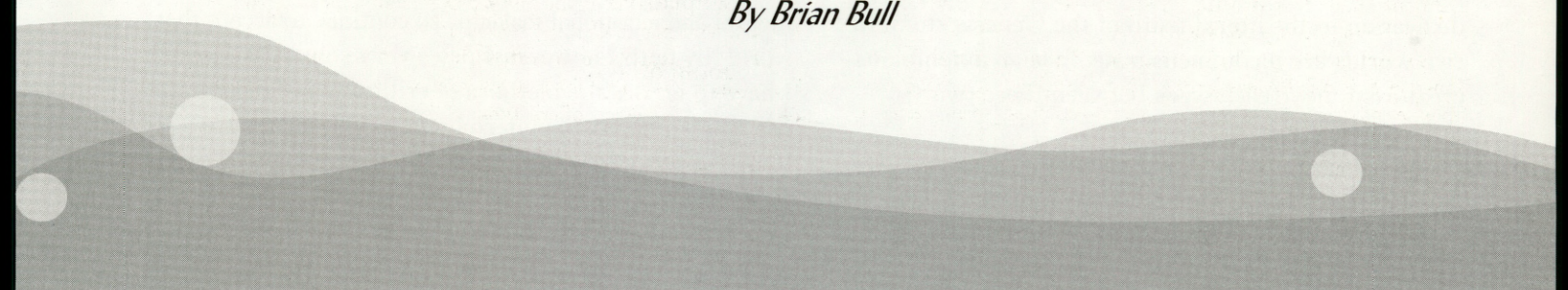


Living in Incommensurate Worlds

By Brian Bull



I am a research scientist. Except for the past few years, when I have served as a medical school dean, I have spent much of my professional life in research. I looked for areas where the knowledge of blood and its disorders was significantly incomplete and where solutions to the pressing problems in my discipline of hematology seemed possible. Then, with the help of my colleagues, I applied for grants, designed experiments, collected data, and published the results so that others who were competent and knowledgeable could agree with and implement, or disagree with and discard, proposed solutions.

For a decade I served as editor in chief of one of the major journals in my discipline with the assistance of my wife as managing editor. In that capacity, I reviewed more than one hundred papers a year, selected those I felt suitable, edited them, and sent them off to the publisher.

As a research scientist, like all other scientists in my field, I followed the tenets and procedures of science as it functions in the modern world. Each day as innovative proposals—new understandings of old problems—came across my desk, I insisted that the scientists who proposed them had made serious attempts to prove their ideas false.

If an obvious experiment that could have undermined such ideas had not been performed, I rejected them as editor or as a reviewer recommended rejection. By such methods, science gains “an increasing verisimilitude . . . better approximations to the truth of the matter . . . a tightening grasp of physical reality.”¹ Those who fail to search for and perform such critical experiments opt out of the fellowship of scientists.

That was my life as a scientist. What about my life as a Seventh-day Adventist? Six days a week I was a diligent researcher, holding others and myself to the paradigms of the scientific method. On the seventh day I was a child of the Adventist Church, raised in the mission field by Seventh-day Adventist parents and taught from childhood the stories of the Old Testament.

Those stories, my mission school environment, and my parents’ lifelong commitment to the Church and its teachings created for me an understanding of God’s purposes and workings in the world. That

understanding gave my life meaning then, and it continues to give my life meaning today.

The problem I now face—and have faced for many years—is that the world I inhabit during the week is a world informed by the scientific method, whereas my weekend world has been structured by my parent's dedication to the literal truth of the Genesis story. My two worlds are incommensurate. Like an amphibious creature, I move each week between these two incommensurate worlds.

I must hasten to add that the two worlds are incommensurate only in part—the scientific part. My scientific world makes no claims theologically; it does not claim the ability to answer questions of meaning. My weekend world makes theological and philosophical claims that I accept joyfully, claims that give my life structure, meaning, and significance. It is the scientific claims woven into or inferred from Old Testament stories that cause me difficulty.

