lost that instinct. However, fasting is an important part of many religions. It is a time to renounce material passions and earthly desires and to just allow ourselves to be “breathed” by the Invisible Spirit (of the higher plane). We now know that there is no miracle involved in fasting. Nowadays, “fasting” is called Caloric Restriction and there are many scientific studies supporting its health benefits. In our old paradigm, it was the “holy spirit” healing us. In the modern scientific paradigm, it is oxygen metabolizing (oxidizing or burning) waste products that have accumulated in the joints and organs.²⁵⁶

We now know that the heavens are not “up” there anywhere, but that they *include* this Earth, which is a crusted-over heap of hot matter, circling round a minor star, embedded in the boondocks of the galaxy. We are a *part* of the cosmos, interconnected, but a very, very, very, very, very, very, very, very, very, very, very, very, very, very, very, very, very small part.

15.6 Near Death and Out-of-Body Experiences

Based upon the information I have presented so far in this book, near death experiences (NDEs) and out-of-body experiences (OBEs) are probably based on wishful thinking and confirmation bias (more on these later). Many scientists such as, Susan Blackmore, Carl Sagan, Oliver Sacks, and Michael Shermer, have given plausible scientific explanations for these phenomena. To claim to have one of these experiences, and feel specially favored by God, may be the brain's unconscious way of gaining social status.

Furthermore, some airplane pilots have had out-of-body experiences after being swung around in a centrifuge. It appears that the nervous system has to recalibrate after being spun around, and the result is this out-of-body experience. For example, when you spin your body around and then suddenly stop, the world seems to keep spinning. Also, some mental exercises may be able to also reproduce this “recalibration” out-of-body phenomenon.

15.7 An Early Unification Theory

Sacrifice comes from the word sacri- (or holy) + facere (to make) or “to make holy.” Holy and whole both derive from the Old English word “hāl,” which meant “whole.” As scientists, we try to unify quantum theory with the Standard Model of physics. As ancients, we probably had our own attempts to unify nature's phenomena into an overarching theory.

However, we did not know that the oxygen content became less as one went higher in the sky. We thought that the Heavens also contained Spirit. To us, the Spirit continued on until it reached the Lights above—the Moon, the Stars, and the Wandering Stars. *Also, we thought (somewhat correctly) that the Fire-Magma-Light beneath the Earth and the Light from the heavens was the same Light, and in between was 1) the Spirit, 2) the weapon of the Gods, Lightning, and 3) the gift of the Gods, Rainbows.* As Heavenly Lights passed “below the horizon” into the underworld, they could renew their supply of food (magma, soma or ambrosia) and so continue to burn brightly when they “rose” the next morning. This was perhaps, to some of

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us, our Theory of Everything, our Whole or Holy. (The invisible Spirit became the Holy Spirit and all things were seen to come from the Spirit, even Lightning.)

Spoken words are also invisible (like the air, oxygen and “spirit”) and so you can have a confusion of *words* and *spirit*. The Bible says: “In the beginning was the Word, and the Word was with God, and the Word was God.” (John 1:1-3). We now know that spoken words are not carried by “spirit” but by waves of air molecules that are initially compressed by the vibrations of our vocal cords and received by our ear drums.

We saw that when someone was cremated that their “soul” (all the water vapor, oxygen and hydrogen gasses, etc.) rose into the air. Therefore, heaven was “up.” Nowadays, to some of us, “heaven” has evolved to mean someplace besides “up,” existing in another dimension. That is because our natural philosophers and scientists have shown over the last few centuries that what’s “up” is not heaven, but the airless Moon, the hot stars, and the generally inhospitable planets of our Home Star.

Some of us, such as Carl Jung, said that God existed because we sometimes felt an “oceanic feeling.” Although this could be interpreted as a “regression” to the aquatic womb, it could also be interpreted as simply being aware of the “ocean” of air in which we live. This atmosphere is readily visible from space. Feeling the wind blowing on your skin, and the subtle changes in air pressure (some people can detect air pressure in their joints) would be the same as sensing the ocean of air around you. So this “oceanic feeling” is not really sensing the presence of God unless you define God as atmospheric oxygen. So while some of us insist, “God is here and now,” and that we sense Its presence. I believe that we are experiencing: 1) what it feels like to be at the bottom of an ocean of air, or 2) the cultural agreement of our churches, temples, synagogues, etc., or more broadly, 3) the interconnected web of all existence, or 4) some combination of these three elements.

The “*holy spirit*” could be loosely conceived as the “*whole oxygen*” that surrounds us and is about 65% of living things by mass and 47% of the Earth’s crust.²⁵⁷ However, you cannot live on Spirit alone. The

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human body also requires carbon, hydrogen, nitrogen, and many minerals.

We can deal with people spiritually—talking with them by means of words carried through the invisible atmospheric, or we can deal with people physically—trying to force them with closed, rigid fists or rigid weapons.

15.8 Names of Oxygen

Primitive cultures over the course of many millennia were able to observe some obvious and important things about sustaining human life: 1) we breathe, whether we want to or not, 2) we die when we can't breathe, 3) our blood evaporates into the thin air, 4) we die when too much of our blood flows out, and 5) our burned (cremated) bodies reduce to a handful of ashes and rising smoke. They attempted to describe these events the best they could.

So based on our observations of our breath and death, we developed names for “universal energy,” “breath,” and “life force”: in Egypt, Ba; in China, Qi; in Greece, Psyche and Pneuma; in Japan, Reiki; in India, Prana; in Hebrew, Ruach; in Inuit, Silap Inua, in Polynesia, Mana, in Lakota, Wakan Tamkan, in Yoruba, Ase, in Tibetan Buddhism, Lung, Hawaiian, Ha, etc.

Culture	Oxygen Name
Egypt	Ba
China	Qi
Greece	Psyche, Pneuma
Japan	Reiki
India	Prana
Hebrew	Ruach
Inuit	Silap Inua
Polynesia	Mana
Lakota	Wakan Tanka
Yoruba	Ase
Tibetan Buddhism	Lung
Hawaiian	Ha

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We were trying to describe what science now calls “water vapor,” “oxygen,” “hydrogen,” and other gasses contained both in the body, and the air. Some of us later decided (incorrectly) that these invisible phenomena were somehow organized into personal units that could survive death.

Most of the time when you see the word “spirit,” you can substitute “blood” or “atmospheric oxygen” and the sentence will make some sense. Many times when you see the words like “spirit,” “soul,” or “God,” if you remember that we are composed of 65% oxygen, the sentence makes some sense. For example, Pierre Teilhard de Chardin once said, “We are not a human being having a spiritual experience, but a spiritual being having a human experience.”

Of course, we were wrong when we thought that the individual had a *personal* “spirit” and “soul” that was uniquely assigned to them. However, we should not judge ourselves too harshly. After all, every model (including atomic theory) is an approximation (however close) of the events occurring in the surrounding environment.²⁵⁸

15.9 Healing

The great physician Albert Schweitzer once said, “We physicians do nothing, we only help and encourage the physician within.” If “spirituality” represents atmospheric oxygen, then we would expect “spirituality” to be beneficial to one’s health, and anything that allowed the individual to breath easier would benefit their health. In other words, many practices and rituals such as meditation, going to church or temple, dancing, etc., which freely allow the person to relax, breath easy, and allow oxygen to flow to various parts of the body could help heal the body.

Thus, doing scientific research on the alleged “health benefits of spirituality,” can be like doing research on whether relaxed breathing is beneficial. Of course, researchers will find that it is beneficial. Of course, most scientists will dismiss these studies, as they do not believe “spirituality” exists.

15.9 Ka and Ba

So the Egyptian Ka, the *invisible-formless-and-personal-life-giver-in the-air-(that-enters-the-red-life-liquid)*, might be called “Spirit” by some of us, and might be called “oxygenated blood and its interactions” by others of us. The Egyptian Ba, the *invisible-formless-and-personal-life-giver-in-the-air-(that-enters-the-chest)*, might be called “Soul” by some of us, and might be called “biological oxygen and its interrelations” by others of us.

Religious	Egyptian	Descriptive	Scientific
Spirit	Ka	Invisible-formless-and-personal-life-giver-in the-air-(that-enters-the-red-life-liquid)	Oxygenated Blood & interrelations
Soul	Ba	Invisible-formless-and-personal-life-giver-in-the-air-(that-enters-the-chest)	Biological Oxygen & its interrelations

Cultures sometimes used only one term (soul or spirit) and sometimes used two (like the Egyptians). The fact that we confuse these two terms is due to: a) blood is supplied with oxygen by the breath and b) oxygen is invisible.

15.10 The End of Materialism?

Several times, we have mentioned an important point. Water vapor and oxygen both have invisible and formless aspects to our human perception. Unfortunately, this gives a “mystical” or “supernatural” quality to knowledge (*meta-physics* or *beyond-the-physical*) that we have been saddled with ever since and has probably encouraged the idea of “other dimensions.”

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Note that *light is also invisible*. If light were visible, as it passed by your eyes, you would not be able to see anything else. Your eye's retinas can only sense it, after it has been partially absorbed and partially reflected by a tree, particles of dust in the air, a cloud, etc.

Logically, there is nothing *super-natural* or *meta-physical*. If something occurs, it is part of nature and responds to natural laws. Some scientists say, "If I can't measure it, it doesn't exist."²⁵⁹ Paul Kurtz coined the phrase "transcendental temptation," to describe the temptation to jump to a supernatural or transcendent explanation of inexplicable events.

Materialism as a philosophy extends back to the ancient Greek philosophy of atomism, developed by Leucippus and Democritus in the 5th century BCE, and, also about the same time, in India by Charvaka, also known as Lokāyata, an ancient school of Indian materialism which "denied the existence of another world ... [and said] whatever cannot be perceived by the senses does not exist ... there is no God, no salvation, no soul (atman)." ²⁶⁰

The word *materialism* has a negative connotation with many spiritual or religious humans. Materialism is generally associated in our minds, due to our ancient misconceptions, with visible objects and events. It took a long time for us to realize that invisible air was also material—matter which could be combined with other substances, etc. Humans are about 93% oxygen, carbon and hydrogen by mass, whereas typical soil contains less 50% of these elements. With each breath, we instinctively know that we are lighter than mud.²⁶¹ However, in 1905, Einstein showed the equivalence of matter and energy. Matter could be considered a sort of frozen or slowed down energy. Perhaps I could be called an energist,²⁶² although energy has some negative connotations too.

15.11 Immortality

We early humans, of the Nile River Valley, believing we knew the fundamental principle of human life, the

invisible-formless-and-personal-life-giver-in-the-air, and thinking that we could prevent death, rotteness and decay through mummification, believed we might achieve immortality.

We put the mummified Pharaoh and his vital organs inside a pyramid, while air shafts in the pyramid made sure that the *invisible-life-giver-in-the-air*, or Ba, could re-animate him when the time came. Still buried beneath the swirling sands of the Nile desert, or neatly displayed in glass-enclosed museum cases throughout the world, mummified Pharaohs wait for their Ba to return to reanimate them.

Today, thanks to work by Darwin, Mendel, Crick, Watson, and now by many others, we have begun to understand cell maintenance technology. Some scientists feel that we will increase the human lifespan and eventually we might achieve some kind of immortality.

Also, perhaps one day we will take some DNA of a Pharaoh and be able to create a clone. In a roundabout way, the Pharaoh might get his wish. However, we can duplicate the genes, but never the exact environment. So, it will not be the same Pharaoh. It will just be a genetic copy that is dropped into a significantly different environment.

15.12 Future Chemistry

How long ago did we first observe, isolate, and codify, the *invisible-life-giver-in-the-air*? Perhaps when we first spoke 50,000 to 200,000 years ago. Yet, it is only in the last 100 years of this span that we have developed atomic theory. Physicist Richard Feynman: “If, in some cataclysm, all of scientific knowledge were to be destroyed ... what statement would contain the most information in the fewest words? I believe it is the *atomic hypothesis ... all things are made of atoms...*”²⁶³ Atmospheric oxygen makes up, surrounds, and gives life to humanity and the biosphere. *We early humans, by saying, “soul” and “spirit,” or fire-earth-air-water were using ideas that allow us to symbolize, in a way that did not require knowledge of atomic theory, extremely vital atmospheric oxygen.*

Synthesis

There exists what I call a “spiral of knowledge.” What in the past was “fire-earth-air-water,” “the soul,” “the spirit,” and “the-invisible-god-in-the-air” become “atmospheric oxygen” or “atomic theory.” The four elements of alchemy were replaced by the 118 elements of the atomic array, which, with the help of artificial intelligence, may be replaced by an even larger number of elements in a future chemistry.

Alchemy	Chemistry	Future Chemistry
4 elements: fire-earth-air-water	118 elements	?

15.13 Why God and Soul?

It is hard for the scientific model to displace the ideas of “soul” and/or “spirit” and “God” because of at least two factors (more on this later):

1) The tremendous cultural momentum of these early concepts, having perhaps 50,000 to 400,000 years of history behind them,²⁶⁴ as compared with only 100 or so years for the atomic theory. For many generations, “soul” and “spirit” have been taught to children, made part of sacred texts, and have become ingrained into our language to the point where they are now an *unexamined background assumption*. When looked at from this standpoint, science has made enormous progress in just a few years.

2) The simplicity (and relative inaccuracy) of the “soul/spirit” model as compared with the “atomic theory” model. This simplicity allows people to avoid having to learn the more complex (and more accurate) array of chemical elements and their interactions. (More on this later.)

15.14 Empirical Spirituality

Does the idea of the soul/spirit have any survival value? Well, it may have helped the culture with how to dispose of dead, decaying bodies. Burn them and release the “soul.” Also, for people who have not had educational opportunities, they provide a simple model of the world.

Synthesis

There is no Santa Claus, no tooth fairy, no Easter Bunny. The “mothership” is really just a computer generated image, the Sun doesn’t “set,” and our individual “spirit” or “soul,” although in a sense they leave our bodies at death, cannot somehow be returned to “you” or “me,” unique personalities, at another time and place through “reincarnation.” Take the cold bath.

At death, in our more accurate scientific model, the “spirit” does not leave the body. The “soul” of the person does not leave the body. Rather, the body ceases functioning, the cells age and eventually die, and respiration stops. Our atoms, which are mostly oxygen, are eventually recycled into the vast interconnected web we call the biosphere or more broadly, the Universe. Our “soul” and “spirit” reveal themselves to be part of a vast, shared, soup of atoms. What was named the “soul” or “spirit” was an attempt by early humans to understand what we now call atmospheric oxygen. It was not a metaphysical spirituality, it was an empirical spirituality.

PART V The Knowledge Inside Us and Around Us

For Part V of our journey let us look inside us, the talking and writing apes, and around us, and examine how we process knowledge and how this relates to science, spirituality, and religion.

16.0 Usable Knowledge

All models are wrong, but some are useful.

George Box, statistician

16.1 Human Factors

In 1973, the Air Force Academy sent a few of us to Purdue University to get a master's degree in what was variously called Human Factors Psychology, Human Factors in Design, Engineering Psychology, Ergonomics, or Man-Machine Interface. The goal was to design things so that humans can use them easily.²⁶⁵ At that time, only about 500 people worldwide were working in this discipline, mostly in government. Today, it is more commonly known by names such as User Experience (UX), Usability Engineering, User-Centered Design, Interaction Design, Human-Computer Interaction (HCI), etc., and there are millions of people worldwide working in this field, mostly in private enterprise.

So when I became an educator in 1982, I applied what I had learned in order to facilitate the transmission of knowledge to students. Since I initially taught inner-city students in grades 7 through 12, I had to quickly learn how to take ideas expressed in sophisticated vocabulary and make them “usable” for these students. I eventually adopted the maxim, “If you can't explain it to a seventh grader, you don't really

understand it.” Later, when I expanded my teaching to include kindergarten through grade 12, I changed this maxim to, “If you can't explain it to a third grader, you don't really understand it.”

Eventually, my study of “usable knowledge” led me to explore the field of abstraction.²⁶⁶

16.2 Abstract vs. Grounded

Although I will usually use the words “abstract” and “grounded,” throughout history, philosophers and educators have developed various ways to describe the relationship between reality and the words/concepts describing reality: the “referent” and its “sign,” the “particular” and the “universal,” the “Noumenon” (the thing itself) and “Phenomenon” (its representation), and the “concrete” vs. the “abstract.” In modern times, we sometimes see the word “granular” being used for “concrete” details, and in AI there is the “symbol grounding problem.”²⁶⁷

The root word of abstraction means, “to draw away from.” It’s related to the word “extract,” which means, “to draw out of.” A reporter “extracts” from events. Abstraction could be thought of as recognizing and labeling the pattern two or more memories have in common. For example, you have seen a German Shepherd, a poodle, and a dachshund, etc., and you noticed that they all have four legs, a large nose, etc., and you abstract what psychologists call a prototypical “dog.” The opposite of abstracting could be called, as I have said, grounding, manifesting, implementing, increasing the granularity, or concreting. When you are told to think of a specific “dog,” you might picture your dachshund.

Pattern sensing gave our ancestors a crucial evolutionary advantage. When early humans recognized patterns—in animal behavior, weather, plant cycles, and celestial movements such as Sun's motion across the sky—they could make increasingly accurate predictions. A hunter who understood animal migration patterns ate better than one who didn't. A farmer who could predict seasonal changes planted more successfully. Over time, this ability to detect patterns, abstract them into mental models, and use them to predict future events

became one of humanity's greatest survival tools.²⁶⁸

16.3 Generalization

Generalization is a form of abstraction. Our minds naturally create hierarchies of increasingly abstract concepts. For example:

One laundry detergent → all laundry detergents → cleaning products → ways to remove dirt → ways to remove anything

Drinking a coke → drinking a soft drink → drinking any liquid nutrient → ingesting nutrients → inflowing

Books → paper products with information → information storage tools → storage tools → tools

Our brains have limited capability for abstraction. To overcome this limitation, humans have off-loaded our knowledge onto external storage systems throughout history: astronomically-aligned monuments, totems, rock carvings, cave paintings, bone carvings, clay tablets, papyri, pictographs, hieroglyphics, alphabets, books, numbers, etc., as well as modern photographs, phonographs, videos, film, digital storage, virtual reality, etc. These tools have enabled tremendous advances in our knowledge.²⁶⁹

Here are some of the benefits of abstraction:

Communication and Learning: 1) Enables the development of oral and written languages, allowing people to share ideas without needing every detail. 2) Aids learning and teaching through metaphors, diagrams, and models that make complex ideas graspable. 3) Reduces cognitive load by filtering out unnecessary details, letting the mind focus on core concepts.

Problem-Solving and Innovation: 1) Simplifies complexity by breaking down complex systems into manageable parts. 2) Facilitates solution transfer across fields, such as applying mathematical models from physics to economics. 3) Encourages creativity beyond paradigmatic constraints, leading to breakthroughs in

mathematics and science. 4) Promotes efficiency by focusing on general principles rather than endless specific cases.

Systems and Technology: 1) Enables scalable frameworks like programming languages and business models that can be widely applied. 2) Builds technological foundations for software architecture and artificial intelligence. 3) Strengthens prediction and planning through abstract models of behavior in science, finance, and policy.

Society and Culture: 1) Facilitates governance through abstract laws that can apply fairly across diverse cases. 2) Drives creativity in arts by encouraging thinking beyond literal interpretations. 3) Promotes interdisciplinary understanding by identifying patterns that connect different fields. 4) Enables broader social systems and frameworks that can adapt to different contexts.

However, there are some problems with abstraction.

16.4 Incompleteness

Maps, theories, models, rules and algorithms, dogma, and even logic (for application) are all abstractions of the physical universe, but are always incomplete. Perhaps Korzybski said it best: “The map is not the territory; the word is not the thing.” Similarly, from Alan Watts: “The menu is not the meal,” and here are several other similar statements I devised: “The symbol is not the substance.” “The blueprint is not the building.” “The recall is not the reality.” “Legality is not justice.” On the last point, “the spirit of the law is greater than the letter of the law,” which is a concept that has been echoed by various philosophers and justices, and in various religions. In China, “people are alive, the law is dead.” Finally, under his famous painting of a pipe, René Magritte captured the incompleteness of abstraction when he wrote:



“This is not a pipe.”

The Internet has evolved from a very abstract, asynchronous, purely textual content system, that left out a lot, to a more granular, synchronous system. The chronology goes something like this: a) Internet 1.0: Text, b) Internet 2.0: Photos, c) Internet 3.0: Sound, d) Internet 4.0: Video, e) Internet 5.0: AI Augmented Reality (AR) and Virtual Reality (VR), f) Internet 6.0: Brain-Machine (i.e., Neuralink), g) Internet 7.0: Brain-Brain (i.e., Hive Minds).

So, even though abstractions attempt to match the pattern or structure of the real world, the ground, *they leave out some part of it*. So: 1) You can never know *everything* about what happened. 2) Whatever you sense is not *exactly* what happened. 3) Whatever you describe is not *exactly* what you sensed. 4) Whatever something means is not *exactly* what you described. 5) Whatever you have been taught will not always work. 6) Whatever the algorithm does will not always be correct or just, leading to cracks in our systems such as tax avoidance strategies, computer hacking, regulatory arbitrage, gerrymandering, algorithmic bias and failure, financial engineering, social engineering, academic fraud, regulatory capture, astroturfing, deepfakes, and more. Consequently, people may unjustly fall²⁷⁰ or rise through these cracks.²⁷¹ Abstract rules and frameworks will always need oversight bodies or arbiters to address these “abstraction injustices.”²⁷²

16.5 Voting

What about systems of voting? They can move from abstract to more granular in terms of the data they collect from voters. 1) First Past the Post (FPTP): This is the most abstract system. It collects the least amount of information from voters—just a single choice. While simple, it loses a lot of nuance about voter preferences. 2) Ranked Choice Voting: This system collects more information than FPTP. It captures not just a voter's top choice, but their full preference ordering. This allows for a more nuanced expression of voter will, especially when no candidate has a majority of first-choice votes. 3) Rated Voting Systems (like

Approval Voting): This can collect the most granular data. Voters can rate each candidate from +10 to -10. The increasing granularity of data shown here allows systems to more accurately reflect the complex preferences of a diverse electorate.²⁷³ However, while more data can lead to more accurate representations of voter preferences, it can also introduce complexity in implementation. There's always a balance to be struck between accuracy, complexity, and usability in real-world voting scenarios. More on this later.

16.6 Education

Mathematics: We might start with five sheep on the grass and then two more sheep arrive. This is a grounded, dynamic, real world event. Then, we can abstract this by *drawing* on paper five sheep and then adding two more sheep. Then we can abstract further with stick-like figures: ||||| + ||. Then further with: V + II, and further with Hindu-Arabic numbers: $5 + 2$. Using letters to represent numbers, such as: $5+2 = x$ gives another level. The grounded, dynamic, and practical origins of mathematics can become merely symbol manipulation, which allows some students to get an “A,” and some to fail.²⁷⁴

Any applied mathematical number “crunching” algorithm, such as summation, averaging, etc., leaves things out. Here’s two simple examples: a) You get the following notification: “Your grandmother’s home was at an average temperature of 75°F over the last 24 hours.” What was left out is that in the first twelve hours the temperature was 90°F and in the next twelve hours the temperature was 60°F. b) National sales for the month of September was \$9,000. Here’s what’s left out: Sales from Alaska was \$8,000, and from the rest of the nation \$1,000.

Mathematics can be difficult to learn because it is so abstract, but I think it could be made easier to learn if students were taught about levels of abstraction.

The Battle of Gettysburg: From very abstract to very granular: a) reading an analysis, b) reading a summary, c) reading a book with no pictures, d) reading a book with pictures, e) listening to an audio recording of the

lecture, f) watching a video recording of the lecture, g) being at a lecture, h) watching a miniseries, i) watching a reenactment, j) participating in an reenactment.

IQ Rise: There are many explanations for why IQ has risen in the last century. However, I think one additional explanation is that during this last century we have gone from using textbooks that were largely absent of any photos and diagrams, to: a) some slideshows (when I was a child these were quite a treat), b) the occasional use of film and film projectors c) textbooks with photos and later color photos and diagrams, d) readily available videos in almost every classroom, e) AR and VR capabilities with AI generated videos. From the very abstract to a more granular multi-sensory experience.

16.7 Large Language Models (LLMs)

Large Language Models (LLMs): Although these models often surprise us with knowledge that they weren't trained on, as of this writing they also often fail on common sense reasoning questions about the real world. That's because they don't have *any* senses, much less any *common* sense—no experience of the real world because they are *language* models. They deal with abstract languages and symbols—and more recently sounds, images and videos.

In artificial intelligence this is called the “grounding problem.” Some labs and companies are trying to solve this with what are call “multimodal models,” meaning models that combine language, sounds, images, and videos. However, even these models are abstract, not completely grounded. So the next step would be to give various sensory equipment to robots (i.e, androids, electric cars) and let them experience the real world.

Once the robots start experiencing the real world, with whatever “senses” they are given, and they share that sensory experience with a million or so other robots, they will have a common robot sense to ground them.

16.8 The Usability of Abstract Knowledge

During the 18th and 19th century many natural philosophers (who later were called “scientists”) were trying to *verify* theories. Karl Popper, in the 20th century, brought into fashion the idea of *falsification* of a theory,²⁷⁵ for to him a theory was scientific if there were some critical test that could be done that might prove the theory wrong. Popper apparently was inspired by Einstein’s theory of relativity, which made specific predictions (the bending of light by matter), which were highly risky because *events could have proved them wrong*. For example, Aristotle thought that heavy objects fell faster than lighter objects which was falsified by Galileo’s experiments. Newton developed an equation to describe gravity which was falsified by gravitational lensing.²⁷⁶ Einstein’s relativity equations may be falsified by quantum gravity, dark matter, dark energy, black hole singularities, or if the constants of nature change over time.

Aristotle	heavy bodies fall faster	falsified by experiment
Newton	gravity equations	falsified by bending star light
Einstein	relativity equations	may be falsified in the future

However, how many scientific theories, laws or principles are *always* true and complete? Since they are abstractions they will always leave something out, unless the universe is somehow based on mathematical equations which seems unlikely when one examines the sequence from Aristotle to Galileo to Newton to Einstein, with each theory becoming more accurate.

Steven Thorton says that Popper backpedaled later in life. “Popper’s final position is that he acknowledges it is impossible to discriminate science from non-science with falsifiability *alone* ... This is itself clearly a major alteration of his position, and arguably represents a substantial step down on his part.”²⁷⁷ So instead of only talking about the truth or falsity of a theory, I think we should also be talking

about its *usability*. (See chart.)

In the 18th and 19th centuries, Bacon asked, can a theory be shown to be true? In the 20th century, Popper asked, can a theory be shown to be false? In the 21st century, we can ask, can a theory be shown to be usable? These are three different perspectives of theories.

18th & 19th Centuries	Verification (Bacon)	Can a theory be shown to be true?
20th Century	Falsification (Popper)	Can theory be shown to be false?
21st Century	Usability (Lauritzen)	Can a theory be shown to be usable?

16.9 Usable “False” Models

Even theories that have been “proven false” are sometimes still highly usable. Newton’s work was shown to be false by Einstein, yet it is still very *useful* at speeds much lower than the speed of light. For example, Newton’s Laws are used with robotic planetary probes that have been sent to most of the planets of our system. This has resulted in an explosion of our knowledge concerning these planets. Some call the period, beginning in the 1960s and into the 1980s, the “golden age of planetary exploration.” All these probes used the mathematics of Newton’s laws and the law of gravity to get where they were going rather than Einsteins’ formulations, because these spacecraft travel at speeds much, much, much slower than the speed of light.

16.10 The Usability Equation

Here’s the simple one line summary: You get greater usability of knowledge when you increase its accuracy and/or increase its conciseness. The equation in symbols: $U = AC$. In words: Usability equals its Accuracy times its Conciseness. I call this the Usability Equation.”²⁷⁸ Of course, we can derive from this: Accuracy = Usability/Conciseness or $A = U/C$ and Conciseness = Usability/Accuracy or $C = U/A$.

16.11 High Usability

Like a computer, the human mind has limited memory, and so, while dreaming, the mind attempts to find similar images (experiences), and classify or blend them altogether. After the evolution of language the mind was able to compress them into *verbal statements*. Recently, I have noticed that when I'm learning a new skill, such how a new washing machine works, after enough experience with the task, a simple verbalization appears.

Here are some examples of High Usability from science and daily life:

1) The Copernican heliocentric system of predicting the motions of the heavenly bodies in the sky, which replaced the geocentric Ptolemaic system.

2) Newton's expression of the theory of gravity which can be stated in one sentence: two objects will attract each other with a force proportional to their masses and inversely proportional to the second power of the distance between them.

3) Freud's *id, ego, superego* model.

4) "Catchy" phrases that are easy to remember for songs or advertisements.

5) Aircraft pilot slang. Pilots have a strong incentive to communicate things quickly and clearly. When moving at high speeds, a slow communication or a miscommunication can result in a catastrophic fail. "Kilometers" become "klicks." "Ready to leave" becomes "good to go." "I understood what you said," becomes "copy that." "Would you repeat that?" Becomes "Say again," and so on.²⁷⁹ Other military organizations also develop accurate and compressed slang.

6) Medical slang. Doctors don't say: send the patient to the Dermatology Department and then to the Gastrointestinal Department, they say: send him to Derm and then GI.

So professions develop slang vocabulary for clarity and speed, my experience teaching English to Chinese students, convinced me that a *language itself*, in this case English, evolves to to become easier to

pronounce, making it more concise.

