

What the Universe Means to People like Me

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WHEN I PICKED UP DAVID'S paper to read it, I had a pencil in my hand. Years of reading my students' and my own papers made it natural to edit as I read. However, I heard in my mind the voice of my mother advising me to put the pencil down. This wasn't a time to edit but to hear and understand. Still, I kept the pencil in my hand for the first few pages and made a few notes before I put it down and just read.

I could hear David's voice speaking the words I read. It was good to hear it. I have missed hearing his voice. We met David when we attended the Princeton Ward a little over thirty years ago. That was a powerful time. The ward was a mixture of local people and transplants from the West. Students were not the largest group, but there were enough to leaven the loaf. The Princeton Institute met Friday nights in a room in the Firestone Library on campus. It was still listed as the "Deseret Club" in the university's publications, and the meetings were more like a graduate seminar than a seminary class. The students took turns presenting papers or thoughts on various themes. Most of us were graduate students and were comfortable with a seminar style.

This was in an earlier and less institutional period for the institute program. The church education program had an instructor, Burt, who was in charge of that half of New Jersey. As I remember it, the students had told Burt that he was welcome to attend. If he had something special prepared, we would schedule him a week to present, but he was not expected to talk each week. He came sometimes.

I found the time so refreshing. It was an opportunity to think seriously about our faith and explore its dialogue with the larger world. It was empowering to see people trying to live reflective lives that honestly integrated their scholarship and their religious understanding. Of course, this was never perfect, but I found that there were people there with whom I could discuss, for instance, my dissatisfaction with some arguments derived from naïve natural theology for the existence of a loving Creator.

I remember Henry Eyring giving a lecture to the Princeton University Department of Chemistry while I was there. He had been the chairman of the de-

partment before he'd joined the University of Utah faculty. He freely talked about evolution and gospel insights. These were not compartmentalized for him. It seemed that he openly accepted the truths which natural science taught as well as those which he had learned in the church. He told us that, as a Mormon, he did not have to believe anything that isn't true. I affirm this.

David Tolman had come to Princeton before Janice and I arrived. He was active in the ward and in the discussions we had. I remember David delivering a sacrament meeting talk while we were meeting in the Rosedale Chapel.¹ Standing at the pulpit, he said that God is not like the tyrants of this earth. They demand that their authority be acknowledged. God, however, gives all people their agency. People do not even have to believe in him. What political leader would tolerate that? It was a compelling talk. Understanding that God was not a tyrant was a step in my understanding of the condescension of God, the God taught by the Book of Mormon who gave up his power to become a helpless child, the son of Mary.

I remember some other times with David. I was in charge of the Adult Aaronic program for the ward, shortly before it became the prospective elders program. Many of the home teachers reported to me. David was one of the few people to come to a special meeting that we had called in the interminable struggle to increase home teaching statistics. He was realistic about the prospects of finding people who wanted to be visited, and he expressed that sentiment clearly, but he was also one of those who went home teaching nevertheless. Many did not.

I know that David lived the church program faithfully. He writes of having been hurt by the excommunications of a decade ago. I believe that he has ample reason to understand that the violence of that time was directed at faithful, thoughtful people like him. The smallness of institutions can be a great stumbling block. David identifies fundamentalism as a threat to world civilization. I agree. With the decline of the terrible tyrants of the twentieth century—Mao, Stalin, Hitler, and Pol Pot—secular totalitarianism may be on the decline. The new irrationalities resemble throwbacks to the "bad old" days of tribalism. Ethnic-based oppression is on the rise. Religions are often glued to tribes, and that can make religions part of the problem. Anciently, narcissistic emperors found signs that they had the mandate of Heaven. If you have the Mandate of Heaven, then your thoughts are God's thoughts, and you can do even horrible things, explaining to yourself and the world that God has willed it so. But the problems don't go away if people reject religions. Often things get worse. The big exterminators of the last century were secular. If there is no judgment day, then tyrants are free to assume that power can be used completely arbitrarily, according to the will of him who holds it. So it has been, and so it continues to be. Though God's name and will have been used to justify horrible things, a world

1. We did not have our own building at the time, so we rented a building belonging to a local Protestant church. We met mornings and they met afternoons.

without God relying on modern science has shown itself even more open to tyrants, violence, and abuse.