Such claims clearly of a scientific nature cry out for the design of a critical experiment—an experiment capable of disproving them. One such matter is the issue of chronology. How many years has this world seen? What can be, what should be, our response to the considerable (some would say overwhelming) evidence for a long chronology? Chronology questions are scientific questions.

This is not a simple matter dismissed in an offhanded manner. Let me illustrate what is, for me, a nonviable option. Three years ago, several of my medical school classmates and I rafted down the Colorado River through the Grand Canyon. Upon emerging from that incredible experience in the upper reaches of Lake Mead they all, without exception, made comments such as, "The world is very old and life has existed for a long, long time—what's for supper?"

"You can't do that," I protested, "all sorts of theological questions arise if the world is old and life has been around for much of its history." My protestations went unheeded, and not one of my classmates has mentioned the matter again!

Unlike my classmates, I find it impossible to ignore the implications of an exceedingly ancient earth. I must at least attempt to establish links between my six-day life as a practicing scientist and my Sabbath life. To do this by accepting deep time is problematic (the understatement of the year!), and yet that appears to be the only scientifically credible option at hand.² The anodyne of deep time promises to make me whole as a scientist, but it takes away the comforting and comfortable world of Genesis that I learned about as

a child and cannot leave behind emotionally, even as I recognize its discontinuity with the scientific realities I confront during the working week.³

On the seventh day I continue to accept "by faith" the world of Genesis. I do not know how to do anything else. The world as pictured in Genesis is part of my mental and emotional makeup. To continue to accept that world "by faith," however, I pay a very substantial price. I have to ignore the plethora of critical experiments whose results would undermine my Sabbath world. I have to accept the Genesis world essentially as I pictured it as a child, for the tools I use during the week to achieve an ever-tightening grasp on the nature of reality cannot be deployed in my Sabbath world.

One of the most traditional of those claims inferred from the Genesis account is that the world is only a few thousand years old. That is clearly a scientific claim, but it is at variance from a very large amount of evidence from many sources, including astronomy, geology, cosmology, paleontology, and physics. One of those claims cries out for an application of the scientific method and design of an experiment capable of showing the claim of such a short chronology untrue.

No critical experiments capable of disproving such statements are allowed in my Sabbath world. In that world my thought patterns change. A statement about physical reality in my seventh-day world—like a statement about theological matters—is to be taken literally, as evidence of the way things really are, not as a hypothesis of the way things might be.

It is vital for a working scientist to be able to design critical experiments capable of disproving his/her own hypotheses or the hypotheses of others. I am fortunate because my mind does this in its default setting.

While working on this article, I wrestled with one totally unexpected outcome from a scientific experiment. As an educational administrator, I constantly search for ways to assist students in academic difficulty. More than half of the time in any medical school a dean's office is consumed with such problems and their fallout. Not surprisingly, the experiment in question concerned this problem.

I was trying to measure the benefits of a formal remediation course for medical students. I was prepared to accept that it was highly effective, moderately effective, or only of borderline benefit. However, statistical analysis showed that it was totally ineffective! There was even a suggestion (just below the limits of generally accepted statistical proof) that it was harmful.

For the two weeks I spent writing this article I used every spare minute designing new approaches to the statistical treatment of the data that would undermine this unexpected experimental result. Surely, teaching borderline students how to read faster, take better notes, and organize their time more effectively would help. Unfortunately, each repeat analysis gave the same results. Our well-intentioned program of remediation really did not help. Science's ever-tightening grasp on

from beginning to end is consistent in implicitly or explicitly endorsing that same picture. My own lifelong understanding of the matter coupled with the testimony of Christ, his disciples, and a host of other witnesses through the ages affirms that my seventh-day understanding of reality has to be correct.

But my training as a scientist and all the skills and knowledge that I have acquired through a lifetime in scientific research unequivocally state that I am wrong.

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reality had convincingly shown one aspect of reality with which we would need to deal.