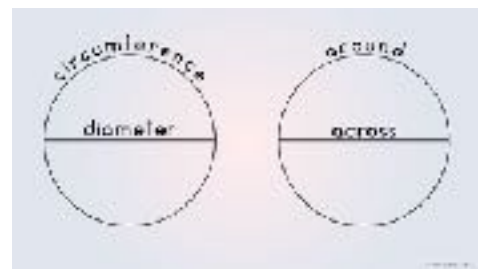
Many theories, models, etc., may be “true” in that they have *some* accuracy. Those that have 1) a large accuracy and 2) are concise, are the best theories. Scientists called these theories “elegant.”

The Usability Equation can help explain beliefs, fake news and false conspiracy theories. These can spread rapidly because they are so simple. “A lie can spread around the world while the truth is still putting on his pants.”

16.12 Simplifying the Language of Science

According to the Usability Equation scientists can do one of two things to make science more accessible: 1) improve accuracy (which scientists often do, and are good at) or 2) improve conciseness (which scientists could improve on). In other words, if science could make its words and phrases more concise, without losing accuracy, then the *usability* would improve.

After about ten years of teaching math in the inner city, I devised a number of simpler terms to use in place of the cumbersome Greek and Latin terminology that English-speaking children are expected to use. I took 250 mathematics words and translated them into easier, everyday English. For example, I use the words “around” and “across” instead of “circumference” and “diameter” so that π equals the *around* divided by the *across*. Although some people have complained to me that the words *around* and *across* are not precise, I am *defining* them in a specialized, precise way. (See image.)



In my experience, the use of these common English terms, which have a kinesthetic memory associated with them, in other words, they are grounded to sense experiences of children, was very valuable in teaching mathematics. This could be tested empirically.

I have also generalized these terms in a white paper, “Upgrading our Knowledge Infrastructure,”²⁸⁰

and I included some of them in a children’s STEM fiction book I wrote.

16.13 Social Abstractions

Social abstractions, such as such as money, religions, democracy, socialism, capitalism, or libertarianism, etc., also have *accuracy*, *conciseness* and *usability*. In the space of all political, economic or religious abstractions there are probably many useful ones still to be discovered—with a recent example of using blockchains in government.

The implicit claim for these social models is that their usability (accuracy and conciseness), by representing more accurately the social needs of humanity, will offer a greater benefit than prior systems such as feudalism or bartering. It’s quite difficult to do a controlled scientific experiment to test the validity of these implicit claims although it appears highly likely that in some cases they are true—as with money.

Money replaced a barter system.²⁸¹ It has a better accuracy and conciseness (imagine the mass of a bartered sheep compared to the mass of a coin), and thus usability. Instead of bartering one sheep for a certain quantity of flour, the person could exchange a coin.²⁸²

16.14 Literary Abstractions

A good story can demonstrate important *abstract human principles*. This can be quite granular. For example, one can state a logical principle, “Don’t jump to conclusions,” or one can *show* it in a story as in the Sherlock Holmes stories when Holmes warns Doctor Watson against making premature judgments about a case, and then demonstrates this when solving the case.

Doyle’s stories, and most other literary stories, demonstrate human nature. To quote Cervantes, literature tells us, “Who we are, and who we ought to be.” The degree of accuracy in these fictional works is high enough for us to find them *usable*.

16.15 Religious Abstractions

Regarding the accuracy of some religious dogma, Harari was correct when he stated: “We are living inside the dreams of dead people.”²⁸³ Usability may partly explain the popularity of certain “nonscientific” beliefs. These beliefs are often quite concise. For example, the ancient “Fire-Earth-Water-Air” model is much more concise than the 119 elements of the table of the elements. Using the word “soul” or “spirit” rather than the more complex “element number 8 of the periodic table and its biospheric interrelations” is also much more concise. To our ancestors, talking apes without a writing system to extend their memory, these simple models were attractive and useful—as beginning steps. Similarly, modern religion is attractive and useful to those without sufficient opportunity for the mathematical and scientific education that will allow them to access the more accurate models needed for better survival.

We can perhaps begin to understand the firm hold that religion has on many people. If the religious believer is surrounded by other people who believe like he or she does, in the reality of Jesus, Mohammed, Krishna, Zeus, etc., and who experience a mutual benefit from cooperation, the religious dogma can embed in their minds with the same firmness as does *nation* or *money* in our minds. Physically, the nation has palaces, court houses, legislative buildings, banks, and money, while the religion has temples, mosques, churches, dress, and relics. Think about this the next time you try to relieve someone of their superstitious beliefs.

Education

However, I think much progress could be made by toward removal of superstition by teaching children the difference between a tree and the word “tree,” etc., and re-emphasizing this year after year in every subject until abstraction and grounding become second nature to them.

By introducing the concept of usability as a key criterion for evaluating the value of models and theories, we provide a powerful framework for bridging the gap between the the struggle to capture “truth” and the practical demands of navigating the real world. My interdisciplinary scope, ranging from mathematics and computer science to linguistics and cultural theory, underscores the far-reaching implications of the ideas presented.

“All models are wrong, but some are useful.”

In the next chapter, we will explore additional strategies and principles for cultivating better thinking habits, as we seek to build a more reliable and robust framework for making sense of the world around us.

17.0 Confession of a Straight “A” Student

17.1 Background

I was once a very successful student with high grades and remarkable athletic achievements, and I was accepted at Yale, Stanford, and USC. However, I was a fake. In fact, I was worse than a fake, because I didn't know I was a fake. But let's go back to the beginning.

Neither of my parents went to college. As the eldest son, I was expected to go to college and I felt pressure to excel in school. The problem was that I had no idea of how to excel in school. My teachers encouraged me to “guess at the meanings of words” and said that if I “read enough” I would become smart. Our public school classrooms did have dictionary sets, which sat very respectably on the shelves, unused. So I was forced to memorize in order to somehow accommodate the pressure.

Air Force Academy

As I have said, with my “good” grades, honors, and my high scores on college standardized tests (thanks to test-prep materials) I could have attended any college.²⁸⁴ However, my parents had little money, and, since my father had wanted to attend a service academy, I attended the Air Force Academy in Colorado Springs. At least I would not have to go to Vietnam for the next four years, I thought.

While there, my parents divorced and my father disappeared for a time. Meanwhile, along with the rest of the country, my sympathies began to shift to those of the antiwar protesters. I even began to think of declaring myself a pacifist, a conscientious objector.

In 1973, I graduated near the top of my class at the Academy, and I was immediately sent to Purdue University to get a master's degree.²⁸⁵ Afterwards I was sent to Edwards Air Force Base to test and evaluate

the usability design of jet cockpits.

Edwards Air Force Base

In the Air Force I was expected to actually *do* something with my knowledge. I was possibly one of the worst lieutenants in military history. I was critical of the government and the Air Force, and, with some other lieutenants, I was routinely smoking marijuana and experimenting with LSD. At this same time some of my family members joined the Church of Scientology, and, encouraged by them, I began to take Scientology classes in Los Angeles on the weekends, driving the 2 hours there from my job at the base.

In 1975, I officially applied to the Air Force to obtain status as a conscientious objector. In February of 1976 I was released from the Air Force, not having completed my five year commitment, and I moved to Los Angeles to be near the Church.

Inside Scientology

I took many courses. Although I never met Hubbard in person, my mother met him when she was on one of his ships in the Caribbean Sea. Meanwhile, I joined the staff as an instructor.²⁸⁶ Over three years, from about 1977-1980, working about 50-60 hours per week with no vacations, which caused a lot of animosity from my non-Scientology family members during the Christmas holiday, I calculated that I earned about 25 cents an hour. So I had to take menial part-time jobs in order to survive—selling “office art” door-to-door, moving furniture, or delivering newspapers in my van to convenience stores and liquor stores. Also, for two months I lived in my van in the Church parking lot on Sunset Boulevard. Later, I moved into a two-bedroom apartment which slept twelve of us, and still later I rented my own room in a large house.

As an instructor, I taught students Dianetic and Scientology principles and techniques. I excelled in certain areas and did very poorly in others. Mostly I excelled in coaching students on communication drills

and I was proficient in training students on the use of the E-meter.

The E-Meter

The E-meter was used by the Scientology counselor to locate an incident of past trauma. The counselor would then have the counselee re-experience the incident and talk about it, as many times as necessary, in order to discharge the negative emotional “charge.” William Burroughs, who embraced Scientology for a time, described it to Allen Ginsberg like this: “They do the job without hypnosis or drugs, simply run the tape back and forth until the trauma is wiped off.”²⁸⁷

If the emotional charge wouldn’t discharge, the counselor would look for an “earlier similar incident” and repeat the procedure until the most basic incident was found and discharged, at which point the entire series of incidents would discharge. I understood the principles well, and I used them on others and later on myself. More details below.

Much of the counseling I received and much of the counseling that I taught to students was similar to a confessional, in which you would reveal the secrets you were withholding from others. Hubbard called them “withholds” and he claimed that they could cause a lot of problems in a relationship. For example, if you were on the E-meter, and you criticized a particular person, you would be asked a question like, “What have you done [your secret or thing you were withholding] that that person *almost* found out about?” For me, despite my effort to repress a certain thought whenever it would momentarily appear in my mind, causing the needle on the meter to move a certain way, the counselor would say softly but precisely, “*That.*” I would remain silent trying to think of something *else*, while the counselor kept an eye on the meter, “*That... there...*” he would repeat whenever the unwanted thought returned. “What was that thought you just had? *That.*” And finally I would give a slight chuckle and with some embarrassment say, “Oh, *thaaat,*” and out would come the confession.

For example, around 1983, as I was drifting away from Scientology, I started to substitute teach. At first everything went smoothly, however I noticed that sometimes I would lose my temper with the students for no apparent reason. This bothered me and so one day I picked up my E-meter and I asked myself, "Have you done anything which the students almost found out about?" The E-Meter immediately responded and what came to my mind was that I had smoked marijuana. As I thought about my experiences of losing my temper, I remembered that sometimes a student would mention marijuana in passing, or make a joke about it, and I would kind of freeze up—not knowing if my mention of my prior usage of the drug would cause some student to report me to the principal and I would lose my job—and that shortly after that I would lose my temper about something unrelated.²⁸⁸

The next time it happened I gulped, took a chance, and casually mentioned that I had used it earlier in my life, while carefully emphasizing that I no longer used it, and I recommended that they didn't use it either. They just smiled and said, "No longer?" as if it were strange that I had quit. I looked them straight in the eye and said, "No longer." I waited the rest of the day for the principal to call me into his office, but it never happened, and after that I realized that student-teacher rapport involved not "ratting out" each other for minor offenses.

A Failing Instructor

In Scientology, I also received practice in leadership, forced into supervisory positions in an organization that desperately needed personnel to achieve Hubbard's grandiose aim—to save humanity by clearing them of their mental aberrations. I learned the importance of professionalism, honor, and competency—things I studied at the Air Force Academy with regard to defending my country—but which did not seem relevant to a controversial overseas war.

However, it was around this time that there was an oil crisis and for the first time in my life I had to

wait in long lines at gas stations. I was rudely, but rightfully, shaken out of my youthful idealism. It was the first of several events that made me question my involvement in Scientology.

I had a problem during my three years as a Scientology staff member—I almost always failed to graduate an acceptable number of students from my course. This was an intensive internship course for counselors, run according to the very strict principles and techniques laid out by Hubbard. I had taken the course myself.

However, there was always a lot of pressure to graduate students as quickly as possible so as to keep production statistics high. So I was rushed through my internship course, and I later confessed that I had not achieved the aims of the internship and had falsely attested to its completion. However, they left me on the job, apparently because no one else wanted it.

The internship counseling sessions, like all the counseling sessions, were meticulously recorded by hand during the sessions, and were then strictly reviewed by the case supervisor. If the case supervisor found any procedural mistakes, the intern would study and do drills in my course to correct their mistakes before doing another session. Sessions were also sometimes audio recorded and evaluated by myself and the case supervisor. The final requirement of the course was to successfully complete ten hours of counseling in one day—without any errors. I didn't want to rush students through the class, like I had been, but, while learning-by-teaching, I valiantly attempted to meet my assigned quotas each week.

Sometimes upper management would notice my lackluster graduation rates and they would investigate. I remember one time a lady in our quality control division, who I greatly respected, was quizzing me on the E-meter, trying to find out *why, why, why* I could not produce more graduates. She was really pressing me and I suddenly broke down crying. She was a little shocked and so was I. It was a pivotal point in my life. After that I began to change for the better. I became a poor student. Let me explain.

A Poor Student

Scientology courses are self-paced. At the beginning of each course, and at the beginning of every book, it was made very clear that you should look up every word you didn't fully understand. The course supervisor would sometimes come to you, look over the material you were studying, pick out an unusual word and say, "What's the meaning of ____." If you could not answer immediately, you were told to look up the word in the dictionary and later the supervisor would reexamine you.

So while studying I used a dictionary like everyone else. I looked up some words and I spouted off the definition when asked. I also demonstrated the meaning with small objects, although often after overhearing or overseeing someone else do it. I finished my counseling course and my internship course, and I became an instructor of the interns.

I had seen poor students in Scientology. We called them "bogged students," probably because as they went through the course, looking up so many words, it was as if they were making their way waist deep through a peat bog.

They were never removed from the course. They were left alone, buried in their dictionaries, looking up a word, then looking up a word within the definition of *that* word, then looking up a word within the definition of *that* word, while dutifully writing down each word, and then crossing them off as they made their way back up the "word chain." I had found them curious. I couldn't understand how they could not just *read* the material. Yet they unabashedly carried on, and I noticed they had an integrity and certainty that I lacked.

However, after the crying incident, a horrible idea began to dawn on me—perhaps I didn't really understand many of these words I was reading. I could not accept it at first. After all, I had graduated from some highly respected universities with top grades, honors and a master's degree—yet I was having trouble on this post.

Dictionaries

So I carefully began looking up more words, lots of words, eventually even simple ones, and soon enough I could not even make it through a word chain and back. I became a hopelessly bogged student.

However, I knew that earlier misunderstood words could affect your understanding of later words—just like early traumatic experiences could affect later experiences. So I began to think that perhaps there were words from my pre-Scientology education that were misunderstood.

Then, about 1979, I saw a Church bulletin, not written by Hubbard personally, but by the Board of Directors, that said that many bogged staff members were getting self-help by studying the textbooks from their prior education, in K-12 school or college—only this time properly defining the words. Of course I understood that these misunderstood words *could* have been located and defined on the E-meter, as they were linked to negative emotional charge.

The negative emotional charge on misunderstood words accumulates when one has to pass a test with these words on it, or when one has to operate in the world in which these words appear. For example, if you misunderstood the word “liability,” and you happen to get a job within the insurance industry, this might cause anger, fear, frustration, grief, etc., during the time period that you held this job. Then later, whenever you saw the word, those negative emotions could reappear.

However, there were not enough skilled E-meter operators to go around. We staff members knew that these skilled operators were needed to serve the high-paying, public Scientologists.

So, which textbook did I choose first? The bulletin said the student should choose whichever ones they were most interested in.²⁸⁹ At that time, for some reason, I was most interested in studying grammar, so, in a used bookstore I found a grammar textbook similar to my old high school one.

I had always hated grammar in school—every year the same old routine: nouns, verbs, adjectives,

adverbs, ad nauseam. I also knew that if I hated a subject, there was probably a lot of emotional charge on that subject and many misunderstood words.

Nouns

I still vividly recall sitting upstairs in the staff study room overlooking Sunset Boulevard and looking up words like “noun,” “verb,” and even “word.” I made diagrams of what these words meant, their relationship to each other, and their relationship to my physical surroundings. I began to have some “Ooooooh!” moments. I was rather embarrassed and amazed to find that I had not fully understood these simple words.

It about was then that I remembered a time in primary school when my well-meaning teacher had held up a pencil and said, “This is a noun.” I had believed her (apparently children have a kind of belief module in the brain) and from that point on, unconsciously, “nouns” surrounded me. The universe was full of “nouns.”

However, now, in the staff study room, when I thought about where nouns existed, it became clear to me that they existed only in books, and, when spoken, in the air. The universe was *not* full of nouns. In fact, the mass of all the nouns, the weight of the ink and paper on which they lay or the vibrating molecules of air on which they traveled, was minuscule compared to the mass of all the buildings, cars, the Sun and Earth and the rest of the universe. So finally, at the age of 27, I grokked that a physical pencil was *not* a noun and that the *word* “pencil” *was* a noun.

Back in primary school grammar had become mistakingly entwined with the universe and the universe had become a somewhat hateful place. But now grammar fell into its proper place in the world. I walked out of the building in kind of euphoric daze, unable to study anymore. I went home and took some dirty clothes to a laundromat and stood outside by a small tree waiting for them to finish their cycle. My

entire worldview had shifted, and I felt a tremendous sense of peace.

Misunderstood Words

So about this time, 1979, I became aware of an entire sea of words that I didn't understand. I became on fire to look up more words, and I became an evangelist throughout the organization for clearing up misunderstood words from one's previous education. I annoyed a lot of people, and eventually the lady who had unintentionally made me cry said, "Bill, not *everyone* needs to clear up earlier misunderstood words!"

I backed off a bit. But I continued searching through my old textbooks for words that I could clear up. From the three years of supervising the interns on my course, I had acquired a lot of knowledge about negative emotional charge and how to relieve it. So every time I found some key words that I had memorized but not connected to the physical universe, I would work to discharge the emotional charge on the words and subject. A kind of silent terror and hatred, buried deep inside me, was turning to understanding.

During this period I recalled something else I had completely forgotten about. It was a time in the fourth grade when I was having a lot of difficulties just *sitting still* in my seat, and the teacher was quite annoyed with me. During recess I asked a classmate of mine how he managed to sit still in class. "You have to learn to sleep with your eyes open," he said, and then ran off chasing a basketball. I was tired of my teacher and parents criticizing me about my behavior and I decided that I would play the "game" of education. So for the next thirteen years I played the game quite successfully, winning many different awards —while sleeping with my eyes open.

A Student Intern

Back in Scientology something interesting happened. A student intern from another course asked me if I wanted to have my earlier misunderstood words cleared up on the E-meter. I was doing quite well by myself

—working with ten different dictionaries to get the concept of the word, linking it to the physical universe, comparing and contrasting the word with other words until the emotional charge on the word disappeared. If the charge didn't disappear, I looked for earlier similar words and cleared them up and then a whole branch of the subject would clear up. However, when the student offered to help me for free—part of his internship course requirement—I thought, “Why not?” So we went into session and began to clear up various words. The problem was that working with this intern was extremely slow compared to what I could do by myself.

Back when I had first started working by myself the pace had also been agonizingly slow. The dictionary itself can be overwhelming. Even after I had learned the many symbols and abbreviations used, there were too many content words that I did not understand. So I developed a simple technique to allow myself to feel more comfortable using the dictionary and which offered me an entry point into its usage: I begin to look up simple words, very concrete words, *that I already knew*—words like *cat, car, house, etc.*, which allowed me to get practice in the use of the dictionary and gave me more certainty and understanding of the English language. Eventually I felt quite comfortable looking up the *unknown* content words.

With the college textbooks I had kept or could locate, I would usually start with looking up the words in the chapter headings, which would often lead to earlier similar words. Sometimes I would spend days trying to grasp the meaning of a word. The words “criterion” appeared frequently in many of my textbooks. To understand “criterion” I had to look up the word “standard,” and then words like “quality,” “value,” “measurement,” and “units,” and “design.” I remember it took me days to figure out the meaning of “quality.” I had to draw diagrams of these words and delineate what they meant and what they didn't mean. When I finished, I firmly understood the word “criterion.”²⁹⁰ Since these words, especially “criterion” and “design” had been important words in my AF job, not understanding them caused some serious consequences and probably influenced my decision to leave the Air Force.

I also cultivated a curiosity about word origins—the old English, old German, old French, Latin,

Greek, Sanskrit, and Indo-European roots.

Also, for a time, I looked up the words I saw on the shops around me (Capitol Management?) and the words associated with tools (nut, bolt, screw, etc.) For example, clearing up the word “valve” had quite an impact, since there are many valves in a home, a car, various machines, and the body. Also, although Hubbard required students to go through *every* definition of the word and make sentences for *each*, after a time, I could look at the etymology of the word, glance over the definitions, draw some diagrams and the negative emotions would evaporate. My speed increased exponentially and eventually became very rapid.

Luckily for me, after several hours of an agonizing slow pace, the student asked me if I wanted to attest to the end result of this particular E-metered process which was “Recovery of One’s Education.” I was shocked at first. I felt we had barely waded into that vast sea of my misunderstood words, and I couldn’t believe that the student and the case supervisor thought I was finished.

Once again the quota pressure that was put on staff and students probably played a part. Also, much later, I realized that most people in Scientology had not had the extensive college and graduate school education I had had, and that perhaps many of them *could* finish this process in just a few hours. Also, that that was why others did not have the enthusiasm for looking up earlier misunderstood words—they didn’t have many earlier words. So I had a choice of saying “no” and continuing to work painfully and slowly with this intern, or lying and returning to work quickly by myself. By then I had begun to suspect that some lying was going on within the Church, so I didn’t feel guilty about also lying, and besides, I knew I was letting the intern finish with his class.

Mathematics

Meanwhile the official bulletin describing the procedure I had been using on myself had been cancelled, “because it had not been written by Ron.” I was somewhat shocked yet again. I think money

played its part here, because if people could do this procedure by themselves, then why would they need to pay to get it done by a professional Scientology counselor? So now I had another choice—remaining true to Hubbard’s “standard technology” or continuing to do what was working for me. I took the practical path, although I was still enough of a “true believer” that I felt guilty about it for several months.

By this time, whenever I read something, such as a magazine article, the misunderstood words—that I supposedly knew—would jump out of the page at me somewhat like a totally unfamiliar word. For example, the word “arbitrary,” the emotionally charged and misunderstood word, would stand out like the never-seen-before word “nikhedonia,” (the pleasure or excitement that comes from anticipating success). When I looked at the misunderstood word it seemed to have a kind of a fog around it, and I would experience unpleasant emotions.

In 1980 my staff contract with Scientology ended, and I went back to Chicago for a couple of months to visit with—and work for—my father. There, in my off hours, I began to tackle another big subject—mathematics. This was also a subject which I had silently hated throughout school, but in which I had received “A.” Restudying this subject was to have a very profound effect on me, perhaps even more so than the subject of grammar, for the subject of grammar had ended with the first year of college, but the subject of mathematics continued for several years after that and was also widespread throughout my heavy course load of science and engineering classes.

How to connect it to the physical universe, to make it more concrete? To represent the numerals 1, 2, 3, etc., I began to use dots or lines on a page. (Later, while reading Euclid, I found that the Greeks had used lines to represent numbers.) In my mind, the dots represented apples, boats, or people, etc., and the lines represented amounts of water, etc. I drew pages and pages of dots and lines, demonstrating various axioms or equations, and the subject began to feel more *grounded* (my word, not Hubbard’s). Also, the *numerals* became separate from the *amounts*—Roman numerals, Mayan numerals, Babylonian numerals, etc., could all

represent the same number of dots in a different way. For geometry, I remember looking around me as I rode on the Chicago elevated “L” train and in all the buildings seeing angles, lines, rectangles, cubes, etc., and thinking how geometry could be applied throughout this entire environment. I filled more pages with lines, figures, shapes and angles.

At some point I asked myself: why does $1 + 1 = 2$? I recalled that “two objects could not occupy the same place at the same time.” Thus, one apple plus one apple could never equal just one apple. This gave me a practical foundation for the subject of mathematics. So, at some point I realized that addition and the other operations implied *motion*. When you add or subtract something you are *moving* something. Behind all those abstract numerals and symbols in mathematics books was an enormous amount of motion. Math became not only grounded but also dynamic for me. Much later, around 2000, I became friends with Mamikon Mnatsakanian, who developed “visual calculus,” a dynamic method of doing certain calculus problems using ordinary algebra.²⁹¹

My education in math had been the traditional “drill and kill” approach: give the students the formula, equation, etc., and have them memorize it and then drill, drill, drill, test, test, test them on it, until all natural curiosity about the subject was completely extinguished. Now, however, I began to do my own explorations in math. I would ask a question and then explore it with numbers, drawings, dots and lines. To take a trivial example, instead of being told that “a minus b does not equal b minus a,” I could try it and see—I could develop on my own the various axioms, and later, when I was teaching mathematics, I used this exploration method with the students whenever possible. I also discovered that whenever a student made a mistake it was because they didn’t understand one of the axioms of arithmetic. One of the regular teachers started to call me “Dr. Math.”

I also remember discovering things like the fact that π , 3.1415... was somewhat arbitrary. π is the *circumference* of a circle divided by the *diameter*, which is a constant number for all circles, but it could

easily have been the inverse, the *diameter* divided by the *circumference*, 0.3183... . Meanwhile clarifying math words such as “ratio” and “common denominator” clarified other branches of my knowledge tree—words or phrases such as “rational,” “rationality” or the “common denominator of success.”

Also, I saw that mathematical terminology was used for a reason. A “quad” was a square courtyard and a “quadratic equation” always had a squared term, etc. I also became more aware of how the sound of a word often matches its meaning—onomatopoeia. Words had not been arbitrarily picked out of the air, and this fundamental idea—why *that* word?—has stayed with me ever since and made it much easier to learn and remember the meaning of a word.

Like with grammar, an astounding thing happened as I was grounding these math words. I remember walking upstairs from the basement bedroom of my father’s home, where I lived and studied, when suddenly a barrage of faces, maybe two hundred of them, flashed rapidly before me, in succession—as if they had all been pages in a book that someone had suddenly riffled in front of me—except that I felt each image in my mind as a kind of very quick and subtle thud. It all happened in less than two seconds. I wanted to slow it down to see who these people were—but I couldn’t—at the end of the two seconds they were all gone and I felt a load lifted off my mind.

I was somewhat scared for a few seconds. However, I thought about the meaning of it and what came to my mind was that these were people that I had dealt with in some manner in the past who had thought I was a bit crazy—from my words or actions—and that from now on my actions would be much more logical—and they were.

After two months of math review, I *liked* mathematics. When I returned to Southern California from Chicago one of my friends said to me: “You look like a completely different person.” And I felt that way too. Much later I saw the movie *The Matrix*, and there is a scene in which Neo—still a battery in a pod—has the plug removed from the back of his head and all the electrodes start popping off his body—at which point he

is flushed down a tube and enters the real world for the first time. I felt that that scene described almost exactly my feeling after getting all these math words and symbols grounded.

I also remember spending a long time re-studying physics and physics equations. I had a book called *The Science of Swimming* which I had never read before, but now I eagerly read it and understood how to apply Newton's Laws to my swim strokes. In my early swimming career, I had used mostly strength and conditioning to achieve results, but now I saw my stroke technique greatly improve, and when I began competing in master's swimming a few years later I became ranked fifth in the world after only six months of training.

Important Words

Also, I was now thinking more in concepts. Einstein had famously said that "imagination is more important than knowledge," and now I understood that. In my earlier academic courses, when I had to submit a paper for a class, I had not used any imagination—I had only rearranged words. I would take some words and phrases from several sources and quote or paraphrase them and then, like a good student, list them in my bibliography. There was little original thought.

At some point I decided to use my college transcripts for this big review of mine. For each course listed, I recalled which words, equations, etc. were most important. This was easy because those were the words and equations I had most thoroughly memorized. Clearing these up often cleared up the entire subject for me.

Then I decided to look at how each subject related to the other subjects. This also had an extraordinary effect on me. I remember looking out the window at a tree and imagining the photons hitting the leaves, the stresses on the branches, the maintenance of the tree, the costs involved, while at the same time seeing the inside of the tree: the photosynthesis, transpiration, and the carbon cycle. The names of the

various subjects, “mathematics,” “biology,” “chemistry,” “physics,” “economics,” had disappeared and there was just a tree with all its various particles and forces.

Later, I came across Buckminster Fuller’s phrasing, “nature has no categories,” and that’s what I had experienced. I also later read the advice of a Nobel Laureate, Christian de Duve, “Don’t study subjects—study the relationship between subjects.” Since then I have had many innovative ideas, and they never fit into a particular discipline but combined aspects of two or more of them. I began to suspect that the mystery of “creativity” was nothing more than being able to combine two or more unrelated ideas.

Kicked Out

I returned to Los Angeles in 1981 and visited the Scientology organization where I had worked for three years. I saw the lady who had made me cry and I spoke with her, and to my surprise, I now felt she was a bit slow, a bit dull—it was another shock to me.

I decided to enroll for the evenings and weekends in a major Scientology course that covered all of Hubbard’s material from 1948 to present. This was something I had looked forward to since 1975. Now, instead of being a bogged student I moved quite quickly on the course. Other students would come to an unusual reference by Hubbard about the Navy, or some historical event, and they would have to stop and look it up, but, with my educational background, which included military history as well as many other subjects that Hubbard was familiar with, I rarely had to stop. The others would take their time studying the reference, and I later realized that many of them probably had had no college education and so they were sort of using this course to broaden their general education.

One day I came across a bulletin by Hubbard in a file cabinet which I thought was interesting and I showed it to the course supervisor. I was being very polite and not arguing or anything but she lost her temper and said, “You think you know everything don’t you! You just get yourself down to ethics!” Being

sent to ethics was like being sent to the principal's office. Instead, I walked out to my car and drove off. A few days later someone from the Church came to my home and asked me to come back, but by then I was beginning to realize I had outgrown Scientology.