Two centuries ago, the French mathematician Laplace² participated in perfecting Newtonian mechanics by developing mathematics that could account for the motion of the planets in the solar system to a degree of accuracy far beyond what had been possible a century earlier. He was confident that it would be possible, in principle, for an intellect of sufficient power to calculate the future if he were once granted the initial positions and velocities of all particles. Nothing would be unknown. Laplace's vision can be termed "reductionistic determinism"—"determinism" because it states that what the future will be is a necessary consequence of the present and "reductionistic" because it reduces more complex phenomena, including human beings, simply to matter-in-motion.

After Napoleon had considered Laplace's famous treatise on Celestial Mechanics, he asked the mathematician what role he saw for God in his system. Laplace answered, "Sire, I have no need for that hypothesis."³ Who can measure the empowering effect of that kind of a statement on a tyrant? Napoleon had achieved victory after victory. Fortune smiled on him. The church could not check his power. In the end, Napoleon took the crown from a prince of the church and crowned himself emperor.

But should we care about the effects of an assertion that there is no God, if the assertion were true? I, for one, believe that truth must be honored. We cannot be true to the God of Truth unless we are willing to hear all truths, even if the truths make us uncomfortable, even if they appear to be in contradiction, even if the truths make those around us mad, and even if the statements are about the nature and existence of God.

However, Laplace's breathtaking affirmation of reductionistic determinism simply is not true to the extent that he imagined. It is the case that both reductionism and determinism have been more successful in explanation, prediction, and intervention than most people of his age would have suspected. Laplace was correct in asserting that the solar system is stable in the short run simply through the operation of natural laws. We do not need to evoke a supernatural being to keep the planets in their orbits⁴ though their stability over billions of years is-

2. "Pierre Simon de Laplace (1749-1827): French mathematician and philosopher. Laplace's determinism was based on the enormous success of Newtonian mechanics, and in particular he, himself, proved the mechanical stability of the solar system. He thus removed the need for the adjusting hand of god." *A Dictionary of Philosophy*, second edition. (Pan Books, 1984), 197. As quoted at <http://www.faragher.freeseerve.co.uk/laplace.htm>.

3. Steven Hawking, well-known cosmologist, blunts the apparent atheism of the statement by saying, "I don't think that Laplace was claiming that God didn't exist. It is just that He doesn't intervene, to break the laws of Science. That must be the position of every scientist. A scientific law is not a scientific law, if it only holds when some supernatural being decides to let things run and not intervene." <http://www.hawking.org.uk/lectures/dice.html>. Indeed, scientists proceed, as did Laplace, in rigorously excluding supernatural causes when seeking a detailed account of phenomena.

4. Newton thought that God might play just such a role.

markable.⁵ However, two developments of the twentieth-century unstick Laplace's vision of total determinism.⁶ Quantum mechanics is one, and a better understanding of chaos (deterministic nonperiodicity) is the other. Neither would have come into existence without focused researchers energetically pursuing the deterministic enterprise into as many possible areas of inquiry as possible. It was in this pursuit that the limitations to determinism began to become evident in the closing years of the nineteenth century. Moreover, knowing the limits of determinism and how it breaks down now sets the stage for better predictions and control. Take meteorology, for example. Edward Lorenz in the 1960s stated that accurate, long-range weather forecasting was impossible because of the way small effects in an iterative system with feedback could grow to dominate the phenomena. This was a founding work in modern chaos theory. Chaos theory cut the legs out from under one of the approaches that meteorologists, who supply predictions to our local weatherman, used. That approach was to take the existing weather in all the places that are upstream [upwind?] from us and then fold them together in a deterministic way to get tomorrow's weather here. Now instead meteorologists run a large number of simulations and see what each predicts. The forecast, with its chances of wet or dry weather, is then a reduction of the ensemble of possible futures to one pattern with probabilities. If all the forecasts predict rain everywhere nearby then they report 90-100% chance of rain, but if the predicted patterns are mixed then the chance of rain is said to be smaller. The probability-based forecast is, thus, at once more approximate and more accurate. And Laplace's confidence that all could be known can now be seen to be a hopeless extrapolation.⁷

5. See for example, Peter D. Ward and Donald Brownlee, *Rare Earth: Why Complex Life is so Uncommon in the Universe* (New York: Copernicus Springer-Verlag, 2000).