So it is that on the seventh day of the week I catch myself thinking as I listen to sermons and Sabbath School lessons "now that assertion would be easy enough to explore scientifically to see if it truly reflects reality." Then, with a start, I realize that I cannot think that way, for on the Sabbath scientific assertions about the material reality in which we live are not hypotheses subject to the sifting of critical experiments.

What is the policing force that prevents me from undertaking this sort of scientific exploration? Is it a formal prohibition on the part of the Church? It is not. However, it is clear that the organized Seventh-day Adventist Church has not been happy with scientists like me who have asked such questions, designed such experiments themselves, or drawn attention to such experiments.

External coercion does not prevent me from venturing down that path. Rather, it is the realization, unvoiced even to myself except on occasions such as this, that there is no way that I can make my seventh-day world commensurate with my six-day world without losing virtually everything that has given my life meaning to this point.

If the long chronology is really true, then my seventh-day world—one of a perfect beginning in a garden where nothing ever died, a beginning a few thousand years ago, a Fall, a change from that deathless perfection, a Flood—the world that lies at the center of my spiritual understanding drifts away from my outstretched fingers, leaving a dark and featureless void.

Nor is that all. It is clear that Christ, too, pictured that Edenic world pretty much as I do. Paul and the apostles did the same. Surely they could not have been wrong. The testimony of Holy Scripture

My two worlds are incommensurate and give every indication of remaining that way for the remainder of my lifetime.

Disparate Realms

Despite all I have said above, my mind tells me that there must be some way to make my two incommensurate worlds compatible. Late at night or early in the morning, when I cannot sleep, my mind returns to the impasse.

If the world truly is very old and my picture of Genesis must be revised to accord with the scientific evidence, what in that Genesis picture could provide the bridge between the Garden of Eden and the reality that science has pictured through discoveries in physics and cosmology during the last one hundred years? What immutable insights into the character of the Creator must be carried along in the process to make the two worlds commensurate?

What about the Plan of Salvation, the Atonement of Christ? What about the fundamental truths conveyed in the happenings at the Tree of Knowledge of Good and Evil? In short, what portions, what concepts central to that Genesis story must appear in any valid retelling?

To guide me on this journey into the unknown—and perhaps unknowable—there are for me three nonnegotiable aspects and one undergirding presupposition. The presupposition with which I begin is that God is the Creator of everything. The three aspects of the Genesis account that I wish to take along as guiding lights on my journey are:



- God has created human beings for communion with him. That is the purpose for which I was created and, to paraphrase Augustine's immortal words, "my heart will be restless until it finds its rest in him."⁴
- All members of the human race have free choice, not just apparent freedom to choose, as some behaviorists would have me believe, but true freedom. The only right and proper exercise of that free choice is to choose to serve him in accordance with the purpose for which I was created.
- The God who created everything is also the God who intervenes. He has intervened throughout history and he continues to intervene today.

Given this beginning, what sort of reality can I mentally construct? Is it a reality that might have the potential of bringing my two incommensurate worlds together?

First, there is the matter of size, my size. Why are I and all other creatures with free choice a few feet tall and not, say, the size of an atom? Given the physical constants of the universe in which I find myself, all three of my starting assumptions require that I be significantly larger than the fundamental particles of which I am composed.

This conclusion, which would not have been apparent to the ancient Hebrews or, indeed, to Christ in his human knowledge or to his disciples, arises as follows.

If I were a great deal larger, I would collapse under my own weight. If I were a great deal smaller—say the size of a cluster of a few hundred molecules—I would be at the mercy of Brownian movement.

Under the microscope, small particles of matter in suspension can be observed to jiggle randomly and continuously. They are buffeted by molecular and atomic hits and follow a completely unpredictable course through the solution. If I were similar in size I could not choose to do anything and carry it out, nor could God intervene effectively in my world.

All of my choices and God's interventions would fare similarly in such a world. They would be wiped out by the random dance of my molecular environment. So I need to inhabit a world where I would be sufficiently large so that molecular interactions would be subject to the statistical smoothing effects of large numbers.

In such a world I can choose and carry out my choices, for it is a world in which effects always follow causes. In such a world, should God choose to intervene his interventions will have predictable and

enduring effects.