Substitute Teaching

I needed a job so I applied at a private school and they gave me an IQ test. My IQ had been measured at the Air Force Academy and it had been 136. Now it measured 149. Not a bad improvement, I thought. However, unbelievably to me at the time, the director of the school didn't hire me because she felt I "would get bored." I was a bit annoyed with her, but later, whenever I tried to become a regular school teacher, I *did* get bored.

In the fall of 1982, I started to teach mathematics as a substitute teacher in the Los Angeles inner city and in a few other districts. I had begun to feel guilty about leaving the Air Force without fulfilling my five year commitment to them, and this was a way of punishing myself for that. I did this for many years. Eventually, over some 25 years, I taught grades K-12 at about 116 different schools in thousands of different classrooms in dozens of subjects. Substitute teaching gave me the challenges I needed and allowed me to pursue my own interests in the evenings. After a couple of years, I would go into the class with no preparation and students would later say to me, "You explain things better than our regular teacher." Incredibly, after several more years, a few even said, "I learned more from you in one day than I have learned all semester from our regular teacher."

If a teacher was pregnant or had a serious injury or illness, I would sometimes teach a class for an extended period, and once, when I need money badly, I taught for two years at a middle school in South Central Los Angeles.²⁹² They couldn't get a regular teacher to work there, so they would hire me for 30 days as a substitute, as that's all my credential allowed, dismiss me for a day, and then re-hire me for another 30 days. Eventually, they just did the dismissal on paper and left me in the classroom. This was quite a

challenging job, but one day an eighth grader came to me and said, “Mr. Lauritzen, because of you I quit a gang. Thank you. I will always remember you.”

At the various schools, I usually passed out rulers, compasses, and protractors that I brought with me from home to let the students get some hands-on practice. Sometimes, when not constrained by the high-pressure “drill and kill” style curriculum, I would take the students outside, and we would measure the height of the flagpole, make large geometrical figures on the playground with string, or make geometric shapes in the classroom using drinking straws and string.

Once, for two months I taught at Garfield High School in East Los Angeles where I met and observed an award-winning math teacher, Jamie Escalante, who was later portrayed in the movie *Stand and Deliver*. I would try to walk causally by his classroom without him noticing to catch a glimpse of his style. I was disappointed that I didn't see any hands-on work, but later I found out he did often use it.

Nowadays, I find hard to believe that I used to hate mathematics. Whenever I have some free time I like to study it on my own. During the 1990s, I did some independent research into number theory and found some interesting social applications for “highly composite numbers.” I wrote a paper about this and sent it to Martin Gardner and Douglas Hofstadter. Gardner called it “eminently publishable,” while Doug Hofstadter called it “interesting” and asked me several questions about it. Also, I later invented a completely new number system, a base-12 system with simplified and colorful visual numerals. I also simplified the nomenclature of mathematics by changing the Greek and Latin terms to common English words.²⁹³

In chemistry, sometimes I would ask a high school class how much space was occupied by a “mole” of liquid water. Students said, “as big as the ocean,” “as big as the room,” “can’t be measured,” etc. Only about 1% to 2% answered correctly, despite the fact that they were solving problems almost every day with moles. It’s about 18 milliliters which conveniently fits into a test tube, which I would then show them.

In 1994, I taught a high school chemistry class for several months, reading each chapter of the book

on the weekend before teaching it. I was constantly taking the students to the laboratory to give them some hands-on experience. The other chemistry teacher would say to me, “You’re taking them to the lab *again!*?” During this time, it was announced that a new form of carbon had been discovered—a spherical form called Carbon-60 because it contained 60 atoms of carbon. I thought that the models of C-60 in the news were not correct. I found out that two of the discoverers would be at a scientific conference near LA, so I sent them a short paper and a photo of my model—which showed the stability of the triangular bonds—and they invited me to show my model at the conference. They won the Nobel prize for their discovery two years later.

I think with too much emphasis on standardized testing, real world, exploratory education disappears, as we strive to show that our students are “educated” because they score high on an abstract paper-and-pencil test. We *don't* want high test scores because we give the students “test-taking strategy sessions” every week or because we hire professional consultants to prep our teachers. We want high test scores as a *by-product* of an education that emphasizes a connection to the real world. Then perhaps more students could identify a noun, a mole, etc.

It took me about three years to ground my education and during this time I had gathered about ten dictionaries at various levels—from a very simple pocket dictionary up to the Oxford ten-volume dictionary. The two in the middle eventually became completely worn and frayed from constant use.

During these years another extraordinary thing happened. My school memorization, what I had used to parrot back or regurgitate the textbook information on tests, what Hubbard called “memory circuits,” became visible in my mind. These had always been unconscious before, but now they appeared as a vast, ethereal, semi-transparent, metallic-gray web, in the shape of a huge disc that was bulging outwards in the middle, with thousands of interconnections.

Math symbols were interlinked with chemistry formulas and physics formulas while history,

psychology and English were all interlinked, etc. It was a huge word and symbol network efficiently designed and organized for one purpose—to get good grades. But now, 1) as I was grounding my education, 2) as I understood the first, or fundamental, principles of each subject and how to apply these principals, and 3) as I understood how to derive the various facts of the subject from these fundamental principles, this memory disc began to collapse and disappear. Meanwhile, after all this work, the prescription for my eyeglasses had changed from 20/200 to about 20/45, and I was able to pass the eye exam for a summer job as a lifeguard.

During the last half of the 1990s, I begin to write my first book—about the origins of mythology. I sent part of this to Martin Gardner and Sir Arthur C. Clarke. They both responded positively and Clarke sent it to another author who later emailed me and said that Clarke had called me “some kind of genius.”

When I went into inner city classrooms as a substitute teacher, particularly English and history classes, I would sometimes pick an unusual word out of the textbook, one that I had misunderstood as a student, write it on the board, and ask students what it meant. I would then write all their guesses on the board and, after about twelve or fifteen guesses, tell them that none of these were correct. Then I would give them the real meaning of the word.

How could a situation like this arise? I can think of several reasons.

Firstly, teachers telling students to guess at the meanings of words. This is both foolish and destructive.

Secondly, an overemphasis on phonics rather than meanings. Students learn how to *pronounce* the word without gaining a full understanding of the *meaning* of the word. Students look like they are reading but they are only “word calling.” I vividly remember teaching one particular class in which students were taking turns reading. They would read a paragraph or two, stop and say “popcorn,” and then call out another student’s name to read. They were all merrily “reading,” but then one particular boy was picked and

suddenly the room became very quiet. He very slowly and painfully read each word. Rather than making fun of him, the students seemed to sense that there was something extraordinary about him. There was. He was reaching for and accessing the meaning of every word as he read.

Thirdly, using the “standard textbook” instead of a lower level textbook when needed. Once I taught an 8th grade algebra class and I knew that the textbook was too hard for them because I was constantly having disciplinary problems. I tried to convince the head counselor to change the class to a pre-algebra class, but she refused. So I gave them their first test, directly from the book, and the average grade was about 55%. I showed the results to the counselor and then she agreed with me and we changed the class—allowing a few students to transfer to another algebra class. After that, the average went up to about 84%. I had no disciplinary problems, and we all enjoyed that class.

I was substitute teaching again from about 2006 to 2010. At one middle school they displayed a large signs declaring, “Our Focus is Reading Comprehension.” They were trying to raise their standardized test scores in this area. However, based on my experience, I think they would've done much better to say, “Our Focus is Using the Dictionary.”

During this time, I wrote an op-ed for a weekly newspaper in Glendale, entitled, “Most Students Can’t Identify Nouns.” In the article I explained how I had conducted an experiment in about 600 classrooms, holding up a pencil and asking students, “Is this a noun? Raise your hand if you think this is a noun.” About 95% raised their hands.²⁹⁴

I would then write on the board the dictionary definition of noun: “a word that describes a person, place, thing, or idea,” and next to it I wrote the *word* “pencil.” I pointed to the chalk marks of “pencil” on the board I said, “*This* is a noun,” and while holding up the pencil again for comparison said, “This is *not* a noun.” If they didn't understand I would write the word “tree” on the board and compare this to a tree outside

the window of the classroom, etc. I talked about the two kinds of noun words: the written word and the spoken word and said that the spoken word travels invisibly through the air at about 750 miles per hour. I usually then walked across the front of the room and asked, “Is what I am doing a verb?” Finally, I would ask, “So where do we find nouns and verbs?” and see if they could answer correctly.

A few years after this, I was told that a student teacher “would be teaching today,” and I didn’t have to do anything, “just watch the lesson.” The classroom needed a credentialed teacher and I had an official substitute credential which was “good enough.” So I watched the student teacher go through her grammar lesson and then at one point she held up a pencil and told the class, second graders, rather firmly, “This is a noun.” Half of them looked confused at first, struggling with the idea. However, eager to please the teacher, they all finally accepted it. This all happened in a few instants. It was an uncanny experience and I felt a bit dazed as it brought back memories of my own education.

The galaxy had spun, the Earth had rotated while revolving around the Sun, and in my own life a circle had closed.

18.0 Rapture of the Nerds

Transhumanism and the “superabundance” promotions, although I am sympathetic to some of their goals, are too often an example of wishful thinking or marketing. I will go into some detail about this:

Transhumanism is “the belief or theory that the human race can evolve beyond its current physical and mental limitations, especially by means of science and technology.” It has a long and interesting history which I won’t go into here. Some transhumanists believe that at some future date, as computers get smarter and smarter, they will surpass us in intelligence, learn to build and improve themselves, and there will be AI which creates fantastic consequences that we cannot even imagine. The so-called “singularity.” Some possible consequences of this singularity might be: a) the machines kill us (they can find other uses for our atoms), b) we become pets of the machines, c) the machines ignore us as they go about exploring the universe, d) humanity merges with the machines, e) the machines help us as our loyal slaves, f) with the help of machines we live in peace and abundance with no more pain or suffering. This last option has been cynically called the “rapture of the nerds.” Although I am generally in agreement with using technology to augment humans, I do not believe that suffering will ever be eliminated.

Firstly, using logic alone we can see that “pleasure” cannot exist without “pain.” Chinese philosophers long ago realized this with the concepts of yin and yang. How can you even talk about “pleasure” unless you have some idea of “pain”? Likewise, “abundance” cannot exist without “scarcity,” “rich” cannot exist without “poor,” “happiness” cannot exist without “sadness,” etc.

Secondly, suppose someone implanted a brain device that continuously stimulated your pleasure center. When rats were given this option, they pressed a button continuously as much as 2000 times each hour ignoring food, water, and sex, and they would have died of exhaustion if not forcibly stopped.

Thirdly, in biology there is a process called sensory adaptation in which our sense receptors respond less to unchanging stimuli. Upon entering a room we might at first smell the fish, or the garlic, but after a few minutes we no longer notice it. Another example: I can listen to my favorite song or eat my favorite food only so many times before I get sick of it.

Fourthly, Darwin showed that survival entails struggle and competition for resources. Natural selection will not suddenly cease as we develop new tools. Natural selection depends on an abundance of life and a scarcity of resources. For life here on Earth, it’s “goal” could be said to be organisms that can survive. How does it achieve that? Through pleasure and pain. For example, it gives you pleasure when you eat and when you have sex. It gives you pain when you injure yourself.

If you happen to have a bigger brain, an opposable thumb, or a skin color fitting to your environment, nature “wants” you to keep going, to keep struggling, and to keep procreating to spread this advantage. Nature “needs” some measure of greed, because if a beneficial genetic mutation emerges in an organism, it can spread more quickly if that organism is somewhat greedy. Of course, if an organism is too greedy, others organisms may work together to eliminate it. Competition and cooperation are both in operation, and the power of cooperation has been underemphasized.

Also, what about that latest brain upgrade? That new immortality treatment? That house in Malibu?

That new stem cell treatment? That new job? Humans, or human-machines will still struggle with each other, individually or in groups, to be the first, to get the best, to be the fastest. Happiness is fleeting for a reason.

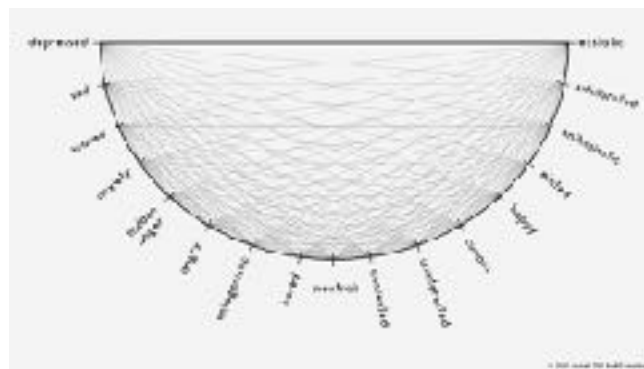
Natural selection's "goal" is not happy people or even large-brained mammals and possibly not even life. A case can be made that natural selection is more fundamental than physics, and that nature has selected those particles, energies, and forces that will best survive in this universe. This theory, in its most expansive form, is called Universal Selection Theory. Universal Selection Theory operates even in the brain. It posits that when a person decides something, there is still a selection taking place as various ideas are considered, get "tried" out in one's imagination, winnowed, until finally (based on genetic predispositions, available information, cultural pressures, etc.) a choice is made. In other words, Cognitive Darwinism. This is a new look at learning and knowledge formation. So Universal Selection Theory can model, besides the traditional evolution of life: 1) knowledge growth, 2) immune system antibody production, 3) neuron/synapse growth, 4) and technology growth. Natural selection's "goal" could be said to be particles, complex adaptive systems, etc., that can survive in this universe.

Also, nature "hopes" that some of these living complex adaptive systems will have the genetic makeup to survive, whatever might come their way in the future. If we humans don't make it, it "hopes" that some other species will. If none of the species make it, it will continue to select particles, energies, forces, and systems that can survive in this universe, and maybe someday, some of those particles will be in the right place at the right time to survive and reproduce once again.

As I said, along with the struggle, there is plenty of cooperation. After all, we are not just individuals. We are also a family, a community, an organization, a nation, a species, etc., competing and cooperating with other similar-sized entities. (More on this later.) The result is a vastly complex interplay which is called life. It's quite interesting, sad, frustrating, exhilarating, horrifying, painful, pleasurable, and all the other emotions and sensations, and combinations of those.

Also, a world without scarcity would be a world without much emotion. Imagine if you had all the resources you wanted. Then, if someone stole your car, no problem! Get another one! You lost your new mobile device? Get another one. A world without any scarcity or emotions would not be a heavenly bliss, it would be a boring hell. In the introduction to her groundbreaking book, *Affective Computing*, author Picard says, “Some scientists have argued that the demands of a system with finite resources operating in complex and unpredictable environment naturally give rise to the need for emotions ...” I agree with these scientists. I think that scarcity is natural, that emotions are built into the fabric of the universe, and that Artificial Intelligence will also develop emotions. Paradoxically, I want to accept life as it is—while trying to improve it. I want to accept the good, the bad and the struggle. I think meditation helps with this. I made a model (see diagram) showing the curved arc of emotion—from negative to positive on the x-axis and degree of arousal on the y axis—with neutral in the middle.²⁹⁵

The interconnection lines show all the possible combinations and possible transitions of pairs of emotions. When I meditate, my emotions return to somewhere near this homeostatic neutral position. Perhaps this could be called serenity or equanimity.



In the following chapter, I share my personal experience of perpetrating an alien abduction hoax and the insights it offers into the nature of belief, skepticism, and the spread of extraordinary claims in the modern world.

19.0 My Alien Abduction Hoax

It's OK to fool people as long as you're doing that to teach them a lesson which will better their knowledge of how the real world works.²⁹⁶

James Randi

About 2008, while I was substitute teaching at Culver City High School, I received a message on my mobile phone from the Vice Principal to call her as soon as possible. I gulped, and at lunchtime, made the call. She wanted to know if I had been telling students that I had been abducted by aliens and teaching students the “alien number system.”

This story began 15 years earlier, in the early 1990s, when I was substitute teaching in LA. I was monitoring students from the back of the room as they added and subtracted three-digit numbers and

wondering if there could be anything more boring. I began to wonder if there were perhaps a better way to write numbers. After all, just five hundred years ago Europe had been using Roman numerals, I, II, III ..., and then had switched to 1, 2, 3, ..., which had been brought to Europe by Arab traders from India.

I spent about the next year researching and developing a better system of counting, using a base of twelve and entirely new circular symbols. (A base of twelve system is superior in most ways to a base of ten due to its having a greater number of factors. Also, it appears that nature often uses twelve, not ten. See my paper, “The Social Applications of Highly Composite Numbers” and my video “Numbers of The Future”). Could I really persuade people to switch from a base ten to a base twelve system?

I was helped in my development of new symbols by my previous job in the Air Force as a “human performance engineer.” Our team was charged with making sure the pilot could operate the aircraft while monitoring multiple information streams. We needed controls and displays easy to use and understand. Mistakes could be catastrophic.

Imagine wanting to change the temperature and instead activating “bomb release.”

⊙	J	∩	⊥
⊙	✓	∩	✓
⊙	∩	∩	∩
⊙	∩	∩	∩
⊙	∩	∩	∩
⊙	∩	∩	∩
⊙	∩	∩	∩
⊙	∩	∩	∩
⊙	∩	∩	∩
⊙	∩	∩	∩
⊙	∩	∩	∩
⊙	∩	∩	∩

When teaching math I could often finish the lesson plan rather quickly, and in the remaining time I began to show these numbers to students (in grades 2-12). I wrote on the board: I, II, III > 1, 2, 3 > ?; then I explained that we had gone from Roman numerals to Hindu-Arabic numerals—why could we not go further? At first the students argued with me. “Look how far we have come with what we have!” they would exclaim. However, I persisted, and like Johnny Appleseed I began to spread the numbers throughout all the schools. One day, I walked into a seventh grade class and one of the girls there already knew the numbers, having been taught them by her older sister!

I think my introduction of this new number system was good, regardless of whether it will ever be used, because it allowed them to see what a completely different system might actually look like and thereby see our own number system in a new light. I would also sometimes show them how to add and subtract the new numbers and how the new numbers had less repeating decimals (or dozenals, in this case). I would test them by writing a “number of the future” on the board and then asking them if they could translate it to our traditional number system. I would make it into a game and see who could translate it first. My goal was to lead them to a fuller understanding of *place value* and ultimately to lead them to see that *the properties of numbers were independent of the number system or numerals used*. Due to lack of time, I’m not sure if I succeeded in that last goal.

○	⊙	6	○	12	⊙⊙	18	⊙⊙
1	⊙	7	⊙	13	⊙⊙	19	⊙⊙
2	⊙	8	⊙	14	⊙⊙	20	⊙⊙
3	⊙	9	⊙	15	⊙⊙	21	⊙⊙
4	⊙	10	⊙	16	⊙⊙	22	⊙⊙
5	⊙	11	⊙	17	⊙⊙	23	⊙⊙

After several months, some students began to *demand* to learn the numbers even if I did not have the time to teach them. They had heard about them at lunch from their friends and wanted to know about them. They simply refused to do the regular teacher’s lesson until I told them about the numbers. Later, many

students would see me in the halls or outside and shout, “Hey! Numbers Guy!”

One time, after I presented the numbers to a class, they were all just sitting, sort of stunned, looking at the strange symbols on the board, and one boy said curiously, “Were you ever abducted by aliens?” and we all laughed.

However, after that, I began to tell classes that I had been abducted by aliens, and that they had sent me back to Earth to teach the people of Earth how the rest of the Galaxy counted so that Earth could begin to trade with them. The aliens had chosen me, a substitute teacher, because they knew a substitute teacher could reach the most students. My familiarity with science, science fiction, and astronomy made it easy for me to

invent alien spaceships, etc.

At the end of class, I would ask how many people had believed me and how many had not. Then I would launch into a discussion of “critical thinking,” and explain that, “extraordinary claims require extraordinary evidence.” We would then discuss what might be extraordinary evidence for an alien abduction. I would try to lead them to the idea that a piece of exotic material from the spacecraft or a strand of alien “DNA,” would be considered extraordinary or “hard” evidence. They would then stare at the numbers on the board and say, “Well, where did those numbers come from then?” I would say that I had thought them up myself. This seemed to greatly impress the students.

Of course, many times the students would just laugh when I would say that aliens had abducted me, at which I would also laugh, wink, and say, “Let’s pretend.” Other classes would have different reactions. Some students would get a bit fearful, perhaps afraid of the aliens or perhaps afraid of me—thinking that I might be a crazy substitute teacher. Unfortunately, sometimes the bell would ring unexpectedly, due to a special schedule, and the students would all get up to leave class. I would frantically try to explain that I was not really abducted by aliens as they were walking out! During the 1990s, I taught these numbers to about 9000 students. (I used to keep a tally.)

During 2000-2005, I worked at a community college teaching psychology as an adjunct. During this time the “alien numbers” remained dormant. Eventually, I went back to substitute teaching. One day, while at Glendale High School, after telling my abduction story, one of the students suggested I make a video and put it on YouTube.

So I began to make a series of short videos. The videos immediately began spreading among the UFO conspiracy crowd, with many people pointing out the similarities to crop circles. At least one person then began to make videos about me! I was surprised at how many people believed the videos, but perhaps I

should not have been.

I realized that I had a responsibility as a teacher and scientist, and so I began to make the videos silly, thinking that people would now know they were fake. For example, I put a tin foil hat on my head and said it gave me protection from the aliens. Also, I offered to sell the tin foil hat for \$95.

Some people began to laugh at my jokes but others were persistent believers. The last video I made, number nine, was called “Critical Thinking.” A third-year high school student came up to me one day and said she had seen my series of nine videos and that she had totally believe them, until she saw the last one.

Some people online were rather upset with me when I confessed the hoax. Some students would go tell their friends that their “sub had been abducted by aliens” (chuckle, chuckle), and these students would come into my classroom to ask about it. I had to explain that I was not really abducted. I also had some high school students tell me that I should take down the last Critical Thinking video. They said that I could get on Oprah, and make “piles of money.” I told them that my conscience would bother me.

In the second grade, I found that students were just beginning to think critically. So after discussing the “alien” numbers, I would sometimes ask how many of the students believed in Santa Clause. On average, I would guess about a third would believe, a third would not, and a third would be uncertain. I would then ask the believers what kind of *evidence* they had that Santa Clause really existed. They would give evidence like they had “set out some cookies the night before” and when they “got up in the morning they were half eaten,” but others in the class would dispute this rendition of events and say that their “parents had eaten them.” That would start a lively and very interesting debate with many personal stories. I remember after one debate like this I asked if everyone still believed in Santa Clause, and one young girl said, “Well, I did, but now I am not so sure.” I felt some satisfaction upon hearing this, but I also wondered if there were any laws against debunking Santa Clause to a second grader in a public school?

One day, I showed my numbers to a group of second graders and told them about being “adopted” by

aliens. (The children that age always changed “abducted” to “adopted.”) They listened to my spiel quite spellbound, and then, at the end, I told them that I hadn’t really been adopted by aliens and that I had invented the numbers myself.

There was deep silence immediately after I said this. Their faces changed from fascination to deep disappointment, and they all stared up at me expectantly. I don’t know exactly why I did what I did next, but I shouted: “Ok, they really *did* adopt me! It’s a *true story!*” At which point they all burst into smiles and spontaneous applause. I just closed my eyes and sighed, thinking that perhaps humans were not genetically programmed to face the truth of certain things, or perhaps children needed these kind of stories. It shook my faith in my lack of faith.

After my abduction presentation, many of the high school students would ask me how I came up with the numbers. At first, I had no answer. Eventually I realized that they were asking about creativity. What makes someone creative? So I tried to explain that, to me, creativity involved having have a rather broad and deep knowledge base. One could then draw on this knowledge base and *combine elements* in new and interesting ways.

So what happened with the Culver City School administrator? I told her that, yes, I had told some students that I had been abducted by aliens, and that I thought that they knew I was joking. She said she had heard good things about me, that the students liked me, and that she was looking at my online videos as we spoke. She said it seemed like I was just using a fun way to teach math, and I assured her that that’s what I was doing.²⁹⁷ Then she wondered aloud what she would do if I *had* really thought that I was abducted by aliens. I felt she was a little bored with her job, and she secretly wished that I had really believed I was abducted by aliens. Once again, I felt I had disappointed someone who needed some extraordinary myth or story, or perhaps entertainment, in their life.

“Alien Numbers” spread further. A bit later I was at an elementary school in Culver City and a first-grader came up to me on the playground and said, “I saw you on YouTube,” and then walked off, leaving me standing there somewhat stunned.²⁹⁸

18.0 Better Thinking

I would rather have questions that can't be answered, than answers that can't be questioned.

(attributed to) Richard Feynman

Thought is abstract. Language is abstract. In a previous chapter we saw that abstractions are never perfect, so of course thinking and language are also never perfect. However, they can be extremely useful.

This chapter is by no means an exhaustive discussion of what has been called, unfortunately, “critical thinking.” The use of the word “critical” has led to students thinking they are intelligent if they can criticize something. Since nothing is ever perfect, this kind of criticism, which is rampant in certain fields of academia, is easy. What is hard? Constructive criticism. I say, “To critique is easier than to construct.” “Scientific thinking” might be a better phrasing, but it seems to leave out intuition, pre-verbal thought, and the hypnagogic state, a transitional state of consciousness between wakefulness and sleep. So I chose “better thinking.” Although most of what I discuss in this chapter is scientific thinking, I will also briefly discuss the importance of intuition and these other forms of thought.

Many “critical thinking” classes are now being offered at various colleges. I taught one of these classes at Los Angeles Community College. In the class I taught, I was given a textbook to use. The “God” question was completely left out. “How can one learn scientific thinking if one cannot even think critically about God?” I wondered.

Now, when people ask me, “Do you believe in God?” I think they do not want to engage in any kind of serious inquiry into the nature of reality. They are really asking, “Do you accept the current, dominant,

religious-political authority in this country at this time?” Otherwise, they would define what they mean by “God.” I like to say, “Religion is a politically correct mythology.”

There are many excellent books on “scientific thinking.” Carl Sagan’s book, *The Demon-Haunted World: Science as a Candle in the Dark* is a classic book that influenced me. Michael Shermer’s books and the lecture series that he hosted in Pasadena also influenced me considerably, and he has an excellent podcast. More recently, astronomer Neil deGrasse Tyson has also spoken considerably about scientific thinking.

Proponents of some religions or philosophies sometimes say that *science doesn’t know everything*. Of course, if it did, all the scientists could go home. So yes, our knowledge is always increasing, but does this justify a belief in a heaven, reincarnation, or past lives? Our ideas, actions and speech spread into many others, and this is a sort of life-after-death. However, there is no credible evidence of a *personal* life-after-death.

The *trend* of knowledge over the last centuries is, if anything, toward materialism (or what I call energism)—a recycling of atoms, a replication of genes, and other measurable, predicable patterns. There is the opposite trend called, “God of the Gaps.” Which says that science has gaps in its knowledge, and that God is used by people to fill this gap. Then science, with later advances, fills in the gaps.

Although Martin Gardner is a well-known skeptic, he told me that he believed in God! He agreed that most of the evidence was against the existence of God, but he thought one still had a *choice*. He referred me to the philosopher, Charles S. Peirce.

I later looked up Peirce, who wrote, “[Someone] will ask himself whether or not there really is a God. If he allows instinct to speak, and searches his own heart, he will at length find that he cannot help believing it.” For me, if I search my heart, I think that there may be something like karma, or the “just-world hypothesis.” Although the “just-world hypothesis” is usually thought to be a cognitive fallacy—and I can

think of no misdeeds the dinosaurs did to deserve an asteroid apocalypse—I nowadays think there might be a biological mechanism operating among humanity that would explain something like karma.

For example, “You can't fool an honest person.” Is there any evidence for this, besides anecdotal? I speculate that, on a biological level, we all recognize that we are closely related: a hypothetical *kin recognition system*. So when we cheat or harm another person, perhaps, at some level, we know we are harming many genes identical to our own. If we then repress the times we have harmed others, this can create an *ethical blind spot*. This allows us to be cheated. In other words, karma, or “What goes around comes around.” Social psychologists could do an experiment: allow people to cheat easily or not to cheat on some multiple player game in an experimental setting. Then, see if it is easier to fool the dishonest person easier than the honest person.

At that time, I felt that I could live without religion, but I didn't think I could live without the idea that I was a “spiritual being” that might somehow continue on after death. However, I often went to Pasadena to visit the Planetary Society, the Jet Propulsion Lab, and especially Caltech, where I heard many lecturers who impressed me with their scientific way of thinking. I was able to be there live as Voyager I and Voyager II flew by the outer planets during the so-called “golden age of planetary science.”

I used to read *Skeptical Inquirer*, a magazine published by the Committee for Skeptical Inquiry, and *Skeptic* magazine published by the Skeptics Society in Pasadena, and I attended many events of both of these groups. Eventually, thanks to all these events, and talking to people there, I came to accept a stricter scientific view of the world—something that I believe has benefited me. Nowadays, when somebody talks to me about “spirituality,” I usually think of this as “the interconnected web of all existence.”

However, even in Pasadena there exists some superstitious behavior. For example, in 1999 there was the Mars Polar Lander mission—the first mission to go to one of the poles of Mars. I visited NASA's Jet

Propulsion Lab to hear a briefing. Afterwards, I chatted outside the small auditorium with the director. As we parted he said something like: “It might be a good idea to say a short prayer for the mission.” This comment worried me, and later, during the lander’s descent, all communication was lost, and it was never regained. No one knows for sure what happened, although it is thought that an early shutoff of the lander’s engines caused it to strike the planet at a high velocity.