6. I am not putting down reductionism and determinism as useless. I am definitely not suggesting either that anything goes or that science is as arbitrary as a person's religion or politics. As a practicing physicist, I rely on reductionism and determinism every day. But they have limits.

7. The word hasn't gotten to many in the social sciences yet where the reductionistic, deterministic enterprise is active. The predictive certainty of the "hard sciences" like physics is an ideal for many. Ideals are fine, but determinism goes beyond ideal to bedrock axiomatic certainty for some. In "A lecture on having a poem," B.F. Skinner expresses an extreme of taking total mechanistic determinism as a description of the universe rather than a discipline of mind for the investigator. This inventor of behaviorism declared that even something as artificial, personal, and creative as the writing of a poem was the same kind of process as having a baby and the outcome just as determined. He ended by saying that he was giving the talk that he had to give and if their positions had been reversed, a member of his audience would have given the same talk. (Skinner, B. F., "A lecture on having a poem." In B. F. Skinner, *Cumulative Record: A selection of papers*, 3rd ed., (New York: Appleton-Century-Crafts, 1972) 345-355. I first came in contact with the piece about a decade ago. It seemed so ridiculous that I put it in the category of "weird, arbitrary and unintelligible assumptions of outlandish groups like Freudians." It took a couple of years for me to realize that Skinner was coming at the human soul and mind from a Laplacian mechanistic mindset. By the time I learned quantum mechanics, atoms and molecules were waves, not machines. I knew that there are only probabilities as to what will happen in any experiment. If something as simple as an elementary particle is governed by probabilities and "the butterfly effect" (chaos theory) can magnify small ef-

Steve Weinberg has told us that the classical God of the gaps, "the idea of God," in the definition David provides, "sometimes used to fill in the gap between areas of scientific understanding," is no longer viable because no longer necessary. As the "gaps" are being filled in, the God of the Gaps will shortly be out of a job if he isn't already redundant. Should we be persuaded by Dr. Weinberg? I am not for several reasons. In the first place, the gaps in the heavens are still there. They have moved out to ever-larger, mind-bending distances and times, and the number of objects in the universe has expanded. In the second place, we can see that there are gaps all around us. Consider the way subtle causes in the world can occasionally produce large effects. The new science of chaos helps us to see that there are many areas, from details of the weather to the beating of our hearts, where small perturbations don't damp out, but can grow larger and larger and eventually dominate the system. Perhaps, instead of Laplace's capable and knowing calculator of the future, it is time to consider again the role that knowledgeable actors could occasionally have in influencing the world using small means,⁸ subtly applied at just the right time and place and in the right manner.⁹ In the third place, there are many more ways of experiencing the divine than as a cause for as-yet-unexplained phenomena.

Lastly, even if the gaps were all filled, the naïve reductionism championed by physicists like Weinberg does not fit the intuitive experience of most human beings. The map reductionism provides does not fit the terrain of human experience and does not provide good guidance on how to live a good or meaningful life in the world. Physics will not render the humanities irrelevant, just as fundamentalist descriptions of the universe also do not fit the terrain.

Let's consider the core issues of scientific reductionism and immediate human experience in greater detail. First, let's look at the reductionist enterprise. Are the gaps really all going to be filled, rendering God irrelevant? Weinberg's critique of religion is partially based on a model of knowledge that is not universally accepted even in physics. Physicists do not agree on the nature or even on the task(s) of physics. This argument shows up in articulate letters to the editor in magazines like *Physics Today*. Some see the task of physics as a quest for discovering the underlying order of the universe, often expressed as the Theory

fects to large ones and change the paths of storms, then the modeling of humans as machines is ludicrous. I had assumed that generally educated scientists and scholars would know that. I have learned that that is not the case and that, in many areas, the news is not particularly welcome. Many consider indeterminacy too theoretical, political, irrelevant, or damaging to their work. And I have learned that, in other cases, there are people who want indeterminacy so as to avoid having to do science at all.

8. The reader may remember: Alma 36:7 "And the Lord God doth work by means to bring about his great and eternal purposes and by very small means the Lord doth confound the wise and bringeth about the salvation of many souls."