Given these considerations, it may come as a surprise that physical reality, including me, must be based on a substrate of the very small—molecules, atoms, electrons, and quarks—for me to have freedom of choice. If everything that makes up reality were macroscopic, visible to the naked eye, and there were no infrastructure of the almost infinitely tiny, then I would be locked into an endless series of causes followed by effects, which would give rise to more causes and so on ad infinitum. In such a world, the clockwork world envisioned by Sir Isaac Newton, I could not freely choose, and God could not intervene without imperiling that freedom.

Let me explain myself with an illustration. Some readers will have seen a child who suffers from severe cerebral palsy, whose arms are in constant motion, uncontrollable despite her best efforts. The technical term for this phenomenon is *athetoid movement*. You and I can choose to raise or lower our arms; we can wield a sword or a golf club. We will move, and our hand complies. Not so for the child with cerebral palsy.

The reason we can choose and she cannot is that we can influence which neuron in our brain fires. We know little about how this occurs, for control is exercised long before the critical neuron fires. Presumably we can, by free choice, determine the right neuron to carry out our will from the cacophony of possible neuronal firings based upon some molecular, atomic, or subatomic correlate of Brownian motion. The child with cerebral palsy cannot, and the result in the macro realm is a direct reflection of the seething unpredictability of the minuscule realm—the infrastructure of reality that we know about and the ancient Hebrews did not.

I have the best of both worlds carrying out my choices in the macro realm but initiating them in the minuscule world. My actions have consequences. I can truly choose to love God and serve him. I can then follow through on that choice. But that choice must be uncaused to be truly free, else it is meaningless. For me truly to choose and not to be inextricably trapped in an immutable chain of cause and effect my choice must be initiated in a minuscule realm, where effects are no longer rigidly linked to causes.

This world is mostly hidden from our sight, but we know from physics, mathematics, and cosmology that it is precisely this sort of infrastructure that undergirds the reality in which we live and move and have our

being.⁵ The fluidity and unpredictability of such an infrastructure undergirds physical reality that makes God's interventions possible, for by it his interventions also escape the chain of cause and effect.⁶

God is thereby freed from the constraints of Deism, which proclaimed an immutable cause-and-effect sequence from the moment of Creation. A Deist's God is free to initiate novelty for only one brief moment at the beginning of time. Thereafter, he is condemned to

the world of earthquakes that build mountains where streams rise and water the earth.

With increase in size, we enter the cause-and-effect world in which the ancient Hebrews lived and from which they took their metaphors for understanding a God responsible for everything that is (The Lord of Hosts—armies, the Owner of the Cattle on a Thousand Hills). We now know that, "What Is," is inconceivably larger than they could ever imagine, yet far more supple

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the role of an absentee landlord. All possible causes had already been set in motion and further interference is ruled out in the here and now.

So much for a brief outline of the path my mind takes in those early morning sessions. Three obvious problems remain. Why the vast eons of time that apparently have come and gone before we sentient human beings arrived? Why the evidence that life has become increasingly complex as those eons rolled on? Why death, why predation, why indeed the whole universe just to get around to us?

We are not the only objects that exist in both the macro and the minuscule realms, so do rocks and trees, animals and plants, mountains and valleys. Like us, all are composed of fundamental elements in various combinations, which in turn are composed of atoms, which are composed of subatomic particles. At that level, the minuscule level, the same limitations of cause and effect, the same absolute unpredictabilities, apply.

For instance, consider an atom of uranium in the center of the earth. At some time that atom will fission. When it does, the heat liberated will contribute to the heat that keeps the earth's center molten. Can we, even in theory, predict when a particular atom will decay? The answer is "No," and we are now as certain as scientifically possible that we will never be able to predict that event. It could occur in the next second, or it could wait 10,000 years.

Given a large number of uranium atoms, we can predict with accuracy when half of them will have disintegrated because, with the large number of those atoms, we have entered the macro realm of cause leading to effect. We are in the world of tectonic plates that float on earth's molten center (kept molten by the unpredictable decay of those same uranium atoms),

and subtle than anything they could have conceived.