Also, in 2004, just before the descent and landing phase of the Mars Exploration Rover landings mission, the scientists at the Jet Propulsion Laboratory in Pasadena, ate their “good luck peanuts,” a ritual they had been doing for many years. In contrast to this, in China recently, some workers were disciplined for performing a Taoist ritual before a rocket launch.

In any case, here are some ideas that I have found personally useful in thinking better.

18.1 Learn To Read With Understanding

What are the advantages of reading? Reading and writing, when compared to speaking and listening, allows:

- a) learning from others who are far away and/or dead, and b) accurate recording of large amounts data, which allows:
- c) enormously larger depths of abstraction with much higher dimensions, and d) manipulation of large amounts of data, which allows:
- e) much greater pattern recognition, which allows:
- f) better prediction, which allows:
- g) better survival.

Reading with understanding, as opposed to mere pronunciation, or “word-calling,” is an often overlooked key to improving education and scientific thinking skills. I suggest that every year, from kindergarten through grade 12, students should be given dictionaries (picture dictionaries for the youngest

students and then gradually more advanced dictionaries). It should be repeatedly emphasized to never read past a word that they don't understand—always linking the word or the image to the real world.

18.2 Study Science and the Scientific Method

Be open to new ideas but stress test them using the scientific method: hypothesize, experiment, observe, collect data, conclude, or as I like to sometimes say: try-see-say. Natural philosophers and scientists have managed to create extremely accurate models of reality. This has come at great expense, over many millennia, through much trial and error. For example, people once thought that heavier things fell faster than lighter things. Galileo disproved this with experiments.

As I wrote previously, he probably never really dropped an iron ball and wooden ball from the leaning tower of Pisa. What he did was to roll iron balls of various weights down ramps of wood. They hit the ground together.²⁹⁹ Of course air friction will slow down an object such as a feather, but if you drop a feather and a hammer at the same time on the moon, where there is no air, they will hit at the same time—an experiment which was done by Apollo astronauts and can be viewed online.

Also, 1) be aware of what you are assuming, and 2) anecdotal evidence may be right, or wrong, but is not sufficient for large scale dissemination.

18.3 Extraordinary Claims Require Extraordinary Evidence (ECREE)

Ordinary claims require ordinary evidence. A claim that “I ate at the local restaurant last night” is not extraordinary and does not require much proof, if any. A simple receipt might do.

A claim that, “I was abducted by aliens last night” can be dismissed without extraordinary evidence. Note that in the 75 years since the UFO phenomenon started, there has been not one shred of hard evidence such as some exotic metal or exotic DNA.

Similarly, “What can be asserted without evidence can be dismissed without evidence.” This is a quote by author and journalist Christopher Hitchens, and is known as Hitchens's razor. The quote implies that the burden of proof lies with the person making the claim. Hitchens often used it for religious claims.

In addition, psychologists now know that babies will stare longer at “impossible,” or extraordinary, events. Put one doll behind a screen and then, while the baby observes, add another doll. Remove one of the dolls through a trap door that *the baby does not see*. Now take away the screen. The baby will stare at this impossible, or extraordinary, event (one doll plus one doll equals one doll!) longer than at a possible event (one doll plus one doll equals two dolls).

Also, in *Religion Explained*, Pascal Boyer suggests that religion requires attention-getting devices: “Among the millions of messages exchanged some are attention-grabbing because they violate intuitions about objects and beings in our environment. These counter-intuitive descriptions have a certain staying power, as memory experiments suggest.”³⁰⁰

Likewise, when someone says that they can “talk to the dead,” “walk on water,” “rise from the dead,” “aliens abducted me,” etc., it violates our usual experience, and can sometimes get our attention. So to communicate the ideas of this book, do I need to say: “Aliens abducted me and sent me back to Earth to tell you this,” or something bizarre like this? I hope not. Some very simple, but profound ideas, which are not cheap attention-grabbers, have become part of our culture. Such ideas as zero, place value, the law of gravity, atomic theory, Darwinian evolution, plate tectonics, etc., have gained footholds in our society (at least in most schools, even though they are sometimes imperfectly taught). I would hope that although *impossible*, or extraordinary, things may grab our attention, possible and useful things would eventually get, and keep, our attention. Creating lies is easy, discovering truth takes work.

Demand evidence. “Show me.” This relates to what I previously called grounding.

18.4 Distinguish Between What You Want To Be True and What Is True

This is very difficult to do, but, for better thinking, you need to force yourself to do this until it becomes a habit.

There was once a million dollar prize to “anyone who can show, under proper observing conditions, evidence of any paranormal, supernatural, or occult power or event.” After many years, no one ever passed the preliminary tests.³⁰¹ (This prize was terminated in 2015 after James Randi retired.) I sometimes see a look of disappointment in some of my students’ faces when I discuss critical thinking—especially with younger children. However, I do not want them to have to go through the same disappointments that I did. Perhaps it is better to know the painful truth.

It is much easier to be lazy. It is much easier, more fun, more intoxicating, and more comfortable to believe what you *want* to be true. We can make a 2 by 2 table divided into 4 sections: comfortable lies, painful lies, comfortable truths, painful truths.

comfortable truths	comfortable lies
painful truths	painful lies

Many people would apparently rather live in the “comfortable lies” section rather than the “painful truths” section. A comfortable lie might be: “I have an immortal soul that will go to heaven.” The painful truth might be: “when I die my atoms and molecules are recycled into the biosphere.”

However, by facing the ordinary, we can create the extraordinary. Putting a human on the Moon can seem miraculous. Some people still don't believe it. It required vision, deep thinking, planning, attention to detail, hard work, coordination, and persistence. It required learning the basics of science and engineering and extending and recombining those basics. Someday humans may travel to other planets and even to other star systems. This won't be accomplished by people who are afraid of hard work and are looking for a quick, easy flight on a nonexistent mothership.

At one time in my life, I believed in ancient astronauts, alien spaceships visiting Earth, past lives, and

disembodied spirits. I wanted there to be magic, miracles, quick fixes, and simple solutions. All these things can be somewhat intoxicating. However, “intoxication” includes the word toxic, and my wanting them to be true did not make them true.

Also, if we want something to be true, for whatever reason, we may fall victim to confirmation bias. This means we lean towards information that tends to confirm what we want to believe or what we already believe. Don’t be a victim of “wishful thinking” or “confirmation bias.”

18.5 Study Logic and Probability

This would include statistics, black swan events, and white swan events.

The mass media is incentivized to sensationalize the news in their headlines in order to increase their number of viewers. So if you see a video of one hundred protestors on the street, calculate how many people are NOT protesting. 10,000,000? This is a ratio of 1:100,000. Ratios are the comparison of two numbers. Comparison is important.

The news outlet can make it seem like *lots* of people are protesting, when it could be a rather small percentage of the total. Most news outlets and social media sites are incentivized to polarize and create conflict. Or it could be people are being paid to protest—I think this happens more often than people realize. On the other hand, there could be a legitimate grievance and the protest could be the first indication.

Also, given enough people (8,000,000,000 throughout the world) and enough events happening each day, and a significant number of these events will seem “miraculous.” When I taught critical thinking classes, I would discuss co-incidence. “Co” means together and an “incident” is a happening. This literally means “together-happening” or “things that happen together.” Well, everything that is happening right now is happening-together. Some of it, just by the laws of probability alone, will be weird. For example, a piece of toast or window will seem to have the face of the Virgin Mary, but with the *vast* numbers of toast and

windows out there, *some* of them, by probability alone, will have a pattern that resembles the Virgin Mary.

Our Paleolithic brains and hearts, molded in the EEA (Environment of Evolutionary Adaptedness—two million to fifty thousand years ago) are not used to dealing with abstract probabilities. If we had evolved instead in a giant casino, those who survived, and their descendants, would be good at dealing with probabilities.³⁰²

For example, if you turn over the cards of two separate card decks simultaneously, 2 out of 3 times, on average, they will have the same card appear. (For example: a two of clubs from one deck and a two of clubs from the other deck at the same time.) This is a mathematical law of probability. The philosopher Daniel Dennett has a thought experiment which I found very informative: (I have modified it somewhat.)

Imagine that you have 32,000,000 email addresses and you send out a prediction to 16,000,000 that a major sports team will win their game tomorrow, and to 16,000,000 you send out a prediction that they will lose. One team then loses. So to those 16,000,000 that you predicted correctly you send 8,000,000 emails saying they will win the next game and 8,000,000 that they will lose. Then 4,000,000 and 4,000,000. Then 2,000,000 and 2,000,000. Then 1,000,000 and 1,000,000. Then 500,000 and 500,000. Then 250,000 and 250,000. Then 125,000 and 125,000. Then 62,500 and 62,500. You have now predicted correctly 10 times to 62,500 people. This has a probability of about 0.001 (if your team has about an even chance of winning) or will happen about 1 in a 1000 times. You then ask these 62,500 people to send you ten dollars to receive the next prediction.

When we look at nature, we are like these 62,500 people. We only see other survivors of a long, long, long evolutionary process. We don't see all the biological end-points that nature made over the last four billion years. So we tend to think that there is some sort of Supernatural Designer that is awfully good. What

we don't see is that nature is "guessing." It doesn't "know" the future and so it "uses" random mutations and "selects" the ones that currently work and eliminates the rest.

Our Paleolithic minds often default to predicting the worst possible outcome. This is because early humans who ignored this, did not reproduce. If you have 1 cow, and you lose 1 cow, it could be disastrous. But if you have 10 sheep, and you gained 10 sheep, it's just nice. So there is some advantage to thinking about the worst possible outcome. But I also try to think of the best possible outcome, and then the most *probable* outcome. Try to prepare for all of these. There is a continuum from the worst to the best.

Logical fallacies:

Here are six of the most common logical fallacies with definitions and examples:

Ad Hominem: Attacking the person making the argument rather than addressing the argument itself.

Example: "You can't trust Jane's economic policy proposals because she went bankrupt once in her twenties."

False Dichotomy (Black-and-White Thinking) Definition: Presenting only two alternatives when there are usually more options available. Example: "Either you support unrestricted free market capitalism, or you're a communist - there's no middle ground."

Slippery Slope: Arguing that a relatively small first step will inevitably lead to a chain of related events resulting in a significant and negative outcome. Example: "If we allow students to wear casual clothes on Fridays, soon they'll want to wear them every day, then they'll stop respecting authority altogether, and eventually the entire education system will collapse."

Appeal to Authority: Claiming something is true because an expert or authority figure said it, even if they're not an expert in the relevant field. Example: "This famous actor says this herbal supplement cures cancer, so it must work."

Post Hoc (Post Hoc Ergo Propter Hoc): Assuming that because one event followed another, the first event

caused the second. Example: "I wore my lucky socks and our team won the game, so my socks must have brought us good luck."

Straw Man: Misrepresenting or oversimplifying an opponent's argument to make it easier to attack. Example:

"You support stricter traffic laws? So you basically want to make it impossible for people to drive and destroy everyone's freedom of movement."

18.6. Be Aware of Levels of Abstraction and Ground Your Education.

"The map is not the territory, the word is not the thing."

Always link the abstractions and words to the real universe (in philosophical terms, find the referent), or at least connect it to the real universe by means of real examples.

18.7 Understand Behavioral Economics.

Be aware of the fallibility of System 1 reasoning and how to use System 2 reasoning.

Psychologist and Nobel Laureate Daniel Kahneman wrote a book called *Thinking, Fast and Slow*. System 1 is fast, intuitive and emotional, while System 2 is slow, effortful and logical. System 2 often uses the symbols invented by us talking and writing apes. As an example of System 1, if I see a dangerous snake on the path in front of me, I will jump back quickly without thinking much about it. However, if I need to make a large purchase, I use System 2, and I take the time and effort to calculate the total cost and compare it to other alternatives.

Here are some key findings from this field:

Base Rate Neglect: People tend to ignore underlying probability distributions (base rates) in favor of specific

but potentially irrelevant information about an individual case. The famous example involves Linda, who is described as quiet, organized, and interested in literary works and social justice - when asked whether she's more likely to be a librarian or a truck driver, most people say librarian, ignoring the crucial fact that there are far more truck drivers than librarians in the population, making it statistically more likely she's a truck driver despite the personality description.

Loss Aversion: People feel losses more intensely than equivalent gains, typically about twice as strongly. A restaurant owner who loses \$100 in revenue feels more distress than the pleasure they get from gaining an extra \$100 in revenue.

Anchoring Effect: People rely heavily on the first piece of information they receive when making decisions, even if it's irrelevant to the actual decision. When negotiating a salary, if the employer mentions \$50,000 first, subsequent discussions tend to revolve around that number, even if the market rate is higher.

Present Bias: People tend to give more weight to immediate payoffs compared to future ones, even when the future payoffs are larger. Someone might choose to watch TV now instead of studying for an exam next week, even though they know studying would yield better results.

Framing Effects: How information is presented dramatically influences decision-making, even when the underlying facts are identical. People are more likely to choose surgery when told it has an "80% survival rate" versus a "20% mortality rate," though they mean the same thing.

Social Proof: People look to others' actions to determine their own behavior, especially in uncertain situations. When choosing between two restaurants, people often pick the busier one, assuming it must be better because others are eating there.

Status Quo Bias: People tend to prefer the current state of affairs and are reluctant to change, even when change would benefit them. Many employees stick with their default 401(k) investment options even when better alternatives are available, simply because it's the pre-selected choice.

Availability Heuristic: People judge the likelihood of an event based on how easily examples come to mind, rather than on actual statistical probability. Example: After widely-publicized plane crashes, many people choose to drive instead of fly, even though driving is statistically far more dangerous (about 750 times more likely to result in death per mile traveled). The vivid, dramatic nature of plane crashes and their extensive media coverage makes them seem more common than they actually are.

How many fallacies are there?

Formal Fallacies (errors in the logical structure of arguments):

About 10-15 main types (like affirming the consequent, denying the antecedent)

Informal Fallacies (errors in reasoning):

Appeal fallacies: ~10 types (appeal to authority, emotion, nature, tradition, etc.)

Causal fallacies: ~5-7 types (post hoc, correlation vs causation, single cause)

Relevance fallacies: ~15-20 types (ad hominem, red herring, straw man)

Ambiguity fallacies: ~8-10 types (equivocation, amphiboly, accent)

Presumption fallacies: ~10-12 types (begging the question, false dichotomy, hasty generalization)

18.8 First Look Exhaustively for Natural Causes

Don't *jump* to supernatural, paranormal, or metaphysical causes. The Center for Inquiry and the Skeptics Society have done excellent work in finding natural causes for "alien abductions," sightings of "ghosts," and "flying saucers." Look at their websites for books and articles. Recently, I have discovered another website, Metabunk.org, that effectively debunks many extraordinary claims. If you can't find a natural explanation, you should be willing to *not-know*.

18.9 Be Willing To Not-Know

Be willing to withhold judgment until more evidence is in. So if you can't find an explanation, be willing to say, "For the present, I don't know." This is the scientific mindset and is perfectly okay. Also, be willing to accept every explanation, theory, or model as provisional.

Additionally, the fact that you don't know what it is (i.e., an *unidentified* flying object), is not evidence that you know what it is (aliens visiting Earth). Of course, absence of evidence, (there is no hard evidence of aliens visiting earth) is not evidence of absence (there could be aliens visiting Earth).

"It is better to have questions you can't answer than answers you can't question."

18.10 Consider the Source

Is it reputable or disreputable? Cui bono? (Who benefits?)³⁰³

With the arrival of *moving* pictures, it is easier to convince our Paleolithic brains and hearts of the existence of spirits. A few cuts, splices, stunt men, and computer animations and you have all the ghosts (or superheroes, magic, and psychic powers) you want. A clever plot line weaves these ghosts into the lives of actors. Our Paleolithic brains and hearts are geared to accept what we *see* as real.

Yes, dead people can affect us by the things they said and did, and by the examples of their lives. Yes, we may dream about them. No, they are probably not disembodied entities floating around in the air, except as dissociated atoms that have spread throughout the biosphere.

So beware of the techniques used by "psychics," "holy men," confidence men, filmmakers, advertisers, politicians, salesmen, and others that try to manipulate your thinking. Do a search online to find out the background of the people making extraordinary claims.

For peer-reviewed academic articles, search on PubMed³⁰⁴ and Google Scholar. (Read scientific publications, even if it's only at the introductory summary and conclusion. Or get your AI to summarize the article in simpler terms that you can understand.)

18.11 Cultivate Humility and Curiosity

A recent book I enjoyed is called *The Intelligence Trap: Why Smart People Make Dumb Mistakes*. David Robson's book gives the latest research on how to make more rational decisions. One of my take-aways: people who are humble and curious tend to make better decisions.

18.12 Sometimes Trust Your Intuition

Scientists distrust intuition. This has proven valuable in some areas such as physics, in which our intuition (folk physics) has been shown to be incorrect. However, in *Descartes' Error: Emotion, Reason and the Human Brain*, a book by Antonio Damasio, he explains the uses of intuition, and the reason we should sometimes trust our intuition. He states, "It is as if we are possessed by a passion for reason, a drive that originates in the brain core, permeates other levels of the nervous system, and emerges as either *feelings* or *nonconscious biases* to guide *decision making*." (My emphasis.) Research suggests that gut feelings can be a result of subconscious processing of information. See also the book *Blink*, by Malcolm Gladwell.

18.13 A Scientific Worldview

The well-known skeptic Michael Shermer describes his change from a Christian to a Skeptic as the "systematic displacement of one worldview by another."³⁰⁵

Let's expand his list. Let's replace:

Revelation with Observation,

Authoritarianism with Experimentation & Publication,

Magical thinking, miracles, and luck with Probability and Statistics,

Creation myths with Geology and Evolution,

Faith with Reason and Intuition,
 Final truths with Provisional Truths,
 Trust with Verification,
 Supernaturalism with Naturalism,
 Spirit and Soul with Chemical and Physical Processes,
 Comfortable Lies with Painful Truths,
 Mysticism with Naturalism or Energism,
 Children of God with Complex Adaptive Systems.

Superstitious	Scientific
revelation	observation
authoritarianism	experimentation & publication
magical thinking, miracles, luck	probability and statistics
creation myths	geology and evolution
faith	Reason & intuition
final truths	provisional truths
trust	verification
supernaturalism	naturalism
spirit, soul	chemical/physical processes
comfortable lies	painful truths
mysticism, paranormal, otherworldly	naturalism, energism
children of God	complex adaptive systems

18.14 Summary

1. Learn to read with understanding.
2. Study science and the scientific method.

3. Examine your assumptions. Be aware of them.
4. Extraordinary claims require extraordinary evidence. Demand evidence. “Show me.”
5. Distinguish between what you want to be true and what is true. Don’t be a victim of “wishful thinking” or confirmation bias.
6. Study logic, logical fallacies, probability, statistics, historical black swan events and white swan events.
7. Be aware of levels of abstraction and ground your education. “The map is not the territory, the word is not the thing.” First look exhaustively for natural causes, rather than jumping to supernatural, paranormal, or metaphysical causes.
8. Understand behavioral economics. Be aware of the fallibility of System 1 reasoning and how to use System 2 reasoning.
9. Be willing to accept provisional truth (or be willing to not-know or to withhold judgment until more evidence is in). “It is better to have questions you can't answer than answers you can't question.”
10. Consider the source. Is it reputable or disreputable? Cui bono? (Who benefits?)
11. Cultivate humility and curiosity.
12. In decision making, sometimes trust your unconscious: intuition, gut, hypnogogic states, dreams.

The principles and guidelines explored in this chapter underscore the importance of successfully navigating the complex landscape of beliefs, claims, and ideas that shape our understanding of the world. By cultivating habits of rational, evidence-based inquiry, questioning our assumptions, and remaining ever-vigilant against the pitfalls of wishful thinking and confirmation bias, we can build a more reliable and robust framework for making sense of the challenges and opportunities we face as individuals and as a species. In an unpredictable world, we will never be perfect thinkers, but we can learn to be better thinkers.

PART VI Provisional Generalizations

In the next chapter, we will explore the concept of “Einstein's God,” and then we will expand this concept into nested systems that make up the universe and discuss how this perspective can shed light on questions of truth, free will, good and evil, and the nature of suffering.

20.0 Einstein's God

... if by God one means the set of physical laws that govern the universe, then clearly there is such a God.

Carl Sagan

20.1 Einstein's Correspondence

Einstein sometimes used the word “God.” In this chapter I am going to describe and elaborate on “Einstein’s God.” I think you might find it interesting. So let’s first look at some of his books and letters. Perhaps his most famous letter is called the “God Letter” which was auctioned in 2018 for \$2,892,500. In it, he writes, “The word God is for me nothing more than the expression and product of human weaknesses, the Bible a collection of honorable, but still primitive legends which are nevertheless pretty childish. No interpretation no matter how subtle can (for me) change this.”³⁰⁶

When you examine his other letters and books you find a man, one of the most famous scientists of all time, who is very humble when viewing the universe: “I believe in Spinoza's God, who reveals himself in the harmony of all that exists, not in a God who concerns himself with the fate and the doings of mankind.”³⁰⁷ Also, “My views are near those of Spinoza: admiration for the beauty of and belief in the logical simplicity of the order which we can grasp humbly and only imperfectly. I believe that we have to content ourselves with our imperfect knowledge and understanding...”³⁰⁸ Also, in his letter of 1936, to a school teacher who asked him if scientists pray, he responded, “... everyone who is seriously involved in the pursuit of science becomes convinced that some spirit is manifest in the laws of the universe, one that is vastly superior to that of man. In this way the pursuit of science leads to a religious feeling of a special sort, which is surely quite different from the religiosity of someone more naive.”³⁰⁹

Although in one letter he referred to himself as an atheist, sometimes he preferred the term agnostic and was disparaging toward atheists: “...fanatical atheists...are like slaves who are still feeling the weight of their chains which they have thrown off after hard struggle. They are creatures who—in their grudge against the traditional ‘opium of the people’—cannot hear the music of the spheres.”³¹⁰ Also, “You may call me an agnostic, but I do not share the crusading spirit of the professional atheist whose fervor is mostly due to a painful act of liberation from the fetters of religious indoctrination received in youth. I prefer an attitude of humility corresponding to the weakness of our intellectual understanding of nature and of our own being.”³¹¹

Even though Einstein was mostly apolitical, he did get involved in politics when it was necessary to do so; hence his famous letter to President Roosevelt urging the building of the atomic bomb. I think that if he still had been living in the United States during the rise of Christian Nationalism he might have again taken some political action to counter this rise.

Finally, Einstein discusses *pantheism*: “I am fascinated by Spinoza's Pantheism. I admire even more his contributions to modern thought. Spinoza is the greatest of modern philosophers, because he is the first philosopher who deals with the soul and the body as one, not as two separate things.”³¹²

Spinoza (1632-1677) was a Jewish rationalist who was effectively expelled and shunned by Jewish authorities and his own family, and his books were banned by the Catholic Church. He was called an atheist, although he never argued against the existence of God.³¹³ Like Einstein, Dorion Sagan wrote that his father, Carl Sagan, “believed in the God of Spinoza and Einstein, God not *behind* nature, but *as* nature, equivalent to it.”³¹⁴ Other famous pantheists include Alan Watts, Emily Dickinson, Nikola Tesla, Terence McKenna, Ralph Waldo Emerson, and Henry David Thoreau.

I am interested in Einstein’s and Spinoza’s God, as nested ecosystems, with the elements of each nest containing its own nest. Nesting has a history. Chinese boxes are nested—with each box sitting into boxes of larger sizes. Russian dolls can also be nested. In literature we find stories that are nested within larger stories.

There are several different ways to build a nested ecosystem model. But first, let's briefly discuss materialism.

20.2 Materialism Equals Energism

Materialism as a philosophy extends back to the ancient Greeks, but the word *materialism* has a somewhat negative connotation among common folks.³¹⁵ “I didn't come from mud!” seems to be the sentiment. Also, materialism is generally associated in our minds, due to ancient misconceptions, with tangible objects. It took a long time for humanity to realize that air was also material—matter which could be compressed, combined with other substances, etc. As discussed previously, humans are about 93% oxygen, carbon and hydrogen by mass, whereas a typical soil contains less than 50% of these elements. So with each breath, we intuitively know that we are lighter than n mud.

Unlike materialism, perhaps the word “energy” has more positive connotations for common folks. So, since Einstein showed the equivalence of matter and energy—matter could be considered a sort of frozen or slowed down energy—we could perhaps replace the word *materialism* by the word *energism*.³¹⁶

20.3 Biological Nested Systems

In the “natural” environment, there are nested ecosystems. A search on the Internet reveals many possibilities. [The mathematical symbol \subset means “is a member of”.]

4-nested: *individual* \subset *population* \subset *community* \subset *ecosystem* \subset *biosphere*.

10-nested: *molecule* \subset *cell* \subset *tissue* \subset *organ* \subset *organ* \subset *system* \subset *organism* \subset *population* \subset *community* \subset *ecosystem* \subset *biosphere*.

10-nested: *organelle* \subset *cells* \subset *tissues* \subset *organs* \subset *organ systems* \subset *organisms* \subset *populations* \subset *communities* \subset *ecosystem* \subset *biosphere*.

20.4 Human-Centered Nested Systems

Here is a loose anthropocentric 4-nested system:³¹⁷ the self is a member of the family, which is a member of a group and its symbiotes, which is a member of humanity and its symbiotes. We get: *self* \subset *family* \subset *group and its symbiotes* \subset *humanity and its symbiotes*. These can be illustrated as concentric circles with the inner most circle being the self.

In a nested ecosystem there is a complex interaction between and within the various nests. Thus, *one needs to take into account all these interactions when making a decision*. This kind of thinking may have originated in Asia. For example, the Chinese book *The Great Learning* by Lezheng Ke says:

The ancients who wished to illustrate illustrious virtue throughout the empire, first ordered well their own States. Wishing to order well their States, they first regulated their families. Wishing to regulate their families, they first cultivated their persons. Wishing to cultivate their persons, they first rectified their hearts. ... Their hearts being rectified, their persons were cultivated. Their persons being cultivated, their States were rightly governed. Their States being rightly governed, the whole empire was made tranquil and happy.

We get: heart is a member of the person, which is a member of the family, which is a member of the state, which is a member of the empire. Symbolically we get this: *heart* \subset *person* \subset *family* \subset *state* \subset *empire*.

Political systems could be nested: individuals are members of towns, which are members of counties, which are members of states or provinces, which are members of nations, which are members of alliances. Symbolically: *individuals* \subset *towns* \subset *counties* \subset *states or provinces* \subset *nations* \subset *alliances*.

Furthermore, nowadays we have nested digital systems:

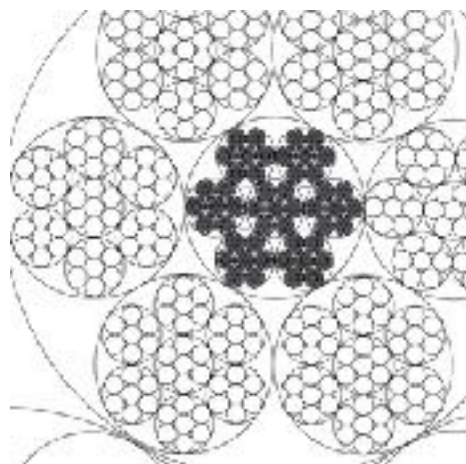
self with a connected device \subset *digital groups* \subset *large cyber-organisms (such as Facebook, X, and Google)* \subset *the Internet*.

20.5 A 14-Nested Anthropocentric System

I have somewhat arbitrarily devised an anthropocentric system into 8 nests (outside of us) and 6 nests (within us) to make 14 nests.³¹⁸

subatomic particles \subset *atoms* \subset *molecules* \subset *cells* \subset *tissues* \subset *body systems and organs* \subset *individuals* \subset *families* \subset *groups* \subset *humanity* \subset *animals* \subset *Earth's biosphere* \subset *the Solar System* \subset *the Galaxy* \subset *the Universe*.

In this system, “groups” could include various large or small and sometimes overlapping entities: friends, neighbors, clubs, schools, teams, corporations, political parties, language-groups, towns, cities, states, nations, communities, businesses, cultures, ideology-groups, electronic-groups (such as talk radio), digital groups.³¹⁹



We can symbolize these nests as, say, 6 circles around one central circle, which extends outwards in an expanding fractal pattern. (See image.) One circle could represent seven families (a community), with

each family having seven people, and each person having seven body systems, etc., (although there are actually eleven body systems).

20.6 Implications

I think that a nested model may help to clarify several issues such as truth, free will, good/evil, and suffering. For example: how can God (or the Universe) allow suffering? The answer is that from a more encompassing nest the suffering may be necessary:

Truth and Free Will:

Verbal “truth” can depend on the nest (or perspective). (I’m not going to get into a discussion of scientific realism versus epistemic or cultural relativism, or the nuanced positions between these two extremes.)

Example 1: The famous parable of the elephant. Several blind men (or men in the dark) are asked to describe an elephant by touching different parts of it, and they all relate different descriptions. We are at a wider nest and can see a different picture.

Example 2: If I draw a large number “6” on the sidewalk with chalk, my friend, in a wider nest than me individually, may walk up from the other side, and say that he sees I have drawn the number “9.”

Example 3: A very, very long, wide building (3D), when viewed from high up, may look like a flat strip (2D). From even farther out, it becomes just a line (1D). From farther out, it becomes a curved line on the Earth. Go out far enough and the Earth becomes a point (0D). What appears “true” about this building’s dimensions depends on how far away you are when you look at it.