9. The falling of dice was one way that unseen, supernatural beings were thought to be able to influence the visible world if they chose. The casting of lots to discover the will of God is well known in earlier ages. Consider the casting of lots in the books of Jonah (1:7) and in Acts (1:26).

of Everything (TOE). This approach is typified in the works of stars like Steven Hawking. There are books with titles like *The End of Physics*.¹⁰ This urge to bring everything into one consolidated theory provides perhaps the common impression that nonphysicists have of physics. But I do not subscribe to it, and there are many individual scientists like me. The unification of forces will not be "A Theory of Everything." It will not account for flightless waterfowl or for the presence or absence of the divine. Instead it will probably show the underlying simplicity and beauty of the universe and that there is greater latitude in possible worlds than we can at present imagine.

The waterfowl reference comes from the comic strip *Bloom County*. Oliver Wendell Jones, the little boy genius, is checking over his calculations. He says that he has the theory of everything completed. Everything fits except flightless waterfowl. There should be no flightless waterfowl. Opus, the penguin, is looking on. He looks down at his lower self in concern. His feet and lower parts have disappeared. Then Jones takes the pencil to his equations. "Missed a factor of two!" he declares. Opus' bottom side comes back into existence, and he finds himself again connected to the floor. "Now, cut that out!" he demands.

In fact, the grand unification theory will likely not have much to say about the existence of flightless versus flight-worthy birds. Some have said that the various disciplines we study are like the layers of an onion. They touch, but the layers are only loosely coupled. Chemistry does not collapse into quantum physics, or molecular biology into chemistry, or the study of tissues into molecular biology. Humans are more than the sum of their organs, and families and other units of society are more than the individuals who make them up. Likewise, each discipline touches others but is largely independent. Taking a phrase from the Doctrine and Covenants, "All truth is independent in that sphere in which God has placed it. . . otherwise there is no existence" (D&C 93:30).

I have studied both quantum chemistry and the quantum physics on which it rests. The computer programs for the quantum equations exist. Given sufficient computing power, we can calculate any molecule's or group of molecules' structure and the interactions of the molecules to any desired precision. The physical equations are correct. But chemistry has not disappeared. Quantum chemistry calculations involve the computation of large positive and negative energy terms. These correspond to attraction and repulsion in a molecule. The positive and negative energy terms are nearly equal. They are usually the same to about six decimal places. Chemistry resides in the part which doesn't cancel out when the positive and negative terms are summed. The equations give little hint before the computation is made what the sum will provide or how the molecule will fold. Chemistry is in the details. It appears to me that each discipline mentioned above is the same. Each has a natural kingdom based on the balancing of

10. David Lindley, *The End of Physics: The Myth of a Unified Theory* (New York: Basic Books, 1994).

forces or causes. They exist in the details. Reductionism has its uses to give insight into foundational causes, but it does not eliminate the discipline. In the end what it means to be a human is more than clothing, food, and water. (Matt, 6:25) Existence resides in the balancing of opposing forces. God and our existence are in the details.

People like me live and work in wonder at the richness and subtlety of phenomena. The expression "infinite in all directions" better captures the awe we feel and more accurately maps the universe we live in. With the things we discover, wonder does not disappear. Familiarity with the mystery does not remove it. It rather makes it larger.

Infinite in All Directions is the name of a book by one of the great physicists and thinkers of our age, Freeman Dyson. It is based on his 1985 Gifford lectures in Natural Theology entitled "In Praise of Diversity." The expression itself dates back over a century. In his third chapter, Dyson quotes a portion of a speech made by the physicist Emil Wiechert in 1896 when there was little hint or anticipation of the revolutionary discoveries and insights that the twentieth century would produce. He talked of atoms being actual entities rather than philosophical speculations; then he affirmed that the richness of phenomena leads to the conclusion that atoms themselves are simple rather than complex. But, he stated, that is all right. Wiechert writes:

I believe that we can abandon this idea (of reaching the ultimate foundations of the universe by going to the realm of the small) without any regret. The universe is infinite in all directions, not only above us in the large, but below us in the small. If we start from the human scale of existence and explore the content of the universe further and further, we finally arrive, both in the large and the small, at misty distance where first our senses and then even our concepts fail us.¹¹

Dyson continues. "Today we still find scientists divided into two camps: the unifiers who, like Einstein, believe that nature can be reduced to a finite set of equations; the diversifiers who, like Wiechert, believe that nature is inexhaustible."¹² Dyson is in the latter group, and so am I though Dyson thinks we are in the minority.