This is a world that is not merely an extension of God himself, but also a world with its own version of free choice. For it is only in such a world that created beings—creatures such as us—could truly be free to choose.

For the material universe to permit free human choice, it, too, must have a material equivalent of freedom. Such freedom, if unlimited, would be chaos. But it is not unlimited. In the interplay between unpredictability and physical law—the unpredictability of the minuscule world, the physical law of the macro world—such freedom is granted. If the material substance of the world had not been similarly empowered to create its own reality the world would have been simply an extension of God himself bound inextricably to his will, with all effects traceable to God-instantiated causes. In such a world you and I would not be free.⁷

In such a world—the macro world that the writers of Genesis knew and the minuscule world of quantum effects—we are free to choose and the world is free to be itself. The price that God and humans pay is that earthquakes happen, mountains are built, and much that is beautiful follows. However, we will suffer if we are in the wrong place when those mountains are under construction. Furthermore, freedom to choose means that humans will make evil choices at certain times. If we are in the wrong place at those times we will suffer, too.

But we are not alone. God suffers with us. Christ freely made his sacrifice, on the Cross and before the foundation of the world, to preserve our freedom. That sacrifice underscores just how much God values love and service freely given. He expects us to do our part



to soften the rough edges that any reality is bound to have if we do so in support of free choice by embodied creatures. Those rough edges exist now and in the fossil record, and there is every reason to believe that they will continue to exist until he makes all things new. With God, our task is to heal the wounds of the world.

So why the eons of time, why the succession of life forms over those eons? Perhaps an answer to that question lies in the nature of freedom when expressed in a world free to be itself. Such a physical reality is most reasonably achieved by working at the pace and with the means that the minuscule world requires, for it is from the workings of that minuscule world that freedom arises.

Certainly God could have spoken the present world and its life forms into existence. . . . It now appears that he may have done something even more breathtaking, and in the process preserved freedom of choice for you and me.

Like all living things, you and I are carbon-based life forms. In chemical shorthand, you and I are organic. The carbon atoms that make up you, me, and the rest of the organic world were formed according to laws of physics that God decreed. Those laws dictated that the first generation of stars following the Big Bang would burn for millions of years, forging carbon from helium in their nuclear cores. A considerable excess of carbon formed—again by physical law—dictating an unusual resonance that favored carbon atoms as an end product. The process took time, unimaginable time. The process required space, unimaginable space, but if that is the process God set in motion he must have judged it best.

At the end of the process, this end, sentient human beings resulted, beings capable of choosing freely to love and serve him. I do not, by any means, envision this process to have escaped God's guiding hand. I find it inconceivable that this outcome could have resulted from unaided chance. There is, I believe, more than enough room in the two-realm structure of reality to allow for mankind—created in God's Image—to emerge from the apparently unregulated interaction of chance and necessity. This insistent but undetectable (by science) guiding process, which ensures that God's outcomes will be achieved, I understand to be Providence with a capital P!

Can I or anyone else ever prove scientifically that Providence was or was not involved? No, I cannot. Nor, I believe, can anyone else. That determination

would require a vantage point "outside" this universe. The only way, scientifically, to determine if God was involved would be to view all of the inputs into our reality from elsewhere, rather than from within the space-time reality of the universe.

From within, the most that can be achieved is data such as we already have: the unreasonable exuberance of life, for example, or a universe constructed with just the precise balance among the four physical constants and between those four physical laws and the unpredictability of the minuscule realm that permits you and me to exist.⁸ That data we already have, and it is all we will ever likely get from science. It has convinced no one unwilling to believe.

To those willing to listen, it speaks unmistakably of Providence—a Providence that may also, from time to time, choose to intervene in the realm of cause and effect, the world of persons, by miracle.