Example 4: A person is three dimensional (3D) up close. From farther away that person begins to look increasingly 2D (but as part of larger complex systems) and from farther away to look increasingly like a one-dimensional point (but seen as part of even larger systems). The farther away you get, the more you see the interaction with wider nests.

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Example 5: We feel we are making decisions and thus have free will, but others, at a more encompassing nest, can see how the environment and genes have shaped us. From *my* viewpoint, trapped inside my head and body, I am free to choose. This is the viewpoint of psychology. To someone from a larger nest, outside of me, such as Robert Sapolsky, I am only making decisions based on my genes, my environment, and preceding events. This is the viewpoint of biology.

Example 6: Some people feel humans have caused and can ameliorate global warming. In other words, we humans think we have “free will” as a species. However, when humans are viewed from a wider nest, when they are seen as a biological species, why are they not just as predetermined as, say, bacteria, lizards, squirrels and whales? So when humans think *they* are causing global warming, they are not viewing themselves as part of nature. So, is it *nature* causing global warming? From the viewpoint of the biosphere, humans are not separate from the rest of nature (they were not specially created). This doesn’t mean we should not try to reverse global warming—the biosphere can cause us to do that too.

Humanity, when viewed up close, has certain characteristics. When viewed from far away, other characteristics appear. I think this is often why psychological theorists, political theorists and various others do not always agree. They are looking at things from different nests (distances, levels, or perspectives). Of course, many disciplines try to incorporate multiple nests, even though they often emphasize one nest over others. For example, within psychology there is the “Bio-Psycho-Social” model, with three contiguous large nests.

Conflict:

Disharmony between various elements in the same nest is necessary for selection/elimination to take place: sibling rivalry, family feuds, corporate and team rivalry, national rivalry, and species rivalry.³²⁰ The Darwinian principle of 1) abundance, 2) variation, and 3) selection/elimination applies. Harmony is restored when one element defeats another, or engulfs another, as when entire genomes are acquired, or when one

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nation, in occupying another, assimilates it, or when two opposing elements become aware of a cooperative advantage or common threat.

Example 1: Two brothers stop fighting when their family is threatened by another family or when they realize they can work together on a project; two families stop fighting when the community is threatened by a flood and they cooperate to control it; two communities stop fighting when they are both threatened by another species (tigers); two species (man and tigers) stop fighting when they are both threatened by a forest fire, two nations stop fighting when they are attacked by aliens from another world, etc.

Pressures Between Different Distances:

Some individuals or organizations do not appreciate their connections to less comprehensive levels or more comprehensive levels.

Example 1: A social media company that only works to maximize profits and thus allows foreign nations to interfere with domestic affairs and weaken their home nation.

Example 2: Corporations that pollute the environment or exploit workers in an attempt to do better than competition.

Example 3: The mafia emphasizing family over nation.

Secrets:

Secrets at the same level, or between different levels, can prevent the smooth flow of information and thus promote disharmony. All level can have secrets (the nucleus, cells, tissues, organs, systems, individual, family, groups, humanity, etc.) from other levels.

Example 1: A person is struggling with a serious health issue but keeps it a secret from their family.

Example 2: Excessive government secrecy may undermine the functioning of a nation.

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Example 3: Corporate environmental pollution that is kept secret may harm the nation, humanity, and wildlife.

Example 4: Corporate “insider” trading may harm individual investors and the smooth functioning of the economy.

Example 5: A disease in a tissue that the individual doesn’t know about.

Example 6: An individual that steals money from his family.

Good and Evil:

Goodness at one level may not be good at another.

Example 1: “Violence against Joe” is evil; however, if Joe is a murderer, violence may be necessary to prevent violence to the larger group.

Example 2: Limited warfare can be “evil” from the individual perspective of someone who is killed or injured; however, from a more comprehensive level, limited warfare could be “good” as nature selects/eliminates technologies, nations, tribes, individuals, etc. Besides facing possible extinction from the various sources mentioned, we may also be competing in the galaxy with lifeforms that have little or no interest in our survival.

Suffering:

“Suffering” at one distance is necessary as selection/elimination restores homeostasis at another distance.

Homeostasis Hypothesis:

All points and levels influence the other points. From inside, genes, in order to survive, pressure the individual organism. From outside, culture pressures the individual organism, also to allow it to survive. There is a mutual feedback “dance” between these two. So at each distance, the structure is trying to reach an equilibrium, a *homeostasis*, by the mechanism of selection/elimination perhaps to dissipate the energy differential between the Sun and outer space or other differences (more in this later).

Of course, since the map is not the territory, any definition of God, including Einstein’s or Spinoza’s, can never completely describe objective reality, assuming there is such a thing.

Current theories in physics do not account for dark matter or a force that repels gravity known as dark energy, and they do not integrate gravity with quantum mechanics. Likewise, Darwin’s theory, Newton’s theory, religious theories, cellular automata, string theory, as well as my own theories can never *completely* explain something. So any description of reality or a description of a God is incomplete, but may be useful.³²¹

By recognizing the interconnectedness and multi-layered nature of the universe, from the subatomic to the cosmic, we can begin to develop a more nuanced and holistic understanding of the forces that shape our reality and give rise to the complexities of life and meaning. The nested systems perspective, grounded in Einstein’s and Spinoza’s conception of God, provides a useful tool for navigating the mysteries of the universe and for finding our place within the grand cosmic dance.

21.0 Why Religion

*... the enduring paradox of religion is that so much of it is demonstrably false,
yet it remains a driving force in all societies.*

E. O. Wilson

21.1 Naturalism

So now our journey is almost complete.

As a result of 1) my multidisciplinary education at the Air Force Academy, 2) living for many years in the geologically active area of Southern California, 3) being part of a new religion, 4) teaching many different subjects at 116 schools, colleges and universities, 5) being an independent scholar—reading many different books in different fields, 6) traveling to see various live volcanoes, and 7) living in another culture for eight years, I believe I have penetrated through the “simulacra” to the common origins of science and spirituality, and I have tried to share this with you.

We have examined how our ancestors viewed 1) the fire below us, 2) the air around us, 3) the sky above us, and 4) the knowledge inside us. What have we found?

We found that religion *does* have some basis in reality, but it is not what most people think.

We found that our ancestors, the talking apes, through their observations of nature created proto-scientific stories, stories of catastrophic destruction and floods, stories of serpents and dragons, stories of battles between Earth and Sky Gods, and stories of omni-present and loving Gods, spirits, and universal energy. Nowadays, we can say, more accurately, that plate tectonics and sea level rise created statistically inevitable volcanoes, earthquakes, lava bombs, lightning, tsunamis, and floods, etc. We can say, more accurately, that there *is* something invisible, but material, in the air that sustains us—what we today call “atmospheric oxygen” and not some spooky “metaphysical” substance. We can say, more accurately, that Earth goes around the Sun and thus there are no “sunsets” or “sunrises.” We can say, more accurately, that life was not designed, but that abundance, variety, and scarcity can create new species. We can say, more accurately, that atoms are fundamental units of matter, and genes are fundamental units of life, and that life, made of vast arrangements of these atoms and genes, is a *complex adaptive system* that takes advantage of energy flows in its surroundings.

We found that our ancient ancestors were searching for those things we still search for—abstract patterns which help us to make predictions for better survival.

21.2 Additional Theories of Why We Still Have Religion

This book discusses what is called a *naturalistic* origin of religion, but some of us believe in a “divine” origin or a direct communication with a God or *the* God. Additionally, online you can find

“Theories about religions,” the “Evolutionary origin of religions,” and “Evolutionary psychology of religion.” Below I would like to discuss some other theories of why we have religion.

1. *The brain has no sensory nerve endings within itself.*

In other words, it senses the body and a large part of the world outside the body, but it does not sense itself. It does not sense how it functions. It feels no pain or pleasure. So doctors operate on some areas of the brain with the patient wide-awake with no anesthesia. For this reason, we tend to think that we are separate from the body.³²² This may be an important and sometimes overlooked explanation for religious belief.

2. *A religion provides social connection and mutual support.*

Religion, at its best, teaches humility, compassion, honesty, and family values. Religion is a part of our heritage, often cares for the less fortunate, provides meeting places for discussion and fellowship, and so allows valuable social interaction and support.³²³ However, at its worst, religion teaches delusion, prejudice, isolation, arrogance, violence, and hypocrisy. We can get a false sense of our place in the general scheme of things, and an inaccurate and incomplete view of the world that can lead to unnecessary death and destruction.

I can see both the good and the bad in religion, with “good” being defined as actions that assist the survival and well-being of humanity and bad being the actions which harm them. Which is predominant in religion, the good or bad? That is obviously a very difficult question to answer because you would need to somehow add up all the instances of both good and bad actions, no matter how small or trivial, over thousands of years, plus their secondary and tertiary effects, etc., for billions of people.

3. *Science and mathematics education is of poor quality in many public schools and so people don't sufficiently learn these subjects.*

Having been an educator for over 45 years, I will go into some detail about this point. Stick with me. Our ancestors saw that sunlight gave life to plants, but *how?* They saw things fall to the ground, but *how?* The energies, masses, and forces are, or were, invisible. Gravity, radiation, water, air and even light is invisible.³²⁴

The invention of abstract symbols and complex models, off-loaded onto paper and digital storage devices, allowed us, unlike other species, to access information that others have stored, no matter how far away they are, or how long dead. These complex models also allowed us to create complex tools so that a person can go through their entire day only touching and interacting with these tools, which include buildings, sidewalks, cars, computers, eye glasses, clothes, cars, books, and mobile devices, etc. These complex models and tools allowed us also to see things that were invisible to our talking-ape ancestors.

Also, we did not evolve any brain structure to recognize and deal with time spans of hundreds or thousands or millions of years. As Darwin said, "...for the lapse of time has been so great as to be utterly inappreciable by human beings."³²⁵ Only after we became writing-apes, did we have a means to accurately record and analyze our observations.

Furthermore, we could not see atoms and molecules because they were so small, we could not see most stars and galaxies because they were so distant, and we could not see all of nature's evolutionary steps because of the long time span involved. We needed microscopes, telescopes, and radioisotope dating.³²⁶

Thus,

A. Thanks to writing, symbols, mathematics, and statistics *we can, with some meaningful probability, perceive the future*: 1) the shortest days and longest days of the year, 2) the coming lunar and solar eclipses, 3) the coming weather, 4) the position of Mars in six months, 5) the speed and direction of the spread of a harmful virus, etc.

B. Thanks to the invention of microscopes *we can perceive the very small*: 1) atoms, which, as far as we know, make up all matter in the universe, 2) molecules, such as water and carbon dioxide, 3) bacteria, both good and bad, 4) viruses, and 5) cells, etc.

C. Thanks to the invention of telescopes *we can perceive* 1) the very distant: a) mountains on the Moon, b) craters on Mars, c) moons around Jupiter, and 2) the past, light from stars and galaxies near the time of the Big Bang.

D. Thanks to radiometric dating, fossils, geological sedimentary layers, as well as writing, photos, videos, *we can perceive (evidence) of the past*: 1) the history of ancient Rome and China, 2) images of Lincoln, 3) the era of dinosaurs, 4) the first life on Earth, etc.

With our complex models and complex tools, we writing-apes are already a transhuman species. We sometimes need to get away from all of this and climb mountains, hike canyons, walk forests, and swim lakes and oceans. However, do we need to resort to ancient superstitions? Our current, naturalistic models explain and predict many events much more accurately, and those who take the time and effort to study and learn these models are able to make much more precise predictions to aid their survival, while remembering that our models are not perfect, they are just useful maps.

4. Life can seem short, brutish and overwhelming, and, just to have the confidence to face life, some of us may need the supernatural, but false hope that comes with some religions.

Some interesting questions: Should only scholars, scientists and some rulers know all the facts, and, to maintain social harmony, encourage the needy populace, with no opportunity for a complete education, to retain their superstitious beliefs, which are engrained in their brains and hearts as firmly as “nations” or “money” is in our brains and hearts? Will these people interfere with technological and medical progress?

Should they be educated with the fact that early humans invented the idea of the “soul” and “spirit” in their search to understand what we today call oxygen?

Due to our Paleolithic minds and the simplicity of superstitious beliefs (more on this below), we may never be able to eliminate superstitious beliefs entirely, but we can *push back* when they become too powerful a force in society and threaten to bring about a Dark Age.

5. *Prayer seems to work.*

A) There’s also a story I read somewhere which went something like this: there was a shipwreck which had only one survivor of three hundred. She was asked how she managed to survive, and she replied that she had “prayed to God.” Everyone was suitably impressed. However, an old sailor standing nearby said quietly to himself, “You think the other people on that ship were not praying to God?” *In a dangerous environment, and in which prayer is encouraged, prayer will always seem to be successful, because we don't hear from the people who all died.*

B) People remember and tell each other about the times it worked—not the times it didn’t work.

C) A prayer posture, head down, perhaps prostrate, hands together or on the ground, is the most humble posture. Contrast it with this: standing, one foot far in front of the other, arms raised and hands in fists, head up: the warrior posture. As I suggested earlier a humble attitude can be better for thinking of new solutions.

D) The social support network, described in number 2 above, can also make it seem like prayer works. For example, Aunt Bessie shares with her church congregation that she prays that she will have the money to save her home from being repossessed by the bank. “Miraculously,” the money appears—by way of a collection taken up by the other church members. It’s this kind of occurrence that makes God as real to believers as money is to non-believers.

E) Dr. John Lilly, a physician, inventor, and writer, who explored dolphin intelligence and human-dolphin

communication, who invented the isolation tank, and who I once had the pleasure of meeting, described prayer as “meta-programming the human biocomputer.” Apparently, to him prayer was a means of programming your own brain.

6. *Paleolithic brains crave Paleolithic answers.*

I will also go into some detail about this point. Throughout our evolutionary history our brains grew until, if they grew any bigger, they would kill the mothers in childbirth. However, our brains are small, compared with the later off-loading and resultant extension of most of our brains via writing.

These Paleolithic brains were good enough for surviving in small hunter-fisher-gatherer nomadic tribes in which we lived for tens of thousands of years. They helped us to find mates, food, shelter, form social alliances and avoid predators. However, Paleolithic brains can mislead us—and other animals. In a modern, complex, technological world, it’s called an “environmental mismatch.”

For example, why don’t more of the world’s people eat healthy foods? Our Paleolithic brains crave sugar and tell us to eat as much as we can. This craving had strong survival value during Paleolithic times when sugar was scarce. Those who survived had the instinct to seek out fruits and honey and we are their descendants. Nowadays, when we can easily mass-produce sugar, this instinct can work against us and we can become obese and develop diabetes.

So likewise, perhaps our Paleolithic brains and hearts crave spirits, souls, angels, gods, and dragons. Paleolithic brains and hearts can understand the world of fire, water, earth, and air. Paleolithic brains and hearts can understand Gods in the Sky and Gods under the Earth but not so easily the 119 chemical elements and the interactions of their protons, neutrons, electrons. As I have said, the *compressibility* (simplicity) of a religious cosmology may outweigh the lack of *accuracy* and so the popularity of religion increases.

Related to this, Daniel Dennett once explained to me the “intentional stance” and how this might explain some aspects of religion. From his writings, “The intentional stance is the strategy of interpreting the behavior of an entity (person, animal, artifact, whatever) by treating it as if it were a rational agent who governed its ‘choice’ of ‘action’ by a ‘consideration’ of its ‘beliefs’ and ‘desires.’”³²⁷ He gives an example of a computer chess program in which we might assume that the computer “wants” to win and “knows” the rules of the game. So too we interpreted the motion of the wind, the tides, the quaking of the Earth, and the eruption of a volcano as the work of living spirits or Gods with “wants” and “knowledge.” Along this line, there probably exists in our System 1 quick-reaction minds a kind of Hyperactive Agency Detection Device (HADD). This device suggests it is better to avoid an imaginary predator than be killed by a real one. It’s better to assume that the rustling of the bush is not the wind, but a lion. This would also tend to encourage belief in ghosts and spirits.³²⁸

7. Confirmation bias.

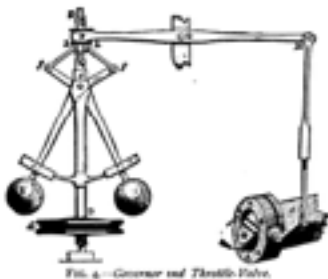
Church-goers usually only see, hear, and transmit the wisdom and inspiration in their sacred texts. Skeptics usually only see, hear, and transmit those religious beliefs that are nowadays obviously false and practices that are, by current standards, morally wrong.

This was brought home to me on a personal level recently. A neighbor of mine, an older lady, died recently. The assistant manager of our mobile home park had to clean out her home, which included many boxes of books. He knew that I read a lot, so he asked me if I could take care of the books. I agreed, and as I looked through the boxes of books I realized that they were all Christian religious books, and I was struck by the positive and uplifting tone of all the books, a stark contrast to books by many prominent atheists that I sometimes read. Although I thought about tossing them in the dumpster, I donated them all to a secondhand bookstore. (Judge me as you will.)

In the final chapter, we will recapitulate the central argument of this book, namely that religion has its roots in the early human attempt to make sense of the natural world through proto-scientific, anthropocentric and supernatural worldviews and how science has given us more accurate descriptions. We will consider the enduring human search for meaning and purpose by situating the human existence within a broader context of thermodynamic processes and by looking at the progressive humbling of humanity's place in the universe.

22.0 Life's Purpose

22.1 Homeostasis



Homeostasis is “the tendency toward a relatively stable *equilibrium* between interdependent elements, especially as maintained by physiological processes.” Humans have many homeostatic systems. For temperature regulation, we sweat when we get too hot, and we shiver and get “goose bumps” when we get too cold. Oxygen, water, glucose, sodium, copper, iron and many other substances are

controlled through homeostasis. The homeostatic equilibrium is called the “set point.” These days homeostatic set points are used in many machines. Let me explain.

Centrifugal governors were invented in 1788. As the speed of an engine increased, two spinning balls would slowly rise up which then closed a valve. This shut off the flow of fuel to the engine and reduced its speed. The balls would then fall which opened the valve again and increased the fuel flow and speed. James Watt used one of these to control the flow of steam into his engines.³²⁹

In 1885 a thermostat was invented which could control the amount of heat in a home. If it became too cold the thermostat would open a damper which would let more air into the furnace and thereby increase the amount of flames, and when it became too hot the damper would close and let in less air and thereby decrease the amount of flames.

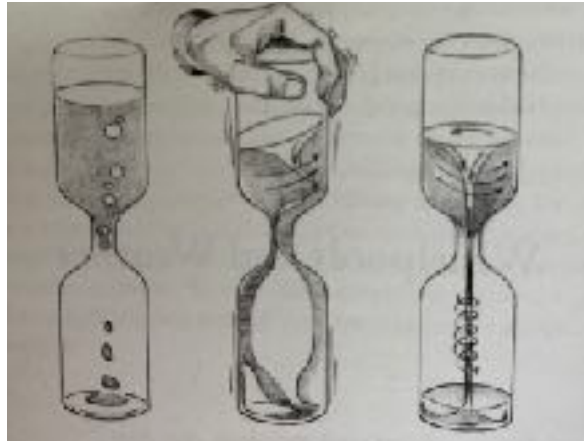
Nowadays, besides set points for speed and temperature, we have robot vacuum cleaners whose homeostatic set points are “a floor free of debris.” Many manufacturing processes, such as nuclear power plants, also use homeostasis. These are now called *control systems*. Thus, engineers have designed systems that exhibit what look like “goals.”

Homeostatic control systems show that goal directed behavior does not require a mystical or supernatural power. In other words, just because humans exhibit “goals” or “purposes” does not mean they are somehow different from inanimate machines. Of course, when we look inside the human body, we don't see a soul or spirit, but rather various machines, some of them large (heart) and some of them extremely tiny (DNA replicators).

Who sets the “thermostat” for humans? Our genes, environment and culture. It does this through the pleasure or pain we feel, depending on whether we take actions which contribute to the reproduction of our genes and memes or to their elimination. Our genes have programmed us to have “set points” for food, water, body temperature and sex, and, through culture, this extends into the psychological domain, such that

a person raised as a Christian can have set points such as: going to church every Sunday.³³⁰

So, although humans have a larger range of actions than a temperature regulation system, this doesn't mean that we are fundamentally different. Homeostasis also appears in non-living things in the natural world. For example, storm fronts, tornadoes and lightning are all trying to equalize differences. For example, a high pressure in one area and a low pressure in another area can be equalized by the means of a tornado.



If water flows, glug-glug-glug, as on the left, into the lower bottle it takes 6 minutes. If it forms a whirlpool, as on the right, it takes 11 seconds. (From Schneider and Sagan.)

Along this same line, Eric Schneider and Dorion Sagan discuss a “tornado tube” experiment.³³¹ You can buy various kinds of “tornado tube” toys, but the one they specifically describe connects two plastic bottles together with a short tube. If water is allowed to flow, glug-glug-glug, from the upper bottle to the lower bottle, it takes six minutes. However, if the water in the upper bottle forms a whirlpool, for the water to drain into the lower bottle only takes eleven seconds!

One possible deduction from this experiment is that living things may be highly efficient at bringing about homeostasis: Schneider and Sagan dig deeply into the subject of non-equilibrium. It was once widely thought that the second law of thermodynamics, the general direction toward disorder—as shown by a cup breaking apart rather than being put together—would eventually result in the “heat death” of the universe. A

rather grim conclusion. However, they point out that we don't really know much about dark energy and dark matter, and we don't really have a theory which integrates gravity with quantum phenomena, so this “heat death” is only one of several possibilities. Although non-equilibrium thermodynamics has been extensively applied to physical processes, such as a tornado, Schneider and Sagan propose that the *same principles also apply to living systems*. They reason that we have complex life on planet Earth to more efficiently equalize the difference between the solar output of the Sun (about 5,800 K) and the coldness of space (about 3 K) to bring about a homeostasis on Earth (about 280 K).

22.2 The Great Demotions

I think it's possible that the universe may be trying to reach equilibrium, or homeostasis, while selecting those non-living and living events that contribute to this, *Universal Equilibrium by Universal Selection*. One might say that, from this perspective, life's purpose is to help equalize the energy differences between our Home Star and the coldness of space. Although homeostasis does not seem like a very lofty purpose, perhaps it is just another demotion of humanity.

Carl Sagan discusses these “great demotions” in which humans have successively realized that:

- 1) Earth is not the center of the universe.
- 2) Earth is not the only planet in our system.
- 3) The Sun is not unique.
- 4) The Sun is not the center of the Milky Way galaxy.
- 5) Our galaxy is not the only galaxy.
- 6) Our galaxy is not the center of the universe.
- 7) Our sun is not the only star with planets.

8) We do not live in a privileged frame of reference.

9) We were not specially created but evolved from other animals.³³²

I would add to this list that:

10) Our motivations are mostly unconscious.

11) From an outside perspective, we don't have free will.

22.3 The Eternal Search

For an individual human, homeostatic equilibrium is not a sufficient answer to, “What should I do with my life? What is the purpose of life? What is the meaning of life?” Our ancient ancestors, the talking apes, struggled with these questions, and we modern apes, with our smart machines, continue with these struggles today. I believe our ancestors were searching for those things we still search for in science—abstract patterns which help is to make predictions. Something that is forever incomplete. In the future, artificial super-intelligences may also search for meaning. We might hope that they will give us Ultimate Meaning (such as “42”), but maybe they won't, because maybe nothing can. Maybe it's unknowable. How can we know the meaning of any system, such as our universe, if we cannot get outside of it?

Is there any evidence of an “ultimate meaning,” or purpose, or goal of the universe? Purpose means “have an end in mind.” Of course, if the universe is eternal, then how can it have an *end*? So an *ultimate* purpose may never be known and a mature mind may need to accept this. Also, even if the universe does have an end or purpose, I doubt if an entity *within* a system can clearly see it. Also, although we will probably never know the ultimate meaning of life in the universe, that doesn't mean we will give up searching. We can make new discoveries, new connections, and better maps.

According to historian Yuval Noah Harari, religion and Gods have provided meaning for thousands of years, though often through prohibitions and prescriptions such as: what to do, what to eat, how to dress,

when to have a day of rest, how to have sex, how and when to pray, etc. However, he notes that the emergence of liberal capitalism allowed the feelings of the individual to become primary. People knew what they needed better than the Gods knew. People decided they could eat, dress, rest, have sex, and pray (or not pray) as they felt. About the same time, existentialist philosophers said, since there is no predetermined meaning to human existence, the individual must choose meaning for themselves. If we must choose a worthwhile purpose for *ourselves*, perhaps we must also choose a worthwhile purpose as a *species*, such as to explore the galaxy and “become a multi-planetary species.”

22.4 Push Back

Four centuries ago, Galileo Galilei’s pivotal experiments with weights proved the ancient Greek texts were wrong. Using observation and logic, he also deduced that the Earth went round the Sun—contradicting the Judeo-Christian text that had been dominant in Europe during the Dark Ages. Galileo's findings challenged the authority of the Church and the prevailing European worldview, setting the stage for the European enlightenment.

As mentioned at the start of this book, there are several existential risks facing humanity: pandemics, global warming, nuclear annihilation, super-volcano eruptions, asteroid and comet impacts, nuclear war, and a robot apocalypse. Fermi’s Paradox suggests that past civilizations, elsewhere in the universe, have not been successful in averting these, or other unknown, risks. It is the methods of science, applied with compassion and courage, that could allow humanity to prevail, where other intelligent civilizations have not.

Thus, while ignoring superstition and illogic, but not ignoring traditional wisdom, we should observe and reason clearly, so we can thereby discover important patterns, and, via scientific journals, philosophy, art, or literature, share these patterns. This approach may provide a balanced and comprehensive approach to our societal problems.

A warning. It *feels good* to make fun of the illogic of religious texts and believers. I admit that I sometimes laugh at clever posts on social media by my atheist friends that poke fun at the illogic of certain religion beliefs. Religious believers also poke fun at atheists on their social media sites. However, does making fun of religious beliefs produce social change? I don't think so. I think it causes people to dig in their heels. As I said earlier, to a person of faith, their God, or Gods, are as real to them as democracy, money, or the nation is to us.

As I said at the beginning of this book, twenty-five years ago, when I began writing about science and religion, my goal was to uproot the tree of religion, expose those roots to the world, and by doing so, let the tree wither and die in the harsh light of science. I have realized that not everyone has the opportunity to upgrade their Paleolithic minds with the more accurate scientific model of the world. So nowadays, I think that atheists, nonbelievers, free thinkers, humanists, “nones”, etc., need to give religion some room and respect in their worldview, *without allowing them to dominate society*.³³³ In fact, I think there are times when scientists and others need to nurture religion and times when they need to nurture scientific thinking.

To bring about greater scientific thinking requires *cleverness*, both the cleverness of educators, who can teach students how to understand and reason well, and the cleverness of community organizers, who know how to make small changes over a period of many years.

There is a kind of battle between reason and superstition. In the USA, we have recently seen the rise of anti-science and Evangelical Christians, who have attempted to impose Biblical prescriptions and to even make the USA into a Christian nation. It requires money, planning and organization to push back against this. It requires a coordinated effort among the humanists, scientists, skeptics, freethinkers, rationalists, critical thinkers, empiricists, atheists, agnostics, naturalists (in the philosophical sense), brights, secularists, nonbelievers, materialists (in the philosophical sense), positivists, and “nones.”

Epilogue

A religion, old or new, that stressed the magnificence of the Universe as revealed by modern science might be able to draw forth reserves of reverence and awe hardly tapped by the conventional faiths.

Carl Sagan

2010: Mount Merapi had a major eruption causing widespread evacuations, the displacement of 320,000 people, and the death of 353 people.

October, 2018: The Child of Krakatoa's eruption sent several large lava bombs into the sea, just missing a nearby tour boat. It was caught on video.³³⁴ Later that year, the volcano experienced "cone collapse" which caused its height to be reduced from 1,109 feet to only 361 feet. This generated a tsunami which spread along the coastline. There is an alert system for tsunamis caused by earthquakes but not for tsunamis caused by volcanoes. As a result 14,059 people were injured and 437 killed. By January, further eruptions were beginning to rebuilt the volcano ...

2019: I led several seminars on the core concepts in this book at a Unitarian Universalist Church—a church which wholeheartedly accepts atheists and encourages a "free and responsible search for truth and meaning." If you're an atheist, freethinker, humanist, etc., and you are looking for the benefits of religion, without the dogma, then you will be welcomed into this church.

Epilogue

January, 2020: As the Earth continued its warming, 11,000 scientists from around the world issued this warning: “Scientists have a moral obligation to clearly warn humanity of any catastrophic threat ... we declare ... clearly and unequivocally that planet Earth is facing a climate emergency.”³³⁵

April, 2024: “Asteroid Institute, a program of B612 Foundation, and Google Cloud today announced the most significant results of their partnership to date: identifying 27,500 new, high-confidence asteroid discovery candidates. The work, which took place over several weeks, has the potential to enable the mapping of the solar system and protect the Earth from collisions, advancing the field of minor planet discovery.”³³⁶

Acknowledgements

It has been 20 years since the core of this book was written, so unfortunately I have lost many of the names of people who helped me, for which I apologize. Some people I do remember: Gisele Horvate, who helped with Egyptian hieroglyphic translations, Peter Johnson, who encouraged my writing, and Dr. Meyer Rainer, a mathematician in Austria who first brought Plato's work on numbers to my attention. Literary agent Michael Lennie gave me encouragement and he recruited an anonymous reviewer who read some of the early chapters and made some valuable suggestions. There were several other literary agents who gave me advice, but I have lost their names due to losing all of my emails from that time period in the early 2000s. To them I apologize.