I am not claiming that all those who are in the former group conclude that there is no God, only equations, or that the latter group is one of believers in some form of divine existence in the universe. Neither is the case. However, believing in the richness of phenomena and that there is so much more to be understood inclines me to reject Weinberg's conclusions.

This brings me again to the second large issue, the very different and personal ways in which people experience both life and God. My own understand-

11. Freeman J. Dyson, *Infinite in All Directions: Gifford Lectures given at Aberdeen Scotland, April-November 1985* (New York: Harper & Row, 1989), 36.

12. *Ibid.*

ing of our existence in the world and of my relationship to our Heavenly Parents is grounded in my experiences and native approach, and these speak to me of both a universe and a God of wonder. I write from my experiences and leave it to others to articulate their own.

God has been given many names and titles as human beings have endeavored to understand the universe and our position in it. The roles which God assumes in the universe are an important aspect of the way in which people have seen God. His role in the natural world is clearly seen in titles like Creator and Sustainer. (It is in these roles that the God of the Gaps finds employ.) God's sovereignty has been emphasized in titles like Ruler of Heaven and Earth, King of the Universe, and the Almighty. But these are not the only types of roles for God. If he were not the answer to core questions about the natural world, would he still be God?

Being in a personal relationship with God has been a very important matter for deeply religious individuals. Jesus spoke of God as a dear parent. ("Abba" means daddy). Some Christian mystics have seen God as lover.¹³

I will speak of the God who loves me and whose work I would do. Before I am a scientist or a member of any group, I am a human being. I do not owe final allegiance to any human activity, neither science nor religion. I try to be true to all of the truth I learn and experience, but in humility I say that we do not have access to all truth.

For me the fundamental, experiential truth of human existence is not "I think therefore I am," but "I am loved and therefore I am." Love brought us into the world and love sustains us. The love of a mother for her child in the first two years of life is central. Without that love the infant cannot survive. Without being picked up, held, comforted, and cuddled, the baby will not thrive. I have experienced the love of God and have had the chance to return that love. To have gained a sophisticated understanding of the nature of the creation of the world¹⁴ does not change the fact that I am loved.

13. Margaret M. Toscano, "Making Love with God: Sex and Identity in Two Late Medieval Mystics: Mechthild of Magdeburg and Margery Kempe," Dissertation, University of Utah, Salt Lake City, 2002.

14. World is an old word for universe. When Copernicus wrote of the motions of heavenly objects in *De Revolutionibus* the first chapter of the first book was entitled "Quod mundus sit sphaericus," "The world is spherical." He did not mean the earth. That was the subject of the second chapter, "The earth is also spherical." By world, Galileo meant all of creation. The word we use for this now is usually "universe," and the word "mundus" in the first chapter is often translated now as universe. LDS may occasionally find it profitable to read the word "universe" when they come across the word "world" in the scriptures. It doesn't always mean universe, but often does.

It is, however, not clear that the word "universe" will continue to mean all of creation. Universe is now used to refer to all of creation that is within our light (and gravitation) cone, whether we can see it or not. But various meditations on the subject of what came before the big bang or of what creation may look like beyond places from which light has reached us have led some to talk of "multiverses."

In addition to the question of the existence and nature of God, there are questions about the interactions of the powerful institutions of religion and the sciences each soliciting adherence to their principles. Human experience is larger than the realm that the physical sciences take as their scope. To me this is a statement of fact. In the hearts and minds of people, the physical sciences are unlikely to replace religious accounts of the world or of humanity's place in it. The soil is too thin for growth, the place too remote to live in. Many people experience scientists as just one more group of authorities claiming preeminence. A natural question is: Why should they have more right to our allegiance than other authorities? Besides, we scientists keep changing the scientific account. Even subtle changes in our understanding of the world can produce monumental changes in our understanding of our role and position in the universe. What are we to believe?