The web of interdependent life that has come into being through this process is astonishingly beautiful. It is also incredibly resilient to the rough edges that characterize a material reality that is free. Earthquakes, tidal waves, fires, and floods may be an inescapable part of a world that exercises its own version of freedom, but, because God decreed it, life under his guiding hand responds by filling each new ecological realm that appears. The geological record indicates that it has always been so.

Certainly God could have spoken the present world and its life forms into existence in a moment, as the ancient Hebrews thought. It now appears that he may have done something even more breathtaking, and in the process preserved freedom of choice for you and me. Over countless eons of time, he created a world that heals itself of wounds caused by rough edges that inevitably result from free choice. Perhaps freedom, the freedom to choose, is a many splendored thing!

Can I claim that this particular (and admittedly idiosyncratic) accounting of how reality has come into being is true? No, of course not! Can I dismiss my midnight musings as wholly in error? No, again. The synthesis that I have presented here is only the latest of many that I have constructed through the years.

However, I hope that each successive synthesis excludes more that is false and includes more that is true.

But such attempts include a vastly more important question than relative amounts of truth and error. The more important question is whether these successive views influence my decisions at critical turning points in my life. They do not. My decisions are less affected by any particular synthesis of how reality operates than by non-negotiable aspects of the Genesis account that undergird those syntheses.

That is as true for me as it was for three Hebrew worthies 2,500 years ago. When they faced a critical decision, they replied, "We have no need to answer you on this matter. If there is a God who is able to save us from the blazing furnace, it is our God whom we serve, and he will save us from your power, O king; but if not, be it known to your majesty that we will neither serve your god nor worship the golden image that you have set up (Dan. 3:16-18 NRSV).

For them, the non-negotiable aspects were the same—God is the Creator of everything and:

- Human beings are created to choose God and his kingdom.
- They are free to choose to do that or to ignore God's claim.
- God is a God who intervenes in the world.

Knowing nothing about the minuscule world that provided the infrastructure of their reality, they still knew that God had called them to serve him, that they were free to choose to serve God or to bow down to the king's image, and that God could intervene if he chose to do so.

With the story of the three Hebrew worthies I come full circle back to the Old Testament. When my musings of a sleepless night come to an end I think once more of Adam and Eve and a perfect garden where nothing ever died. Time-hallowed stories from that setting beautifully contain all I need to know ethically and theologically. I still call on them to undergird meaning and purpose in my life.

Nor do I find that strange. It happens elsewhere in my life also. I call my wife to the window to look at a beautiful sunset, and I mentally picture the sun moving around the earth and dropping below the horizon each night. On an early morning hike, we stop to marvel at the reflection of a snow-capped peak in the unruffled surface of a mountain lake. Do I at that moment remember that the mountain, the mirror-like lake, and the two of us are moving through space at more than a

thousand miles an hour? No, of course not.

Perhaps the incommensurate worlds that I inhabit differ no more radically from each other than the world of sunsets and mountain lakes differs from the NASA world, in which trajectories of satellites must be calculated.

I can move comfortably between these two worlds. Surely I should be able to move comfortably between the worlds of the Old Testament and science. Tolerance and understanding from those in the Church who do not suffer from incommensurate worlds is probably all that is required. Those in the Church who do suffer from incommensurate worlds already understand and sympathize.

Notes and References

1. John Polkinghorne, *Beyond Science: The Wider Human Context* (New York: Cambridge University Press, 1996), 8.
2. A phrase that connotes hundreds of millions or thousands of millions (billions) of years. It probably arises from analogy to "deep space," a phrase with which we are all familiar thanks to science fiction
3. An anodyne is a soothing substance, a pain reliever.
4. *Confessions*, chap. 1, page 1.
5. See, for example, Kenneth R. Miller, *Finding Darwin's God* (New York: Cliff Street Books, Harper Collins, 2000), 249-51.
6. Non-miraculous interventions. More about the miraculous interventions will be discussed later.
7. See, for example, John Polkinghorne, *Belief in God in an Age of Science* (Oxford: One-world, 1998), 13.
8. Science commonly acknowledges this unlikely set of circumstances. It is termed the "anthropic principle" and credited to fortuitous chance.

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