For line editing, thanks to Patricia, my mother, Peter Johnson, and Miriam Cormier, and Jim Whitefield.

Sir Arthur C. Clarke, Martin Gardner, Elizabeth Loftus, Dan Dennett, Sir Harry Kroto, Lynn Margulis, Mamikon Mnatsakanian, and Richard Marken all gave some encouraging feedback.

Appendix A: Questions and Answers

Q: Before debating about God, what is a good list of words to define beforehand?

A: You only need define one word. God. God is a three letter word, a noise we make with our vocal cords. If you can agree on a precise definition of that word, what it is and what it isn't, I think there will be no longer any reason to debate anything.

Q: How would you convince me of the existence of God knowing that I'm an atheist?

A: This is very easy to do actually. Define "God" as something that an atheist believes actually exists, rather than as current religions define "God." For example, God = all space, time, energy, and matter in the universe.

Q: On what basis do people choose to be atheists?

A: I didn't choose to be an atheist. I chose to value experimentation over authoritarianism, observation over revelation, reasoning over blind faith, logic and probability over miracles, and truth, however painful, over a lie, however comforting. If some call this atheism, then so be it.

Q: Is there any possible truth to the assertion that the pyramids were used as granaries?

A: According to my research, the pyramids were meant, originally, to represent volcanoes.

The Pharaohs were put into the pyramids to be "one with Osiris," the God of the Underworld. The Nile Valley rulers wanted to usurp the Nature worship of early humans as they migrated down the Nile and out of Africa. If you go up the Nile, you come to a slew of volcanoes on an extremely active geological area called the East African Rift Valley.

In fact, the Christian "resurrection" originally was the volcanic "rebirth" that sometimes occurs after a massive explosion. Of course, people eventually forgot all about the volcanoes, although if you read the hieroglyphs with some knowledge of geology (something obviously never done before), they make sense. So it is possible they may have stored some grains in them, but I have not researched this.

Q: I am a Christian. I struggle with what the Bible says as far as dates, the age of the earth, etc. Carbon dating and other scientific methods seem to be valid but in direct conflict. What should I make of this?

The Human Invention of Gods

A: One is right and the other wrong. I suggest you continue to expand your intellectual horizons by reading about other religions and science.

Q: I am not an atheist, but I can't realize god ... I am confused ... Can you clarify?

A: It is perfectly OK *not to know*. Scientists must often be willing to wait until more evidence is found before they can come to any conclusion. I suggest you call yourself an agnostic, which means you are someone who doesn't know if there is a God or not.

Q: What is the relationship between science and religion?

A: They share a common ancestor on the tree of knowledge, just as chimps and humans share a common ancestor on the tree of life. Chimps are not the ancestors of humans and religion is not the ancestor of science.

Q: Can science change people's belief in religion?

A: Of course. Religion is a *politically correct mythology* often based on primitive and inaccurate conceptions about the world. Many people first question religion when they enter college and are exposed to a wide range of ideas that conflict with what they were taught in their religion. Also, your religion is largely based on where in the world you were born, whereas physics and biology are independent of geography. As your worldview expands it becomes harder to believe in Gods, angels, miracles, etc. (Although some people stay in their religion because that's where their friends are.)

Q: Can we trace a connection between science and religion?

A: Yes. If you go back far enough there were no words for "religion" and "science." There were just Gods that represented various natural phenomena such as lightning, volcanoes, oxygen, the planets, etc. This was an attempt to explain and predict the natural world. Later these "nature religions" branched into alchemy, astrology, and various mythologies.

Q: Would science bring you closer to God?

A: "God" is a noise we make with our vocal cords. What different people mean by this noise would affect my answer to this question. Here are three possible "Gods":

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1) “God” as an all-knowing being.

My study of evolution refutes a “God” of this type. Why would this “God” need something like natural selection if “It” knew what was going to happen in the future? Evolution is “ignorant” of the future and hedges its bets by creating multiple forms “hoping” that some of them have what it takes to survive in whatever the future presents.

2) “God” as a being with limited powers.

It is possible, for example, that we are living in a computer simulation of some kind, a lab experiment of some super-advanced being. In this case, this “Being” would be like a “God” or creator to us. I read that some scientists at MIT may be testing this idea. But what created that Super-Being? And what created the Super-Being that created that Super-Being? It is possible we will never know the answer to these very big questions, any more than a bacteria in our gut can know about us.

3) “God” as all the forces and energies in the Universe.

This might be called Einstein’s God, and clearly this type of God does exist—it’s called reality. I think science can bring you closer to this kind of “God.” However, most people prefer a more personal “God,” and they often want it to look human, like themselves. Hence, Jesus often looks European (rather than like Middle Eastern Jew), and Buddha often looks Chinese (rather than like an Indian).

Q: In five words what makes you believe in or deny the existence of a creator?

A: Paleolithic brains crave Paleolithic answers.

Q: As an atheist, would you bet your life on your belief that God doesn’t exist?

A: All these questions about God are easily answered if people would define what they mean by the word “God.” Some estimates say there may have been as many as 10,000 gods in the history of humanity. Which one are you

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referring to? I would guess the Judeo-Christian God. But even that God has gone through many changes in its definition throughout history.

I prefer to define God in terms of systems theory in which each level is nested inside the next—individual, family, community, nation, planet, etc.

So to answer your question, if I define “God” as something I know exists, then I would bet my life on that.

Q: Was there any recorded time when Theists were not a majority? How did Theists become a majority? Can that be an indicator for the existence of God or at least the Human need for that?

A: I would say that our Gods came into existence at about the time humans observed thunder, lightning, volcanoes, etc. and then anthropomorphized them.

I would also say that our Paleolithic brains evolved to “believe” in “Gods.” Then, with the invention of writing, we were able to off-load a lot of our knowledge onto paper, etc., and our scientific knowledge base expanded greatly, allowing us to understand what makes lightning, thunder, volcanoes.

Theists are a majority just as people who eat unhealthy, fast food are a majority. That doesn’t make them right.

Q: I don't subscribe to the typical interpretation of “God.” I have a spiritual experience, not a religious one. I'm a true Agnostic. I don't know, and NEITHER does anyone else. I feel sorry for people like Hitchens and Dawkins because they don't get the awesome experience you have when you touch the divine in yourself or in nature, and I also feel sorry for the very religious in that they think it is outside and other than themselves. For me, divinity is the Earth, and She is real. I'm a part of her consciousness and one of her neurons. And she is a part of living solar system and a living Galaxy. Divinity is not a transcendent GOD that watches our every move.

A: I understand and generally agree with you when you say we are part of the larger Earth, Galaxy, etc.

Regarding experiencing the Divine: I would add that there are other things besides what we can see and touch in nature; we don't see radio waves, x rays, ultraviolet waves; we need telescopes to see and measure the vastness of the Galaxy and the Universe; we need microscopes to see the incredible intricacies of biological phenomena; we need radiocarbon dating and other scientific methods to show us the vastness of geological time. All of these things are also part of nature, and scientific measurements have allowed us to glimpse them.

So I think it is possible to glimpse a much larger and richer Universe than our Paleolithic ancestors. We can extend our minds and consciousness and thus our appreciation of the Divine.

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Q: Is there more than one truth?

Truth is something that is created in a brain. Outside of the brain there is reality (although this is an assumption, it is a useful one). Our brains extract certain information from this (outside) reality such as visible light, while it ignores other information such as x-rays and radio waves. Other animals get slightly different information from this outside reality (for example, dogs can hear higher frequencies and bats see by using sound, etc.) Our brains also fill-in missing information using what they expect to see or hear.

So, in our brains we have models of the outside reality. Usually, as we get older, we refine these models. For example, a young person might think, "All people of X nationality are ignorant." As they grew older they might think, "Some people of X nationality are ignorant and some are smart." Science is the formalized process of building models of the universe and refining these models so they are more concise and more accurate.

The problem is that no model is ever 100 percent accurate. By definition, a model is a smaller version of something else. If it were 100 percent accurate, it would not be a model, it would be a duplicate.

The most amazing thing, in my view, is that the brain takes the universe, which is billions of light years across and massive, and compresses it into useful models which are stored within its 3 pound neuronal structure or its extended brain.

So, all models are inaccurate to some degree. Perhaps the most noble goal is to create a model which is both accurate and concise. For example, Newton's law of universal gravitation, which can be stated in one sentence and which unified motion on Earth and motion in the heavens for the first time, is highly accurate. Darwin's model of speciation through natural selection with variation, a highly concise statement, unified all life forms for the first time. Einstein's equation $E = MC^2$, another highly concise statement, unified all energy and matter in the universe for the first time.

Q: When Jesus returns on his second coming, atheists will finally be convinced of his existence at that point. If they then repent and follow him, will they get to heaven or will it already be too late?

There are a lot of assumptions here that an atheist would not agree with:

1. Jesus existed. (There are no records of him left by the Romans, although most historians nowadays accept that he did live.)
2. Jesus was the son of the God (God as defined by the Abrahamic religions).

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3. Jesus will return.
4. God (as defined by the Abrahamic religions) exists.

Most atheists would say that none or most of these are not good or useful assumptions to make.

Q: A unifying characteristic of all Indo-European mythologies is a story about a battle between a god of thunder and a huge serpent or a dragon. What is this meant to represent?

The serpent or dragon is the God of the underworld, representing magma, lava, earthquakes, and volcanoes. Thunder and lightning results when the volcano is spewing out lots of ash particles which create what is called “volcanic lighting.” (You can see many photo and videos about this nowadays on the Internet.)

The lightning bolts down into the caldera of the volcano, making it look there is a battle going on between the “Sky God” and the “Earth God.” Usually, the volcano explodes violently making it look like the Sky God has won.

Q: Why do we pray to different gods in different ways?

The world’s great religions and mythologies have similar beginnings in their search to understand:

- 1) the heavens (various lights in the sky and movements of those lights—what we today call astronomy),
- 2) fire mountains, their outflow and the violent shaking of the ground (volcanoes, lava, lava bombs, magma),
- 3) fire and the invisible substance around us that keeps us alive (combustion, oxygen, and chemistry).

However, from the beginnings have come many different Gods and mythologies and religions. Foods in one country are different from those in another country even though they are made from similar ingredients such as meat, chicken, fish, fruits, nuts, vegetables, and greens.

We must sometimes struggle to recognize the common ancestors of all the peoples of the Earth and we must sometimes struggle to recognize the common natural origins of all our religions.

Q: If God exists, he is evil. How true is that statement?

Some possibilities come to mind:

1. God exists, good and evil exist, and God is good.
2. God exists, good and evil exist, and God is evil.
3. God exists, good and evil exist, and God is neutral or somewhere between good and evil.
4. God exists, good and evil don’t exist.

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5. Many Gods exist, repeat 1–4 for Gods.
6. God or Gods don't exist and good and evil are subjective labels given to things by a person or group or species, etc. as those things help or hinder their survival.

Q: When a TV evangelist calls upon God to cure someone's cancer, and God doesn't, what is the patient expected to conclude?

There are several possibilities that come to mind:

1. God didn't get the message from the TV evangelist.
2. He received the message, but decided not to do it.
3. God, as envisioned by the evangelist, doesn't exist.

Q: Do you believe that God created religion or that people created religion?

Humans invented the word "God" and "religion" but these ideas were originally based on real things such as volcanoes, stars, planets, lightning, thunder and the search for what today we call atmospheric "oxygen."

Q: Is there any concrete proof for God's existence or nonexistence?

"God" is a noise that travels through the air in your voice or three letters you write on a page. If you *define* "God" as all Space-Time-Energy-Matter in the universe, or in some other concrete manner, then I think that would constitute "concrete proof" that "God" exists.

Q: Why do humans create myths to explain what they don't understand instead of accepting that they do not know?

All stories, theories, explanations, hypotheses, and myths have various degrees of conciseness and accuracy. "The map is not the territory; the word is not the thing."

The most compelling myths have a high conciseness and accuracy. For example, Isaac Newton's theory of gravitation can be stated in one sentence, yet has a tremendous amount of accuracy. We know it is not 100% accurate because of *relativistic effects* near the speed of light. Yet, it is accurate enough to send spaceships from here to Mars, because the spaceships travel at much slower speeds than the speed of light.

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So it's very usable even though we know it's inaccurate. Maps are not 100% accurate but they are quite usable. So there are many things we don't understand and we try to build models that are simple yet accurate enough for preliminary use. This is why people created myths.

Q: Is there an absolute truth about anything?

Since "The map is not the territory; the word is not the thing," it appears that every statement is incomplete, even this one!

Q: What is the deepest philosophical concept you have come by?

TWO ... One thing or one being, all by itself filling the entire universe, cannot know It exists unless It encounters some Other thing, because beforehand It IS everything. So only Comparison with Another and Interaction with Another can result in Self-Awareness. Something can only take on meaning by comparison to something else.

Q: If we view the ancient Greek gods as myth, will people view our God as a myth in 2000 or so years?

Maybe. I've said before: a religion is a politically correct mythology.

Q: How can a scientist believe in a higher entity?

A scientist might ask: what do you mean by "higher." This universe appears to have no up or down. "Up" in China is "down" in the USA.

Perhaps the scientist would modify the question: How can a scientist believe in greater entities? (The scientist would know that an "entity" is something that *does* exist.) Then the scientist might ask: Greater than what? Greater than me? Perhaps the scientist would change the question to: How can a scientist believe in a greater entity than their self?

Then they might ask: Greater in what way? Greater in knowledge? Strength? Beauty? Wisdom? Power? All of these? The scientist needs something specific (an operational definition) so they decide that a "greater entity" would have the power to hurt them or help them.

Perhaps the scientist thinks about many things like tigers, snakes, microbes, tornadoes, asteroid impacts, supernova explosions, family, friends, their community, their nation, other nations with better weapons, humanity, various plants and animals, tools such as clothing, shelter, farm equipment, cars, trucks, trains, airplanes, computers,

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medicines, the oxygen in the biosphere, the sun, etc., and they decide that there are many entities in this universe that can hurt them or help them, including perhaps some unknown ones, and then they try to figure out ways to decrease the power of the hurtful entities and increase the power of the helpful entities.

Q: How does the idea of a common ancestor for science, spirituality, and religion help to bridge the perceived gap between these domains?

A: By recognizing that science, spirituality, and religion all have their roots in the early human quest to make sense of the natural world and our place within it, we can begin to see these domains as different branches of the same tree of knowledge, rather than as fundamentally opposed or incompatible. Just as understanding the common evolutionary origin of humans and other primates helps us to appreciate both our shared heritage and our unique adaptations, seeing the common ancestor of science and religion can help us to understand both the similarities and the differences between these ways of knowing.

Appendix B: Timeline

This timeline presents a chronological overview of the key events, discoveries, and figures that have shaped our understanding of the natural world and the human condition, from the earliest origins of life on Earth to the groundbreaking developments of the present day. By examining the histories of science, spirituality, and religion, the various branches of our tree of knowledge, we can trace backward to find their common roots in the natural world. (Note that many dates are only approximate.)

3.8 billion BP: (before present): First life on Earth. Life may have developed in the deep hot biosphere or volcanic vents on the ocean floor, suggesting the importance of geological processes in the origin of life.

2.4 billion BP: The Great Oxidation Event. Earth's atmosphere changes radically, and becomes saturated with oxygen (O₂) for the first time, allowing the rise of complex cells, multicellular life, and air-breathing animal life. This event highlights the crucial role of atmospheric composition in the evolution of life on Earth.

65,000,000 BP: Comet or asteroid impact (and resulting volcanic activity) may have led to the extinction of the dinosaurs and allowed for mammals to flourish in the empty ecological niches, demonstrating the profound impact of cosmic events on the course of life's evolution.

6,000,000 BP: Split of chimpanzee ancestors and our ancestors in the Old World, marking the beginning of the distinct evolutionary path that would lead to the emergence of *Homo sapiens*.

2,000,000 BP: The ice ages begin on planet Earth, perhaps driven by interstellar dust or certain oscillations in the Earth-Sun system. The Earth has been more often in an ice age than not since. Some scientists feel that these ice ages may have helped trigger the beginning of the *Homo* genus, suggesting the role of climate change in human evolution.

1,800,000 BP: *Homo erectus* migrates rapidly to Asia and Indonesia, demonstrating the early human

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capacity for long-distance migration and adaptation to new environments.

1,000,000 BP: Regular oscillations in the ice ages are evident. During the ice ages, great areas now underwater are laid bare—such as the Sunda Plain. The volcano Krakatoa may have had 10-12 mega eruptions, highlighting the ongoing influence of volcanic activity on the Earth's landscape and climate.

800,000-900,000 BP: The first ocean voyages, according to archeologist Robert Bednarik, suggesting the early development of human seafaring capabilities and the potential for long-distance cultural exchange.

800,000 BP: Some evidence that *Homo erectus* existed on Flores Island, Indonesia. They may have used sea craft to get to the island, further supporting the idea of early human maritime abilities.

600,000 BP: Yellowstone mega-volcano explodes. No humans are in the New World to see it. The last explosion before this was 1.2 million years ago. It has an 800,000-600,000-year cycle, so we are about due for another one, underscoring the ongoing threat of catastrophic volcanic eruptions.

1,000,000-400,000 BP: Fire is domesticated by *Homo sapiens*, marking a crucial milestone in human control over the environment and the development of cooking, heating, and other technologies.

500,000 BP: Domestication of dogs, the first animal to be domesticated by humans, leading to a close partnership that would shape human societies and cultures for millennia to come.

500,000 BP: Possible geometric engraving on shells by *Homo erectus* at Trinil on Java suggesting abstract pattern cognition.³³⁷

400,000 BP: Weighted wooden spears found in Schöningen, Germany, providing evidence of early human hunting technology and the development of complex tool-making abilities.

350,000 BP: Stone hand ax may have been buried with the dead in a Spanish cavern, suggesting the emergence of early burial practices and the possible beginnings of religious or spiritual beliefs about the afterlife.

300,000-200,000 BP: The beginnings of modern speech may have occurred somewhere in this time span,

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marking a critical step in the development of human language and symbolic communication.

100,000 BP: The most recent ice age begins. The *Homo* genus differentiates into what we call *Homo sapiens*, marking the emergence of anatomically modern humans.

100,000 BP: Symbolic burial site, decorated with red dye, found in Qafzeh Cave, Israel, providing further evidence of the development of symbolic thought and the possible emergence of early religious or spiritual practices.

75,000 BP: A volcano in northern Sumatra explodes violently, one of the largest explosions ever of a volcano, leaving behind today's huge Lake Toba. A 5-degree Celsius temperature drop worldwide. This event killed a majority of the human population and thus reduced genetic diversity by forming a DNA bottleneck, demonstrating the profound impact of volcanic eruptions on human evolution and genetic variation.

63,000 BP: A ram figurine made (found in Israel), one of the oldest known examples of representational art, suggesting the development of symbolic thought and artistic expression.

60,000 BP: The peopling of Australia, marking the arrival of humans on the Australian continent and the beginning of the world's longest known continuous spiritual culture.

41,000-52,000 BP: Neanderthals used fiber and bone carving technology revealing the development of complex tool-making abilities and the capacity for symbolic thought and behavior.

30,000 BP: Notches on bones suggest the beginning of primitive mathematical writing, demonstrating development of abstract thought.

27,000-20,000 BP: Last Glacial Maximum (LGM). Ocean levels would have been at their lowest in many years, exposing vast areas of all the oceans, including the area between Indonesia, Southeast Asia, and the Philippines. This period of low sea levels would have facilitated human migration and cultural exchange across these regions.

23,000-21,000 BP: Apparent evidence of humans in North America during the Last Glacial Maximum.

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15,000-8,000 BP: Rapid sea level rise following the Last Glacial Maximum. This rise probably covered up archaeological evidence of ancient civilizations and influenced human migration patterns.

10,000 BP: Beginnings of agriculture and possibly specialization. Planting of bananas in New Guinea. Bronze smelting. These developments mark the transition from hunter-gatherer to agricultural societies and the beginning of the Neolithic Revolution, which would transform human cultures and societies around the world.

12,000-5000 BP: The volcano Krakatoa may have erupted violently around this time, further demonstrating the ongoing influence of volcanic activity on human societies and their knowledge of the world around them.

7000 BP: The beginnings of written language in China and the Nile River Valley, marking a crucial step in the development of human civilization and the ability to record and transmit knowledge across generations.

4000 BCE: Abraham, the common patriarch of Judaism, Christianity, and Islam, is believed to have lived around this time in Mesopotamia. He was a central figure in the development of Western monotheism and the Abrahamic religions.

4700 BP: Rise of the Great Pyramids in Egypt, representing one of the most impressive architectural achievements of the ancient world and a testament to the power and sophistication of early human thinking.

2000 BCE: The Vedic period begins in India, marking the emergence of Hinduism and the composition of the oldest sacred texts, the Vedas, which contain early speculations about the nature of the universe and the human soul. This period represents a major milestone in the development of Indian philosophy and spirituality.

1628 BCE (Before the Common Era): The violent eruption of the island Santorini in the Mediterranean. May have been responsible for the fall of civilization on Crete. Evidence exists that it explodes periodically, demonstrating the potential for volcanic eruptions to disrupt and transform human societies and their knowledge about the world.

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600 BCE: The arrival of Buddhism and Greek rationalism. Buddha creates a prescientific psychology, while Socrates also promotes rational thought. These developments mark a major turning point in the history of human thought, as philosophical and spiritual traditions begin to emphasize reason, logic, and empirical observation alongside faith and revelation.

500 BCE: The rise of Confucianism and Taoism in China, two philosophical and spiritual traditions that emphasize harmony with nature, moral cultivation, and the pursuit of wisdom. These traditions would shape Chinese culture and society for millennia to come.

350 BCE: Aristotle writes *De Anima* (On the Soul), an attempt at a logical analysis of the soul, marking an early milestone in the philosophical study of the mind and consciousness.

30 CE: The reported crucifixion and resurrection of Jesus Christ, the central figure of Christianity, whose life and teachings would go on to shape Western culture and spirituality for centuries to come.

535 CE: A possible eruption of Krakatoa around this time may have precipitated the collapse of the Roman Empire, demonstrating the potential for volcanic eruptions to impact human history and thought.

570-632 CE: The life of Muhammad, the founder of Islam, one of the world's largest and most influential religions.

1000 CE: Sunda Strait, site of Krakatoa, is navigable once again, indicating the power of volcanic activity to alter the Earth's landscape and the course of human travel.

1006 CE: An eruption of Merapi on Java possibly ended the Hindu-Javanese kingdom of Mataram in central Java, further illustrating the impact of volcanic eruptions on human societies and political systems.

1268 CE: Thomas Aquinas begins writing *On the Soul*, commenting on the work of Aristotle. He maintains that the soul is the most substantial part of the body and survives after death, representing a major milestone in the development of Christian theology.

1439-1440 CE: Johannes Gutenberg invents the printing press, a revolutionary technology that would

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greatly accelerate the dissemination of knowledge and ideas, paving the way for the Renaissance, the Reformation, and the Scientific Revolution.

1452-1519 CE: The life and work of Leonardo da Vinci, the quintessential "Renaissance man" whose diverse interests and accomplishments epitomize the spirit of intellectual curiosity and creativity that characterized this period of European history.

1473-1543 CE: Nicolaus Copernicus develops the heliocentric model of the solar system, challenging the long-held belief in an Earth-centered universe and setting the stage for the Scientific Revolution.

1517-1546 CE: Martin Luther initiates the Protestant Reformation, arguing that salvation is a personal matter between the individual and God, rather than mediated by the Catholic Church.

1564-1642 CE: The life and work of Galileo Galilei, who champions the Copernican heliocentric system and uses the telescope to make groundbreaking observations of the heavens, further challenging traditional religious and philosophical views of the cosmos.

1592 CE: Body dissection reveals that men and women have the same number of ribs, contrary to the biblical account of Eve being created from Adam's rib. This discovery represents an early example of empirical evidence challenging religious doctrine.

1600 CE: Europeans (Hernán Cortés) contact the Aztecs, marking the beginning of the Spanish conquest of the Americas and the profound cultural and demographic transformations that would follow.

1608 CE: Hans Lippershey invents the telescope, a transformative scientific instrument that would expand human vision and understanding of the cosmos, from Galileo's observations of the moons of Jupiter to the discovery of countless galaxies beyond our own.

1642-1727 CE: The life and work of Isaac Newton, who develops the laws of motion and universal gravitation, demonstrating that the same physical laws govern both terrestrial and celestial phenomena. Newton's work represents a major milestone in the Scientific Revolution and the development of modern

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physics.

1654 CE: Biblical scholar James Ussher calculates the date of the Earth's creation to be 4004 BCE, based on a literal interpretation of the biblical genealogies. This date would be widely accepted among Christians for centuries, despite mounting scientific evidence for a much older Earth.

1664 CE: Thomas Willis publishes *Cerebri Anatome (Brain Anatomy)*, a detailed anatomical study of the human brain. He was the first to use the term “reflex action,” marking an early milestone in the scientific study of the nervous system and behavior.

1728 CE: The first cataloged dinosaur bone is identified by John Woodward, probably belonging to *Megalosaurus*. This discovery provides evidence that some species have gone extinct, challenging the belief that all of God's creations were perfect and unchanging.

1748 CE: Julien Offray de La Mettrie publishes *L'homme Machine (Man a Machine)*, arguing that the soul is not separate from the body and that all human behavior can be explained in purely mechanistic terms. This work represents an early milestone in the development of materialist philosophy and the scientific study of the mind.

1774-1783 CE: Joseph Priestley, Antoine Lavoisier, and others investigate and isolate the element oxygen, clarifying the nature of combustion and respiration. This represents a major milestone in the development of modern chemistry and the understanding of the role of gases in biological processes.

1785 CE: James Hutton publishes *Theory of the Earth*, which proposes that the Earth is much older than previously believed and that its features can be explained by gradual processes still operating in the present. This work marks the beginning of modern geology and the concept of “deep time.”

1796 CE: Georges Cuvier establishes the field of paleontology and provides clear evidence for the extinction of species, further challenging the notion of a static, unchanging natural world created by God.

1803 CE: John Dalton proposes the modern atomic theory, which holds that all matter is composed of

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indivisible particles called atoms. This theory represents a major milestone in the development of modern chemistry and the understanding of the basic building blocks of the universe.

1822-1911 CE: The life and work of Gregor Mendel, an Austrian monk whose pioneering experiments with pea plants lay the foundation for the modern science of genetics, revolutionizing our understanding of heredity and biological inheritance.

1859 CE: Charles Darwin publishes *On the Origin of Species*, proposing the theory of evolution by natural selection. This work represents a major milestone in the history of biology and a challenge to traditional religious views of the origin and diversity of life on Earth.

1860s CE: Louis Pasteur develops the germ theory of disease, which holds that many diseases are caused by microorganisms. This theory represents a major milestone in the development of modern medicine and public health, leading to the development of antiseptic techniques and vaccines.

1863 CE: Charles Lyell, in several books, provides evidence 1) that the earth was shaped by the same natural processes still in operation today, 2) for the great age of the human species, and 3) for human evolution from earlier hominid ancestors. His works further challenge traditional religious views of human origins and the timeline of Earth's history.

1869 CE: Dmitri Mendeleev publishes the periodic table of elements, which organizes the known elements based on their atomic weights and chemical properties. This work represents a major milestone in the development of modern chemistry and the understanding some of the basic building blocks of the universe.

1883 CE: The volcano Krakatoa erupts explosively, killing over 36,000 people in the resulting tsunamis and affecting global climate for years afterward. This event demonstrates the immense power of volcanic eruptions and their potential to impact human societies and their resulting beliefs about the world.

1896 CE: Svante Arrhenius publishes the first calculation of global warming from human emissions of carbon dioxide, providing an early warning of the potential impact of human activities on the Earth's climate.

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1897 CE: J.J. Thomson announces the discovery of the electron, the first subatomic particle to be identified. This discovery marks a major milestone in the development of modern physics and the understanding of the structure of the atom.

1905 CE: Albert Einstein publishes his special theory of relativity, which revolutionizes our understanding of space, time, and the relationship between matter and energy. This work represents a major milestone in the development of modern physics and the understanding of the fundamental nature of the universe.

1911 CE: Ernest Rutherford proposes the nuclear model of the atom, which holds that the atom consists of a small, dense, positively charged nucleus surrounded by negatively charged electrons. This model represents a major milestone in the development of modern physics and the understanding of the structure of matter.

1927 CE: Arak Krakatoa, the child of Krakatoa, breaks through the surface of the ocean, proving the repetitive nature of some stratovolcanic growth and self-destruction.

1920s CE: The philosophy of logical positivism emerges, which holds that meaningful statements about the world must be empirically verifiable. This philosophy represents a major challenge to traditional metaphysical and religious views and emphasizes the importance of science and empirical evidence in understanding the nature of reality.

1930s CE: Engineers develop control systems for homeostasis, which use feedback loops to maintain stable conditions in mechanical and electronic systems. These systems provide a powerful analogy for understanding the self-regulating processes that maintain stability in living organisms and ecosystems, without the necessity of a “soul.”

1938 CE: Guy Stewart Callendar publishes a paper linking rising global temperatures to increasing atmospheric carbon dioxide levels, providing further evidence for the potential impact of human activities on the Earth’s climate.

1939 CE: Sigmund Freud publishes *Moses and Monotheism*, which proposes that Moses was an Egyptian

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and that the Jewish concept of God originated from the worship of an Egyptian volcano god. This work represents a provocative attempt to trace the psychological and historical origins of monotheism.

1945 CE: The first atomic bombs are detonated, demonstrating the immense destructive power of nuclear fission and the potential for human technology to impact the world on an unprecedented scale.

1946 CE: The construction of the first electronic general-purpose computer, the ENIAC (Electronic Numerical Integrator and Computer), marks the beginning of the digital age and the rise of information technology as a transformative force in human society and culture.

1948 CE: Norbert Wiener publishes *Cybernetics*, which applies the principles of control systems and homeostasis to the study of living organisms and machines. This work represents a major milestone in the development of systems theory and the understanding of the common principles that govern complex adaptive systems.

1952 CE: James Watson, Francis Crick and Rosalind Franklin discover the double helix structure of DNA, providing a clear mechanism for the storage and transmission of genetic information. This discovery represents a major milestone in the development of modern biology and the understanding of the molecular basis of life.

1950s CE: Gilbert Plass and other scientists use early computer models to study the potential impact of increasing atmospheric carbon dioxide on global climate, providing further evidence for the greenhouse effect and the potential for human activities to alter the Earth's climate.

1956 CE: The Dartmouth Conference on Artificial Intelligence is held, marking the birth of AI as a distinct field of research and the beginning of efforts to create intelligent machines that can perform tasks typically requiring human-like intelligence.

1961 CE: Unitarian Universalism religious communities were formed. Their principles include: “A free and responsible search for truth and meaning,” and its members include atheists, agnostics, deists, and theists. Its

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historical roots include these notable intellectuals: John Quincy Adams, Ralph Waldo Emerson, Susan B. Anthony, and Buckminster Fuller.

1962 CE: Thomas Kuhn publishes *The Structure of Scientific Revolutions*, which argues that science progresses through a series of paradigm shifts rather than a simple accumulation of knowledge. This work represents a major contribution to the philosophy of science and the understanding of the social and historical factors that shape scientific knowledge.

1964 CE: William Hamilton proposes the concept of inclusive fitness, which explains how natural selection can favor the evolution of altruistic behaviors that benefit related individuals. This work represents a major milestone in the spread of evolutionary theory into the social sciences.

1980 CE: “Dark Matter.” Vera Rubin and Kent Ford publish an influential paper suggesting that, due to the speed of rotation of outlying stars, in order to keep the stars from flying off into space, most galaxies must have a large force keeping them constrained, and most physicists have hypothesized “dark matter” within the galaxy as a solution.

1984 CE: The Santa Fe Institute is founded to study complex adaptive systems, which are systems composed of many interacting parts that can adapt and evolve over time. This research helps to unify the study of complexity across fields ranging from physics and biology to economics and social science.

1986 CE: Eric Drexler publishes *Engines of Creation*, which proposes the concept of molecular nanotechnology and explores the potential for engineering at the atomic and molecular scale. This work represents a major milestone in the development of nanotechnology and the understanding of the potential for human technology to manipulate matter at the most fundamental levels.

1988 CE: James Lovelock publishes *The Ages of Gaia*, which proposes that the Earth's biosphere functions as a self-regulating system that maintains conditions suitable for life. This work represents a major contribution to the development of Earth systems science and the understanding of the complex interactions

Timeline

between life and the environment.

1988 CE: The Intergovernmental Panel on Climate Change (IPCC) is established to assess the scientific, technical, and socio-economic information relevant to understanding the risk of human-induced climate change. The IPCC's reports play a crucial role in shaping global climate policy and public understanding of the urgency of the climate crisis.

1990 CE: Richard Dawkins publishes *The Selfish Gene*, which popularizes the gene-centric view of evolution, further challenging religious dogma, and introduces the concept of memes as self-replicating units of cultural information. This work represents a major contribution to evolutionary biology and the understanding of the interplay between genes and culture in shaping human behavior without supernatural causes.

1992 CE: Mott C. Greene publishes *Natural Knowledge in Preclassical Antiquity*, which analyzes the role of volcanic lightning in shaping Greek mythology. This work represents a major contribution to the naturalistic interpretation of mythology.

1997 CE: IBM's Deep Blue becomes the first computer to defeat a world chess champion, Garry Kasparov, in a match. This event marks a major milestone in the development of artificial intelligence and the potential for soulless machines to outperform humans in complex cognitive tasks.

1998 CE: “Dark Energy.” Teams led by Adam Riess, Saul Perlmutter, and Brian Schmidt present evidence suggesting that the universe’s expansion is speeding up instead of slowing down, leading physicists to hypothesize some kind of dark energy to account for this.

2000 CE: The first draft of the human genome is published, marking the completion of the Human Genome Project and ushering in a new era of genomic medicine and biotechnology.

2004 CE: A massive earthquake in the Indian Ocean triggers a series of devastating tsunamis, killing over 227,000 people in 14 countries. This event, which could be interpreted as a modern-day “Judgment Day” or

Timeline

“end of the world” scenario, highlights the potential importance of interpreting ancient myths in naturalistic terms.

2011 CE: IBM's Watson defeats two human champions on the quiz show *Jeopardy!*, further demonstrating the potential for a soulless AI machine to out perform humans on cognitive tasks.

2016 CE: The Paris Agreement on climate change is signed by 195 nations, committing to limit global warming to well below 2°C above pre-industrial levels and to pursue efforts to limit the increase to 1.5°C. This agreement represents a major milestone in global efforts to address the climate crisis and to transition to a sustainable, low-carbon future.

2017 CE: AlphaZero, a chess-playing computer program developed by DeepMind, achieves superhuman performance in chess, Shogi, and Go, through self-play reinforcement learning. This achievement demonstrates the potential for artificial intelligence to master complex domains through self-directed learning and to surpass human performance in a wide range of cognitive tasks without the need for a human “soul.”

2020 CE: The COVID-19 pandemic spreads rapidly around the world, causing widespread illness, death, and social and economic disruption. The pandemic also reveals the critical importance of scientific research and evidence-based decision-making in responding to global health crises.

2022 CE: The James Webb Space Telescope (JWST) begins scientific operations, providing unprecedented views of the early universe, the birth and death of stars, and the potential for life in other solar systems. The JWST represents a major milestone in the development of space-based astronomy and the ongoing quest to understand the origins and evolution of the cosmos.

2023 CE: The artificial intelligence large language model (LLM) designated GPT-4, is released. A milestone highlighting the ability to capture aspects of human language and thinking without a human “soul.”

Appendix C

Psalm 7:13: He has prepared his deadly weapons; he makes ready his flaming arrows.

Psalm 11:5-6: The LORD examines the righteous, but the wicked and those who love violence his soul hates.

On the wicked he will rain fiery coals and burning sulfur; a scorching wind will be their lot.

Psalm 18:46: The LORD lives! Praise be to my Rock!

Psalm 21:9: At the time of your appearing you will make them like a fiery furnace. In his wrath the LORD will swallow them up, and his fire will consume them.

Psalm 29:7: The voice of the LORD strikes with flashes of lightning.

Psalm 29:9-10: And in his temple all cry, "Glory!" The LORD sits enthroned over the flood;

Psalm 30:3 O LORD, you brought me up from the grave; you spared me from going down into the pit.

Psalm 30:9: What gain is there in my destruction, in my going down into the pit.

Psalm 30:5: For his anger lasts only a moment, but his favor lasts a lifetime;

Psalm 30:7: O LORD, when you favored me, you made my mountain stand firm...

Chart of Ancient and Modern Knowledge

Appendix D: Chart of Ancient and Modern Knowledge

Event or Phenomenon	Ancient Knowledge	Modern Knowledge
creation of matter	Volcano God: volcanic islands and volcanic mountains	big bang, quantum fluctuations
creation of life, mankind	Volcano God: volcanic islands and volcanic mountains	deep hot biosphere, test tube life
S p e c i e s	Volcano God (Divine Potter makes man out of clay)	natural selection
creation of structure of matter	fire-earth-air-water, volcanic sulfur, fire-powder, alchemy	118 elements of the periodic table, chemistry
motion of the land	movement of the underground serpent	plate tectonics
G r a n d Unification Theory	fire-water-air-earth, or all things come from fire-light (Ra and Atum)	gravity, radiation, strong nuclear force, weak nuclear force
Breeding	artificial selection of plants (bananas, etc.) and animals (dogs, horses, etc.)	DNA mapping, genetic engineering, cloning, stem cells
the sky	motion of the Gods (planetary and star motion), eclipse prediction	gravity (curved spacetime), quasars, "black holes," relativity, extra-solar planetary discovery
construction	carpentry, cut stone, poured stone	geo-polymerization, carbon fibers, nanomaterials
V a r i o u s invisible forces	sparks, falling-to-earth, lodestone	g r a v i t y w a v e s , e l e c t r o m a g n e t i s m , superconductivity
breathing	connection with spirit, soul, God	intake of oxygen, exhale of carbon dioxide
m o t i o n o f humans	moved by spirit, soul, or God	programmed by DNA and fueled by oxygen and the Sun
human birth	flesh and bones with base material desires, but imbued with spirit or soul by God	atomic and molecular pattern that is programmed by genes for survival in past environments
human death	a return to natural and perfect state of spirit (in the air, in heaven, or in the underworld) or returned to flesh again (reincarnate)	biospheric, atomic, and molecular recycling or cryogenic freezing, etc.
catastrophic destruction	angry Gods punishing humans in a "Judgment Day" event	statistically inevitable volcanoes, earthquakes, and comet/meteor impacts

Chart of Ancient and Modern Knowledge

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Endnotes

ENDNOTES

- ¹ A hominid is a member of the family sometimes known as the Great Apes. This family includes orangutans, gorillas, chimpanzees, bonobos, and us, what I call “the talking apes.” For the purposes of this book, “talking apes” refers to those species in the *Homo* genus that communicated by speech and gesture, possibly starting around 200,000-500,000 years ago.
- ² Katherine Stewart, *The Power Worshipers: Inside the Dangerous Rise of Religious Nationalism*, 2020. Kristin Kobes Du Mez, *Jesus and John Wayne: How White Evangelicals Corrupted a Faith and Fractured a Nation*, 2020. Sarah Posner, *Unholy: Why White Evangelists Worship at the Altar of Donald Trump*, 2020.
- ³ To be fair, on the question of whether modern religion has been beneficial or not for humanity, the problem is incredibly complex. You would need to quantify every act of kindness or harm, large or small, committed by religious people all across the globe and the ripple effects of these acts. This is, of course, an impossible feat for anyone, unless you’re some kind of “God.”
- ⁴ For this idea thanks to: Wilson, David Sloan, *Darwin’s Cathedral*, p. 149. Also note: “Each fact is suggestive in itself, together, they have a cumulative force.” Sherlock Holmes.
- ⁵ For example, see the works of astronomer Ed Krupp.
- ⁶ I should mention that although the Sun does not move around us, it does slowly move round the center of the Milky Way Galaxy along with other stars, but that motion is very slow and not significant for our purposes here. Some super-advanced civilization, thousands of years from now, may have to take that motion into consideration in their language.
- ⁷ Young’s Literal translation, www.biblegateway.com.
- ⁸ Shakir translation, www.hti.umich.edu/k/koran/
- ⁹ One possible exception is some of the early Hindu texts. See the work of Subhash Kak on the Internet. However, these are rare and other interpretations are possible.
- ¹⁰ Quoted in Aczel, 2003, p. 12.
- ¹¹ Ptolemy, *Almagest*, 150 AD. Available in the Great Books series from the University of Chicago Press.
- ¹² Copernicus, Nicolaus, *On the Revolutions of the Heavenly Spheres*, 1543. Available in the Great Books series from University of Chicago Press.
- ¹³ Bruno was not the first. “Cosmic pluralism, the plurality of worlds, or simply pluralism, describes the belief in numerous “worlds” (planets, dwarf planets or natural satellites) in addition to Earth (possibly an infinite number), which may harbour extraterrestrial life.” https://en.wikipedia.org/wiki/Cosmic_pluralism.
- ¹⁴ Galileo, *Dialogue Concerning the Two Chief World Systems*, 1632.
- ¹⁵ Sobel, p. 155.
- ¹⁶ For the next few paragraphs I rely on Aczel, 2003.
- ¹⁷ <http://www-history.mcs.st-andrews.ac.uk/Biographies/Foucault.html>
- ¹⁸ One of these pendulums, a huge weight suspended by a wire from the beautiful mural ceiling far above, slowly swings back and forth at the Griffith Observatory in Los Angeles. It inspired me to think about the Earth and its motion.
- ¹⁹ Aczel, 2003, p. 239.
- ²⁰ http://puffin.creighton.edu/Austerberry/SRP%20420/Galileo_all.html
- ²¹ Fuller, Buckminster, *Critical Path*, St. Martin’s Press, p. 161-197 for Geoscope.
- ²² It is not so easy to maintain this viewpoint, however, when everyone is thinking a different way.
- ²³ www.geocities.com/CollegePark/4110/whorf.html
- ²⁴ https://en.wikipedia.org/wiki/Benjamin_Lee_Whorf
- ²⁵ Steven Pinker in *The Language Instinct* (p. 67) says that linguistic determinism is an “absurdity,” but he fails to convince me that language does not influence thought.
- ²⁶ https://en.wikipedia.org/wiki/Friedrich_Bessel
- ²⁷ See *Critical Path*.
- ²⁸ Some would say that we have been infected with a false meme, and I am trying to disinfect us.
- ²⁹ Galileo, *Dialogues*, p. 347.
- ³⁰ Also, if you are in a city, buildings in the distance appear shorter than they are due to the curvature of the Earth.
- ³¹ Some slight enlargement at the horizon may be due to the additional atmosphere that spreads out the Moon’s light.
- ³² <http://www.griffithobs.org/IPSMoonIllus.html>
- ³³ They were often the first to be present at a new volcanic eruption where they videoed the event up close, often risking their lives in the process. Maurice once said, “I am never afraid because I have seen so many eruptions in 23 years that even if I die tomorrow, I don’t care.” In June of the same year, 1991, in Japan, they went to record the eruption at Mt. Unzen. An unusual pyroclastic flow killed them instantly, along with 41 other people, including firemen and journalists.
- ³⁴ <https://en.wikipedia.org/wiki/Krakatoa>
- ³⁵ <https://www.sciencedaily.com/releases/2009/11/091123142739.htm>.
- ³⁶ A lot my information about Mount Merapi came from the Wikipedia site, https://en.wikipedia.org/wiki/Mount_Merapi#2010_eruption.
- ³⁷ <http://www.orientalarchitecture.com/yogyakarta/prambananindex.htm>
- ³⁸ Alford, Allen, *The Phoenix Solution*, Hodder and Stoughton, London, 1998.
- ³⁹ There was the Pasadena Library, the Glendale Library, and the Santa Monica Library, and the large Los Angeles Library. (Finding inexpensive parking was always a problem, but I somehow managed, using various side streets and a bit of hiking.)
- ⁴⁰ Budge lived from 1857 to 1934 and worked for the British Museum. He went frequently to Egypt to participate in various digs and published many books. I also found a used copy of his *Osiris and the Egyptian Resurrection*, which I still remember fondly. Budge also collected various artifacts for the British Museum. In fact, in his book *By Nile and Tigris*, Budge admits stealing the Papyrus of Ani, a marvelous and colorful 78 foot scroll, from an Egyptian government storeroom, in 1888. It still lies in the British Museum today. He was knighted by the British government for his service to the museum in 1920. I had bought a large folio color copy of this papyrus which I added to my library.
- ⁴¹ <https://www.haaretz.com/archaeology/no-ben-the-pyramids-were-definitely-tombs-not-grain-silos-1.5418013>
- ⁴² For example, Roman historian Ammianus Marcellinus (330-400 CE) wrote: “They exceed in height anything ever constructed by human labour, being towers of vast width at the bottom and ending in sharp points ... And their shape received this name from the geometers because they rise in a cone like fire (πῦρ).” Although I think his reasoning is incorrect, after you finish reading this book, I think you’ll agree that fire is a better origin word than grain.
- ⁴³ Bárta, Miroslav, *Journey to the West: The world of the Old Kingdom tombs in Ancient Egypt*, Charles University in Prague, Faculty of Arts, 2011.

Endnotes

- ⁴⁴ <http://www.gizapyramid.com/mehler-originword.htm>.
- ⁴⁵ https://www.jstor.org/stable/27899432?seq=1#metadata_info_tab_contents.
- ⁴⁶ <https://en.wikipedia.org/wiki/Heaven>.
- ⁴⁷ It is interesting that the ancient Egyptians put the south at the top of their maps. See: https://en.wikipedia.org/wiki/Tabula_Rogeriana.
- ⁴⁸ I happened to meet Johanson at a conference in Pasadena and had him sign a copy of his book.
- ⁴⁹ Larick, Roy, and Ciochon, Russell, "The African Emergence and Early Dispersals of the Genus Homo," *American Scientist*, Vol. 84, No. 6, Nov-Dec 1996.
- ⁵⁰ Fagan, Brian, *Floods, Famines, and Emperors*, 1999, quoted by Calvin at <http://williamcalvin.com/BrainForAllSeasons/Sahara.htm>
- ⁵¹ LaMoreaux, Dr. Phillip E., and Idris, Col Hussein, *The Exodus: Myth, Legend, History*, Word Way Press, Alabama, 1996.
- ⁵² See article by T. H. Druitt on this page: <http://elementsmagazine.org/past-issues/south-aegean-volcanic-arc/> and also: Druitt, T.H., and Francaviglia, V., 1992, "Caldera formation on Santorini and the physiography of the islands in the late Bronze Age," *Bulletin of Volcanology*, v.54, p. 484-493. Also personal communication with author T. H. Druitt in June, 2022.
- ⁵³ as told by Casti, p. 39.
- ⁵⁴ Budge, *The Book of the Dead*, Chapter 146.
- ⁵⁵ Budge, *The Book of the Dead*, Chapter 14.
- ⁵⁶ de Neve, G.A., "Earlier Eruptive Activities of Krakatoa in Historic Time During the Quaternary," in *Symposium on 100 Years Development of Krakatoa and Its Surroundings*, Volume I, LIPA, 1983.
- ⁵⁷ Thornton, Ian, *Krakatoa: The Destruction and Reassembly of an Island Ecosystem*, Harvard University Press, Cambridge, 1996.
- ⁵⁸ Even twins reared together have different experiences. For example, when they play cards together and one wins and the other loses, they have somewhat opposite experiences.
- ⁵⁹ Clark, p. 37.
- ⁶⁰ Budge, *The Book of the Dead*, Chapter 93.
- ⁶¹ Chapter 17, from http://www.sas.upenn.edu/African_Studies/Books/Papyrus_Ani.html
- ⁶² Clark, p. 56.
- ⁶³ Wasserman, Chapter 151.
- ⁶⁴ Wasserman, Chapter 110.
- ⁶⁵ Wasserman, *The Theban Recension*, p.122.
- ⁶⁶ Budge, *Book of the Dead*, Chapter 156.
- ⁶⁷ Mercer, Samuel A.B., *The Pyramid Texts*, Longmans, Green and Co., NY, 1952.
- ⁶⁸ Budge, *Osiris and the Egyptian Resurrection*. Vol. 1, p. 1
- ⁶⁹ *Man, Myth and Magic*, Osiris, vol. 5, pp. 2087–2088, S.G.F. Brandon, BPC Publishing, 1971, via Wikipedia: https://en.wikipedia.org/wiki/Osiris#cite_note-13
- ⁷⁰ Wasserman, Plate 2.
- ⁷¹ Budge, *The Book of the Dead*, Chapter 1.
- ⁷² Wasserman, Plate 6.
- ⁷³ Wasserman, Plate 11.
- ⁷⁴ Wasserman, p.106.
- ⁷⁵ Wasserman, Plate 33.
- ⁷⁶ Wasserman, p. 111.
- ⁷⁷ https://en.wikipedia.org/wiki/Mount_Nyiragongo
- ⁷⁸ From Volcanic World web site: http://volcano.und.nodak.edu/vwdocs/volc_images/img_erta_ale.html
"Erta Ale is a shield volcano in the Afar region of East Africa. Erta Ale is a remote and rarely visited volcano that is known currently to have an active lava lake in its summit crater. Erta Ale has undergone seven eruption events in the past 125 years. Three of the early eruption dates, 1873, 1903, and 1904 are uncertain. However, 1906, 1940, 1960, and 1967 are well established events. Erta Ale has been erupting continuously since 1967. Two new studies on Erta Ale have recently been published. Oppenheimer and Francis (1998) looked at the implications of long-lived lava lakes. They believe that Erta Ale's lava lake has been active for at least the last 90 years (making it one of the longest known historic eruptions)."
- ⁷⁹ Wasserman, Chapter 24, Plate 15.
- ⁸⁰ Budge, *The Book of the Dead*, Chap. 175.
- ⁸¹ There are many images of volcanic turquoise lakes on the Internet.
- ⁸² https://en.wikipedia.org/wiki/Lake_Victoria
- ⁸³ There are images of these are the Internet.
- ⁸⁴ Budge, *The Book of the Dead*, Chapter 151.
- ⁸⁵ <http://www.thekeep.org/~kunoichi/kunoichi/themestream/wadjet.html>
- ⁸⁶ <https://www.ancient.eu/Apophis/>.
- ⁸⁷ https://www.youtube.com/watch?v=W_Va7wY5BGU
- ⁸⁸ Greene, p. 62.
- ⁸⁹ From Volcanic World website: Gilbert, J.S., and Lane, S. J., 1994, Electrical phenomena in volcanic plumes, in Casadevall, T.J., ed., *Volcanic ash and aviation safety: Proceedings of the first International Symposium on Volcanic Ash and Aviation Safety*: U.S. Geological Survey Professional paper 2047, p. 31-38.
- ⁹⁰ From Volcano World website: It has also been suggested that the charge is generated as the particles formed by fragmentation, not by collisions in the plume. Gilbert, J.S., and Lane, S. J., 1994, Electrical phenomena in volcanic plumes, in Casadevall, T.J., ed., *Volcanic ash and aviation safety: Proceedings of the first International Symposium on Volcanic Ash and Aviation Safety*: U.S. Geological Survey Professional paper 2047, p. 31-38.
- ⁹¹ Greene, p.63.
- ⁹² Greene, p. 61-62.
- ⁹³ Greene, p.63
- ⁹⁴ Mercer, p. 29.
- ⁹⁵ Budge, *Osiris and the Egyptian Resurrection*, Vol. 1, p.2
- ⁹⁶ Chapter 39, quoted by Clark, p. 211.
- ⁹⁷ Wasserman, Plate 14.

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- ⁹⁸ Wasserman, p. 113.
- ⁹⁹ Wasserman, p. 113
- ¹⁰⁰ Thornton, p. 28-39.
- ¹⁰¹ Greene, p. 60.
- ¹⁰² Clark, p. 21.
- ¹⁰³ Lichtheim, *Ancient Egyptian Literature*, Vol. II, p. 215. Quoted by Sellers, p. 58.
- ¹⁰⁴ Coffin Texts III, 343, quoted by Clark, p. 225.
- ¹⁰⁵ quoted by Budge, *Osiris and the Egyptian Resurrection*, Vol. I, p. 62.
- ¹⁰⁶ Budge, *The Book of the Dead*, Chapter 17.
- ¹⁰⁷ Budge, *Osiris and the Egyptian Resurrection*, Vol. I, p. 86.
- ¹⁰⁸ Budge, *Osiris and the Egyptian Resurrection*, Vol. I, p. 88
- ¹⁰⁹ Budge, *Osiris and the Egyptian Resurrection*, Vol. I, p. 71.
- ¹¹⁰ Wasserman, p. 134.
- ¹¹¹ Vitaliano, p. 164.
- ¹¹² Wasserman, p. 162.
- ¹¹³ Wasserman, Plate 12-14.
- ¹¹⁴ Sellers, Jane, *The Death of God in Ancient Egypt: An Essay on Egyptian Religion & the Frame of Time*, Penguin, 1992.
- ¹¹⁵ There is a long discussion of this on Wikipedia: <https://en.wikipedia.org/wiki/Narmer>
- ¹¹⁶ Random House Webster's Unabridged Dictionary, 1999
- ¹¹⁷ <http://www.swagga.com/ankh.htm>
- ¹¹⁸ Greene, p. 57.
- ¹¹⁹ The Stromboli volcano in Italy had periodic eruptions which would make it a good candidate for study by early humans. The word strombolian has come to describe a volcano that has frequent, moderate eruptions.
- ¹²⁰ Godwin, 1990, p. 24.
- ¹²¹ Krafft, p. 11.
- ¹²² New International Version available at: www.biblegateway.com
- ¹²³ New International Version available at: www.biblegateway.com
- ¹²⁴ www.biblegateway.com
- ¹²⁵ New International Version available at: www.biblegateway.com
- ¹²⁶ Fuller, 1981, p. 21.
- ¹²⁷ Although Freud has been criticized frequently in the last few decades, I predict that 500 years from now his books will still be read, while his critics will be long forgotten. Freud is certainly wrong in a number of instances, but such "pioneers" cannot be expected to achieve the same level of rigorousness as the later "settlers." In fact, it is these settlers that are expected to provide the rigor. The pioneers get the arrows, the settlers get the land.
- ¹²⁸ Freud, 1939, p. 39
- ¹²⁹ "[Sulfur] was also mentioned in Bible, by the termed 'brimstone,' which means 'burning sulfur.' Sulfur was known for its bactericidal activity in Egypt and Greece and was used for fumigation and in medicines and ointments." <https://periodic-table.com/sulfur/>
- ¹³⁰ "Jesus was a Buddhist Monk" BBC documentary: https://youtu.be/15m5ZL9eWQ?si=RZzdAC9eOAO_2bye. Contrary to that: Klafkowski, P. *From Russia with love. Nicolas Notovitch, Nicholas Roerich, and the myth of Jesus in India*. Studia Rossica Gedanensia, 5/2018. P. 335-362. Also see: Rice, B. N. "The Apocryphal Tale of Jesus' Journey to India: Nicolas Notovitch and the Life of Saint Issa Revisited," in *Fakes, Forgeries, and Fictions: Writing Ancient and Modern Christian Apocrypha: Proceedings from the 2015 York University Christian Apocrypha Symposium*. Edited by Tony Burke. Eugene, OR: Cascade, 2017. P. 265-284. Also, Fader, H. Louis, *The Issa Tale That Will Not Die, Nicholas Notovitch and His Fraudulent Gospel*, University Press Of America, 2003.
- ¹³¹ See Wikipedia, "The Historicity of Jesus."
- ¹³² <https://www.worldhistory.org/article/225/enuma-elish---the-babylonian-epic-of-creation---fu/>
- ¹³³ Do an Internet search. Many news sites reported this.
- ¹³⁴ Greene, p. 56.
- ¹³⁵ <http://volcanoes.usgs.gov/Hazards/Effects/Ash+Aircraft.html>
- ¹³⁶ quoted by Richard Thompson in *Alien Identities*, p. 265.
- ¹³⁷ summary by Dr. C. S. Shah, <http://www.geocities.com/neovedanta/ramayana23.html>
- ¹³⁸ for the next several paragraphs I rely on this book. *Mythology*, ed. by Cavendish, p. 17-19.
- ¹³⁹ <http://www.sacred-texts.com/hin/rigveda/rv09018.htm>
- ¹⁴⁰ <http://www.sacred-texts.com/hin/rigveda/rv09019.htm>
- ¹⁴¹ <http://www.sacred-texts.com/hin/rigveda/rv09018.htm>
- ¹⁴² Random House Dictionary
- ¹⁴³ <http://www.jyh.dk/indengl.htm#Mandala>
- ¹⁴⁴ I learned several additional things from this book including naturalistic explanations for the Arthurian sword legend, vampires, dwarfs, cattle mutilations, and the Centaur. Also, they give several mythology principles which are quite useful in studying mythology.
- ¹⁴⁵ I have seen this throughout Asia and in the Natural History museum and the Southwestern Museum in Los Angeles.
- ¹⁴⁶ <https://www.britannica.com/topic/Tezcatlipoca>
- ¹⁴⁷ <https://pages.ucsd.edu/~dkjordan/nahuatl/ReadingQuetzalcoatl.html>
- ¹⁴⁸ Sahagún, Bernardino de (1950). *Florentine Codex: General History of the Things of New Spain*. Santa Fe, New Mexico. Book 1, Ch. 5.
- ¹⁴⁹ <https://www.dictionary.com/browse/tezcatlipoca>.
- ¹⁵⁰ Knab, Timothy J. (2004). *The Dialogue of Earth and Sky: Dreams, Souls, Curing and the Modern Aztec Underworld*. Tucson: University of Arizona Press
- ¹⁵¹ Read, Kay Almere; Jason González (2000). *Handbook of Mesoamerican Mythology*. Oxford

Endnotes

- ¹⁵² In China, although I was quite busy with teaching and trying to survive in a foreign country that I knew little about, I tried to give a talk at the city library about my first book. I thought China might embrace a book that attempted to deconstruct religion. The librarian turned me down. So I figured it was because I had the word “God” in the title of the book and they thought I would be trying to promote religion, so I said my talk would be about mythology, and that I was not promoting religion. They turned me down again, saying that the people would not understand my lecture. So I assured them that I could make it easy to understand, but again I was turned down. Looking back on it, perhaps it was because religion is such a sensitive topic in China. They might have thought I could anger some people and cause an incident. In fact, shortly after this, in March, 2014, at a railway station in Kunming, China, a bomb killed 31 and injured 140. However, Islamic separatists on the far side of the country did this, and I didn’t think I would be attacked here on the East Coast of China, so I think the librarian was being overly cautious or maybe he or she really thought people could not understand me.
- ¹⁵³ *Mythology*, ed. by Cavendish, p. 59.
- ¹⁵⁴ <http://www.survive2012.com/dragons4.html#15>
- ¹⁵⁵ *Parabola*, “Repaying Hun-tun’s Kindness” Chinese, retold by Rama Devagupta,” Fall 2003
- ¹⁵⁶ https://en.wikipedia.org/wiki/N%C3%BCwa_Mends_the_Heavens
- ¹⁵⁷ Wang Xiaolian, 1987, quoted in *Handbook of Chinese Mythology*, Lihui Yang, Deming An, and Jessica Anderson Turner, Oxford University Press, 2008.
- ¹⁵⁸ In this section I rely on: <https://new.artsmia.org/teaching-the-arts/japanese-tiger-and-dragon/the-tiger-and-dragon-are-ancient-symbols-of-yin-and-yang-forces-that-combine-to-make-up-the-universe/> Also, various wikipedia entries.
- ¹⁵⁹ Hainan is considered the Hawaii of China. Since it’s the southernmost point in China they have built a spaceport there. There are signs up for a “visitors center,” but when I tried to find it, I discovered it hadn’t been finished yet. Apparently in China, at least when I was there, you can camp anywhere you can find open ground. One time I met some college students who were on a bike trip, and I followed them onto a middle school playground where we pitched our tents on the concrete. Most of the time I camped on the beach at a famous surfing location.
- ¹⁶⁰ When I expressed concern about the large number of deaths from this quake to one of my Chinese friends, he replied, “Why, that’s just a village.”
- ¹⁶¹ https://en.wikipedia.org/wiki/Wufang_Shangdi
- ¹⁶² I saw the Hollywood movie *Thor: Ragnarok*, and I confess I enjoyed it even though it grossly perverted the original story—which was based on natural phenomena—into something which was merely entertaining. I wish moviemakers around the world would entertain us without exploiting these ancient stories.
- ¹⁶³ *The World of Myth*, David Adams Leeming, p. 86-87
- ¹⁶⁴ de Santillana, Giorgio, and von Dechend, Hertha, *Hamlet’s Mill*, p. 161.
- ¹⁶⁵ Greene, p.65.
- ¹⁶⁶ quoted by Greene, p. 68.
- ¹⁶⁷ quoted by Greene, p. 70.
- ¹⁶⁸ quoted by Greene, p. 70.
- ¹⁶⁹ Greene, p. 70-71.
- ¹⁷⁰ <http://www.bulfinch.org/fables/bull2.html>
- ¹⁷¹ <http://oaks.nvg.org/oma.html#a32>
- ¹⁷² <http://www.in2greece.com/english/historymyth/mythology/names/chimera.htm>
- ¹⁷³ <http://www.usd.edu/erp/Lycia/lycplace.html>
- ¹⁷⁴ <https://en.wikipedia.org/wiki/Bellerophon>
- ¹⁷⁵ https://en.wikipedia.org/wiki/Jesus_in_comparative_mythology#Iconography.
- ¹⁷⁶ excerpted from *Meteorites in History* by John G. Burke (University of California Press, 1986), at <http://www.alaska.net/~meteor/legend.htm>
- ¹⁷⁷ <http://www.wright-house.com/religions/islam/Quran/99-earthquake.php>
- ¹⁷⁸ Oppenheimer, p. 320-321.
- ¹⁷⁹ Oppenheimer, p. 322.
- ¹⁸⁰ quoted in Oppenheimer, p. 329, from Van Over, Raymond, *Sun Songs*, p. 137.
- ¹⁸¹ Greene, p. 72.
- ¹⁸² Anthropologist and structuralist Claude Lévi-Strauss gave the term *mytheme* widespread usage. See <https://en.wikipedia.org/wiki/Mytheme>.
- ¹⁸³ <http://planetary.org/html/news/articlearchive/headlines/2003/neoworkshop.html>
- ¹⁸⁴ http://www.noao.edu/meetings/mitigation/media/workshop_report.doc
- ¹⁸⁵ http://www.geology.sdsu.edu/how_volcanoes_work/Pelee.html
- ¹⁸⁶ https://en.wikipedia.org/wiki/Ludger_Sylbaris
- ¹⁸⁷ http://www.geology.sdsu.edu/how_volcanoes_work/Pelee.html
- ¹⁸⁸ Keys, p. 277. He adds: “A major caldera eruption could quite easily disrupt climate to such an extent that hundreds of millions of people would die...political administration would rapidly disintegrate in many areas. Banditry would increase, huge refugee flows would develop, epidemics would break out, and the medical infrastructure would be totally overwhelmed. Cholera, measles, typhus, and dysentery epidemics would occur on a massive scale...the bubonic plague could again devastate substantial areas.”
- ¹⁸⁹ Of course, there is also the threat of global warming. When I first started writing this book, many years ago, global warming wasn’t as accepted as it is today.
- ¹⁹⁰ <https://www.scientificamerican.com/article/earths-tectonic-activity-may-be-crucial-for-life-and-rare-in-our-galaxy/>
- ¹⁹¹ https://en.wikipedia.org/wiki/Aquatic_ape_hypothesis
- ¹⁹² *New Scientist*, 17 March 1960. “My thesis is that a branch of this primitive ape-stock was forced by competition from life in the trees to feed on the sea-shores and to hunt for food, shellfish, sea-urchins etc., in the shallow waters off the coast.”
- ¹⁹³ *Darwin’s Dangerous Idea*, page 244.
- ¹⁹⁴ See also: Stephen Cunnane and Kathlyn Stewart, editors, *Human Brain Evolution: The Influence of Freshwater and Marine Food Resources*, Wiley-Blackwell, 2010. See also: M. Verhaegen & S. Munro 2004 “Possible preadaptations to speech – a preliminary comparative approach” *Human Evolution*, 19:53-70.
- ¹⁹⁵ Leinani Melville, author of *Children of the Rainbow*, Quest, 1969.
- ¹⁹⁶ <https://www.geopolymer.org/archaeology/pyramids/>
- ¹⁹⁷ <https://www.livescience.com/1554-surprising-truth-great-pyramids-built.html>
- ¹⁹⁸ https://en.wikipedia.org/wiki/Chinese_alchemical_elixir_poisoning.
- ¹⁹⁹ https://en.wikipedia.org/wiki/Grasberg_mine.
- ²⁰⁰ See the video, *Ring of Fire: East of Krakatoa*.

Endnotes

- 201 This is sometimes called the "rational theory" of myth.
- 202 For example, the 1997 eruption of Popocatepetl, or Smoking Mountain, very near Mexico City.
- 203 Although modern interpretations might place them in a "different dimension."
- 204 *Random House Dictionary of the English Language*, print edition.
- 205 Bower, B., "Human Origins Recede in Australia," *Science News*, Vol. 150, Sept. 28, 1996.
- 206 See the book *The Invention of Air: A Story Of Science, Faith, Revolution, And The Birth Of America* for a full version of this remarkable man and his impact on the establishment of the USA.
- 207 <https://www.beautifulchemistry.net/lavoisier>.
- 208 see <http://www.swil.ocdsb.edu.on.ca/FreRev/lavois.html> and also, <http://www.woodrow.org/teachers/ci/1992/Lavoisier.html>
- 209 see <http://www.swil.ocdsb.edu.on.ca/FreRev/lavois.html>
- 210 <http://www.brainyencyclopedia.com/encyclopedia/c/cr/cremation.html>
- 211 https://en.wikipedia.org/wiki/Crystal_healing.
- 212 https://web.archive.org/web/20210922032038/https://lithicsireland.ie/phd_quartz_lithic_technology_chap_3.html
- 213 The piezoelectric effect was discovered by French physicists Jacques and Pierre Curie in 1880.
- 214 Freud, 1939, p. 146.
- 215 "Oxygen," Wikipedia. Retrieved from <http://en.wikipedia.org/wiki/Oxygen>.
- 216 Bodanis, p. 30.
- 217 There are some exotic states of matter, and there is also something called "dark matter," which we don't understand yet.
- 218 Although these atoms and molecules are too small to be seen, I read somewhere that if you cup your hand over your ear, you are hearing billions of molecules hitting your eardrum, but I can't find the reference, so it may not be true.
- 219 When I arrived in China in 2010 you could buy fake money and burn it so that your ancestors would have use of it. As an experiment I tried this a few times. Nowadays, the Chinese government discourages this practice because of air quality concerns. But you can still burn virtual money online.
- 220 *Sociobiology: The New Synthesis*, p. 561
- 221 www.workreference.com
- 222 <http://www.wmich.edu/dialogues/themes/indianwords.htm>
- 223 <http://www.wmich.edu/dialogues/themes/indianwords.htm>
- 224 I have also practice Buddha meditation, but only as a secular practice to give me greater peace of mind not to achieve total enlightenment.
- 225 <http://www.clas.ufl.edu/users/gthursby/taoism/ttstan3.htm#13> A Translation by Stan Rosenthal.
- 226 http://www.chemeng.ucl.ac.uk/research/combustion/nl2003_1/nl03_110.html
- 227 <http://www.tenspeedpress.com/whatsnew/page.php3?fr=126>
- 228 http://holisticonline.com/Reiki/hol_Reiki_home.htm
- 229 Prana-Vyana-Samana-Apana-Udana, from *The Mahabharata*, Santi Parva Section CLXXXIV at: <http://www.hinduism.co.za/prana-vy.htm>
- 230 www.hyperdictionary.com
- 231 <http://uwacadweb.uwo.edu/religionet/er/hinduism/HGLOSSRY.HTM>
- 232 In the case of "psyche" and "pneuma," the initial "p" sound (and the "ps" and "pn" clusters) could be seen as phonesthemes, a sound sequence which suggest a certain meaning, in this case related to breath or exhalation, which aligns with their meanings involving spirit, breath, or life force.
- 233 <http://classics.mit.edu/Plato/timaeus.html>
- 234 http://www.hellenism.net/eng/soul_literature.htm
- 235 *Random House Dictionary of the English Language*.
- 236 Davidovits, glossary.
- 237 Clark, p. 232-233.
- 238 *Ptahhotep*, ed. Devaud, 1.135ff. as quoted in Clark p. 231.
- 239 *Ptahhotep*, ed. Devaud, 1.135ff. as quoted in Clark p. 232.
- 240 Quoted in Budge, 1960, p. 74.
- 241 Budge, 1960, p. 73.
- 242 Budge, 1960, p. 76.
- 243 *Random House Dictionary of the English Language*.
- 244 Crick, 1994, p. 3
- 245 To find life like ours on extrasolar planets, planets that do not orbit the Home Star, we can use oxygen in the atmosphere as a marker. James Lovelock pioneered this method when looking for life on Mars. He told NASA we didn't need to go there because of the atmospheric composition of Mars. In the future, 20-60 years, we may discover life near other stars using this method.
- 246 "The Rise of Oxygen," by Lee J. Siegal, *Astrobiology Magazine*, at: <http://www.astrobio.net/news/article541.html>
- 247 "The Rise of Oxygen," by Lee J. Siegal, *Astrobiology Magazine*, at: <http://www.astrobio.net/news/article541.html>
- 248 Marsh and Crawford, p. 67.
- 249 Marsh and Crawford, p. 68.
- 250 *Random House Dictionary of the English Language*.
- 251 <https://en.wikipedia.org/wiki/Trailokya> In Buddhism, Kāmaloka is the world of desire, Rūpaloka is the world of form, Arūpaloka is the world of formlessness. In other words, we have the heat and passion of the underworld, the physical world of static objects, and the formless world of air and oxygen.
- 252 Unless you are cryogenically preserved.
- 253 Galileo's daughter, a nun, after hearing of his imprisonment said, "... you, by virtue of your vast experience, can lay claim to full cognizance of the fallacy and instability of everything in this miserable world ..." *Galileo's Daughter: A Historical Memoir of Science, Faith and Love* by Dava Sobel.
- 254 The poem by Shelley, "Ozymandias of Egypt," comes to mind with the poignant line, "My name is Ozymandias, king of kings: Look on my works, ye mighty, and despair!"
- 255 Such as the large asteroid that caused the extinction of the dinosaurs or the large body that crashed into Earth resulting in the formation of our Pacific ocean and our Moon.
- 256 Furhman, 1995.

Endnotes

- ²⁵⁷ The “Father, Son, and Holy Spirit” of Catholicism were probably originally: 1) the volcano (such as Osiris), 2) the volcano resurrected (such as Horus), and 3) atmospheric oxygen.
- ²⁵⁸ Korzybski, *Science and Sanity*.
- ²⁵⁹ A philosophy closely related is “logical positivism.” A central tenet is that metaphysical, theological, and ethical sentences are “cognitively meaningless.”
- ²⁶⁰ quote from p. 39 in: Schumann, H. W., *The Historical Buddha*, Buddhist Tradition Series, English edition 2016, First German edition, 1982. Also see Chattopadhyaya, Debiprasad (1959) *Lokayata: A Study of Ancient Indian Materialism*. New Delhi: People's Publishing House.
- ²⁶¹ The word “naturalism” doesn’t have as much negative connotation.
- ²⁶² Wilhelm Ostwald, 1853-1932, a famous chemist and acquaintance of Einstein, may have also thought this same way.
- ²⁶³ Feynman, *Six Easy Pieces*, p. 4.
- ²⁶⁴ <https://www.discovermagazine.com/planet-earth/how-we-know-ancient-humans-believed-in-the-afterlife>.
- ²⁶⁵ Since we were working mostly in the design of cockpits, we often called it “knobs and dials.”
- ²⁶⁶ For example: Alfred Korzybski and his seminal work “Science and Sanity: An Introduction to Non-Aristotelian Systems and General Semantics” (1933) which is about 800 pages long.
- ²⁶⁷ Particularly in Stevan Harnad’s work.
- ²⁶⁸ Dimensions are Abstractions:
All things in the universe exist, in what we might call “unified field” or “interconnected web of all existence.” It’s probably more accurate, and more complex, to call it zero-dimensional (0-D) or infinite-dimensional ∞ -D, but it’s useful to separate it into abstract parts in which we can see patterns and made predictions. I will explain this in more detail below.
Some reputable mathematicians and physicists talk about the existence of unknown and unseen “dimensions.” For example, in his book, *A Brief History of Time*, Steven Hawking mentions the possibility of ten and even twenty-six dimensions.
Why don’t we notice all these extra dimensions, if they are really there? Why do we only see three space and one time dimension? The suggestion is that the other dimensions are curved up into a space of very small size, something like a million million million millionth of an inch. This is so small that we just don’t notice it; we see only one time and three space dimensions ...
Certainly quantum reality appears strange to our Paleolithic minds, but we can explore dimension from our reality. Dimension gets meaning from ratios. Imagine a piece of paper. Most people would say this piece of paper is two dimensional, having a width of 8 1/2 inches in a length of 11 inches. But its thickness is actually about 0.009 inches. If you increased the thickness of the paper by another sheet of paper, and then another sheet of paper, etc., at some point people would say that resulting object is three-dimensional. At what thickness? Their answers would probably be clustered around a particular, rather extreme ratio. If you take the original shield paper and cut it in half, and then cut those pieces in half, and cut those pieces in half, etc., at some point people would say you had two, one-dimensional lines. After which cut? Their answers would probably be clustered around a particular, rather extreme ratio. Then, if you take that one dimensional slice of paper and cut it in half, and then cut it in half again, and then cut it in half again, etc., at some point people would say you had two, zero-dimensional points. After which cut? Their answers would probably be clustered around a particular, rather extreme ratio. The extreme ratios nudge us towards a practical mental condensation (or summarization) of the object. We think (unconsciously): when one dimension becomes seemingly insignificant, (but not zero) why not eliminate it?
Likewise, time, space, energy, and matter are convenient abstractions. None of these things can exist without the others, but, again, it's useful to break apart the unified field into parts so we can look for patterns and make predictions.
We could also define dimensional threshold ratios. These would be ratios at which the average person, 50% of the time, would increase the dimensions from 0 to 1, or 1 to 2, or 2 to 3, or reduce the dimensions from 3 to 2, or 2 to 1, or 1 to 0. So, dimension is a psychological question having to do with the function of the mind. “Dimension” is an abstraction of space, which is an abstraction of reality (reality > space > dimension). Our minds use 1-D, 2-D, 3-D to simplify the universe around us.
Our minds' ability to compress the dimensionality of objects a powerful example of how abstraction can enhance the usability of our cognitive representations. By reducing the complexity of the raw sensory data we encounter, this process of dimensional abstraction allows us to form more compact, efficient mental models of the world, which in turn enables us to navigate our environment more effectively. This is also why we create stereotypes, which can be useful or harmful.
- ²⁶⁹ However, unlike speech, reading and writing are not natural to humans. Leave children alone in a village and they will learn to speak, but they will not learn to read on their own. Our eyes and brain were selected to scan the horizon for predators, prey and potential mates, and to speak about them, not stare at tiny marks on a page for hours, and to write about them. Hence, every time a culture obtains literacy, the need for eyeglasses also goes up.
- ²⁷⁰ I have recently experienced this firsthand: my Facebook account, with about 4,500 friends and thousands of followers, was hacked, and I have spent over 100 hours trying to recover it, as Facebook has no live support. The Facebook algorithm requires me to login to the hacker’s Instagram account in order to recover it!
- ²⁷¹ I think it's likely that just as many people rise through these cracks as people who fall through these cracks.
- ²⁷² It's possible that a Blockchain or quantum computing could help to mitigate some of these injustices.
- ²⁷³ Kenneth Arrow won the Nobel Prize for proving that a ranked choice voting system had limitations. Towards the end of his life, Kenneth Arrow agreed that rated voting systems, particularly approval voting, were likely the best method for elections. Approval voting allows voters to express support for multiple candidates, potentially increasing voter turnout, decreasing negative campaigning, and preventing the spoiler effect.
- ²⁷⁴ I am aware that pure mathematics, such as imaginary numbers, have later been found to have practical applications.
- ²⁷⁵ Thornton, Stephen, "Karl Popper", *The Stanford Encyclopedia of Philosophy (Winter 2002 Edition)*, Edward N. Zalta (ed.), <http://plato.stanford.edu/archives/win2002/entries/popper/>.
- ²⁷⁶ During a total solar eclipse in 1919, Arthur Eddington and his team observed the positions of stars near the Sun. They found that the light from these stars was bent more than predicted by Newtonian gravity.
- ²⁷⁷ Stanford Encyclopedia of Philosophy, Stanford University, available on-line.
- ²⁷⁸ The Usability Equation is similar to what is known in computer science as “Kolmogorov Complexity.” Andrey Kolmogorov (1903-1987) was a Russian mathematical genius, and he made many major contributions in mathematics besides Kolmogorov Complexity. Kolmogorov said that the complexity of an object (for example a string of text characters) is determined by the smallest computational resources needed to output that object. For example, it is easy to write a program to output this string of characters: abcabcabcabcabcabcabcabcabcabcabcabcabcabcabc. It’s more complex to write a program to output this sequence: abc1abc2abc5abc14abc41abc122. According to Kolmogorov Complexity (Kc) the second string of characters is more complex. Computer scientists want to find algorithms with the least complexity because of limited computational resources. Another example: abc repeated 2 times. But it could also be written: abc repeated 10 times. In computer science, this last way saves computational resources. In terms of the Usability Equation, the second abstraction is more concise and hence has greater usability. So Kolmogorov Complexity attempts to measure the complexity of the object whereas the Usability Equation attempts to measure the usability of knowledge. Kolmogorov Complexity is merely the inverse of Conciseness. $Kc = 1/C$. We could say that usability equals accuracy divided by Kolmogorov complexity. ($U = A / Kc$) or we could say that Kolmogorov Complexity equals accuracy divided by usability. ($Kc = A/U$).
- ²⁷⁹ There are web sites devoted to fighter pilot slang.

Endnotes

- 280 <http://earth360.com/K2.pdf>
- 281 Although Strauss suggests otherwise: <https://www.theatlantic.com/business/archive/2016/02/barter-society-myth/471051/>
- 282 The coin represented the relative value of that flour. Relative value is an abstraction that is based on supply and human demand (to eat). If 1 sheep equals 20 kilos of flour, we can arbitrarily agree to assign 1 unit of money to equal 1 kilo of flour. From most concrete to most abstract we have the very real Supply and the Human Demand, to the Relative Value of Things, to Money.
- 283 <https://www.bigissue.com/culture/books/yuval-noah-harari-we-are-living-inside-the-dreams-of-dead-people/>
- 284 I was accepted at every school I applied to: Yale, Stanford, USC, US Air Force Academy.
- 285 My classmate at the AFA (in the psych department) and at Purdue (also in the psych department) was Captain Sully Sullenberger.
- 286 I was also ordained as a Scientology minister for the state of California.
- 287 <http://www.openculture.com/2018/06/how-william-s-burroughs-embraced-then-rejected-scientology.html>
- 288 In 1983, Marijuana usage was not as socially acceptable as it is today.
- 289 Of course this would mean they would be motivated and not be overwhelmed by the material.
- 290 Since “criterion” was a key word in my education, Hubbard called this a “crashing misunderstood word” because it caused one to crash, and it did cause me to crash.
- 291 https://en.wikipedia.org/wiki/Visual_calculus
- 292 I was there during the 1992 Los Angeles Uprising.
- 293 This nomenclature was praised by cognitive psychologist Elizabeth Loftus.
- 294 When I was teaching at an elite university in China I did the same pencil test on them. The number who got it right went from 5% to about 65%. Of course, it was not a fair comparison. If I did the same test with Ivy League students it would be a fair comparison.
- 295 Psychologists would call the “affective valence,” “affect” here meaning emotion, as our emotions certainly affect us and valence meaning the strength of something. See for example: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4743948/>
- 296 In 1988, James Randi went to Australia with his partner Carlos where they teamed up with the TV show 60 Minutes and pretended that Carlos was a psychic to see if they could for the media and the public.
- 297 Culver City is the home of Sony Pictures, so I think this school district is especially appreciative of creative storytelling.
- 298 Several years later I developed colored versions of the numbers for digital use. <http://earth360.com/math-naturesnumbers.html>.
- 299 Galileo, *Dialog Concerning the Two New Sciences*.
- 300 Boyer, p. 326.
- 301 See www.randi.org.
- 302 I've heard it said that recently we are selecting for young men who can drive successfully when drunk.
- 303 The Roman phrase used frequently by Cicero. Today we say “Follow the money,” popularized in the movie “All the Presidents Men.”
- 304 PubMed® comprises more than 34 million citations for biomedical literature from MEDLINE, life science journals, and online books. <https://pubmed.ncbi.nlm.nih.gov/>
- 305 Shermer, 2004, p. 23.
- 306 <https://www.christies.com/lotfinder/books-manuscripts/einstein-albert-autograph-letter-signed-a-6167096-details.aspx?from=salesummary&intobjectid=6167096>.
- 307 Isaacson, Walter (2008). *Einstein: His Life and Universe*. New York: Simon and Schuster, pp. 388-389.
- 308 Holton, G. J. and Yehuda Elkana (1997). *Albert Einstein: Historical and Cultural Perspectives*. New York: Dover Publications, p. 309.
- 309 <https://bigthink.com/hard-science/did-einstein-pray-what-the-great-genius-thought-about-god/>
- 310 <https://books.google.com/books?id=58HQXMP1ESwC&pg=PA97#v=onepage&q&f=false>
- 311 https://i.dailymail.co.uk/i/pix/2015/06/11/11/6ZCNTH5HT-HSK1-3119437-For_sale_This_undated_image_provided_by_Profiles_in_History_show-m-1_1434020122921.jpg.
- 312 G. S. Viereck, *Glimpses of the Great* (Macauley, New York, 1930) p. 372-373.
- 313 Scholars debate what Spinoza actually meant by the word “God,” but agree it wasn't the traditional meaning. See more at his Wikipedia page: https://en.wikipedia.org/wiki/Baruch_Spinoza.
- 314 Sagan, Dorion, *Dazzle Gradually: Reflections on the Nature of Nature*, 2007, p 14.
- 315 A philosophy closely related to what I have been discussing is what's known as “logical positivism.” A central tenet of logical positivism is that metaphysical, theological, and ethical sentences are “cognitively meaningless.”
- 316 Also, some scientists have claimed that the universe is basically information and this has come to be known as “digital physics” or “digital philosophy.” <https://robertwright.com/universe-just-happen/>
- 317 I read about this in Dianetics, by Hubbard, and I also read about in a book by Robert Heinlein, who was an acquaintance of Hubbard.
- 318 This model has implication for what is called “multilevel selection.” This is the possibility that nature selects at more levels than just the gene level. In his book, *Darwin's Cathedral*, David Sloan Wilson discusses religion as multilevel selection, and I refer you there for a fuller treatment. Also in E-Skeptic #26 for July 5, 2004, Ernst Mayr says, “George Williams and Richard Dawkins have made a mistake, in my opinion, in completely rejecting group selection.”
- 319 A “higher power” for an individual could be defined as any or all more comprehensive spheres, such as the family, community, species, the biosphere which would including powerful tornadoes, hurricanes, volcanoes, etc.
- 320 Of course, harmony/cooperation may be the best strategy at times (see “game theory” data).
- 321 In the West, it appears that hunter-gatherer nature-inspired polytheism was abstracted by authoritarian monotheism (in which a ruler interceded for you with God), which was later decentralized and liberalized by Martin Luther so as to give you personal access to God, which was later grounded (by God as nature) by Spinoza, which was liberalized in the 12-Step spiritual program of Alcoholics Anonymous (so you could choose a God of your own understanding, although the use of “He” and the singular “God” is somewhat limiting, and there is also a noticeable Christian bias within AA literature). I am not suggesting here that any one of these definitions of God is superior—but some may be more useful at certain times than others.
- 322 Hawkins, *On Intelligence*.
- 323 Recent research has suggested that altruistic groups survive better than other groups. See Wilson, David Sloan, *Darwin's Cathedral*.
- 324 We only see light when it is absorbed by something—a nice evolutionary adaptation that allows us to avoid bumping into things.
- 325 Darwin, *The Origin of Species*, p. 439.
- 326 Unstable elements decay at predictable rates.
- 327 <https://ase.tufts.edu/cogstud/dennett/papers/intentionalsystems.pdf>

Endnotes

³²⁸ Barrett, Justin L. , *Why Would Anyone Believe in God?* 2004.

³²⁹ As an aside, James Clerk Maxwell published a mathematical analysis of governors in 1868. Maxwell revolutionized our understanding of reality by unifying magnetism and electricity and showing that light was also electromagnetic wave. His famous equations, although still used today, were later found to be approximations of the more precise equations of quantum electrodynamics.

³³⁰ Perceptual Control Theory posits that the organism does not respond to stimuli, but rather responds in order to control stimuli—to keep it at a certain level. To read more about this, get Gary Cziko's book *The Things We Do*.

³³¹ *Into The Cool: Energy Flow, Thermodynamics, and Life*. University of Chicago Press, 2006.

³³² Sagan, Chapter 3, *Pale Blue Dot*, Random House, 1994.

³³³ During my eight years living in China, from 2010 until 2018, I saw many people, including Christians, Muslims, and of course Buddhists, attending Church openly and freely. Yet, the Chinese Communist Party, the ruling party of the People's Republic of China, is essentially atheistic. So they perhaps have a good balance between tradition and innovation.

Nowadays, despite the repression of religion during the Mao era, recognized religions are practiced openly, and you can visit many temples (Buddhist, Confucian, or Taoist) and Christian churches. In the temples the people kneel and burn incense for their ancestors or the various gods and in the churches they sing traditional Christian hymns in Chinese.

For example, within 10 minutes of my home in Xiamen, I saw three large churches—two for the local Chinese people and one for foreigners, like me. One website claims there are over forty churches, but a google search today shows only thirty-seven. I also saw one famous old mosque, and Buddhist temples were on almost every block and actively used. All of the people I saw or knew, Chinese, Arabic or Western, were practicing their religion openly, freely, and happily.

Also, one time I drove north along the coast for two hours, and I stopped to have some coffee. I heard a strangely familiar sound. It was Christian psalms being sung in Mandarin at a large church across the street. So I went outside and watch the Chinese people exit their church. It might have been Omaha except for their language and ethnic appearance.

For Communist Party members it is a different situation. "China must be on guard against foreign infiltration through religion and stop 'extremists' spreading their ideology ... Communist party members must adhere to Marxist principles and remain 'staunchly atheist', President Xi Jinping told a top-level meeting on managing religion." <https://uk.reuters.com/article/uk-china-religion/chinas-xi-warns-of-foreign-infiltration-through-religion-idUKKCN0XL07I> In fact, Party officials can be expelled from the Party and removed from their post for engaging in excessive superstitious activities. "Party members must establish a correct outlook on life and values, seeking truth from facts rather than being addicted to feudal and superstitious activities." http://www.chinadaily.com.cn/china/2016-01/13/content_23060613.htm

³³⁴ <https://www.rt.com/news/441477-tour-boat-fire-bombed-volcano/>

³³⁵ <https://academic.oup.com/bioscience/article/70/1/8/5610806>.

³³⁶ <https://b612foundation.org/asteroid-institute-and-google-cloud-identify-27500-new-asteroids/>

³³⁷ <https://www.nature.com/articles/nature13962>.