Even when people escape the antiscience approach of Creationism or other narrow readings of scripture, many do not find that the map provided by scientific reductionism fits the territory of their personal lives. Some people have natural faith in God, life after death, and the existence of the transcendent. Some have had experience with life-after-death, transcendent love, seeing angels, empathetic contact with animals, plants, and the other. Others find the remoteness in time and space of the big bang creation and the esoteric mathematics and the claims of cosmology simply irrelevant to their lives. For still others, including religious scientists, ancient or modern religious texts can suddenly gain new meaning with the discoveries of natural science. If some, nevertheless, feel that Weinberg is correct in asserting that science shows that there is no God or ultimate purpose in the universe,¹⁵ my own response is that science has not shown any such thing.

At the same time, the maps provided by fundamentalists of all religions manifestly do not fit history, science or, most often, the best impulses of their own traditions. Living with a good mind but in deliberate ignorance is deplorable state. I appreciate David's quoting Martin Gardner's thoughts on the "sin of willful ignorance." Here my own negative experiences with religion come powerfully into play. There is no question that religious people do and have done bad

15. Cosmology as it has been done may not be the right science for Weinberg's task. Dyson observes that Weinberg in *The First Three Minutes* takes only five pages to dismiss the future. "He (Weinberg) sums up his view of the future in twelve memorable words: 'The more the universe seems comprehensible, the more it also seems pointless.'" Dyson counters, "Weinberg here, perhaps unintentionally, identified a real problem. It is impossible to calculate in detail the long-range future of the universe without including the effects of life and intelligence." Cosmology gives us a view of the present universe whose grand structure unfolded from the big bang, but it has little to say about life. Life doesn't come out of the equations, except, as some have observed, in that the physical constants which enter into the equations are finely tuned to allow life. Dyson points out that life changes the world, and intelligent life can do that even more so. We must take into account the presence of intelligence and life to understand purposes, values, and the future. Chapter 6 of *Infinite in All Directions*, "How will it all end?" [99-100]

things in the name of piety. This is especially hard to bear for me. Janice Allred, my wife, was excommunicated and those who carried it out claimed that this action was for the protection of the church. I know that this hurt Janice. Our whole family was damaged. I do not believe that the action protected the institution.

I remember there was an incident at the dedication of the Princeton Ward when David led the choir. Among other things he had chosen "How Lovely is Thy Dwelling Place," from the Brahms Requiem, sung in the original German, and the Latin "Sanctus" from the Faure Requiem. It was beautiful music of a kind and quality we had become accustomed to in that ward. Both pieces use scripture as text, both deal with the theme of sacred space, we had the English translations of both texts in our programs, but a very high church dignitary who'd been invited to the dedication took offense. Red faced and angry, he stepped to the microphone and announced that the congregation would sing four verses of "Come, Come Ye saints." What followed was, of course, not the comfortable singing of a familiar hymn; it became, instead, the awkward execution of a highly dubious public reprimand. Many of the "little ones" Jesus spoke of, who are offended by those with power are not little, not children at all, but mature and accomplished adults. These are, of course, small matters compared with the great crimes of religion to which David refers. But small or large, because they address evils attendant to the very institutions from which we derive our moral ideals, we have to look at them squarely and honestly.

At the same time, being honest also requires that we put such religious crimes into historical perspective. Truly, the greatest murderers of history have been, and are likely to remain, secular or ethnic. In the last century, tens of millions were murdered for political reasons, like the millions of Kulaks in the Ukraine, the later millions across the USSR killed by Stalin, the millions of Chinese by Mao Zedong, and the millions in Cambodia by Pol Pot and the Khmer Rouge. Millions more were minorities killed by majority populations: the Armenians in Turkey, later Jews and Gypsies in fascist Germany and the countries it occupied, then still later, those killed through ethnic cleansing in Indonesia, the Balkans, and central Africa. Weinberg, of course, is not the first antireligious man to point to Galileo, the Inquisition, anti-Jewish pogroms and the like. I have confronted this kind of rhetoric at social gatherings of scientists for years, but Weinberg is not at a cocktail party. Conceding such religiously motivated atrocities, I maintain that even a cursory, unprejudiced look at the numbers shows an overwhelming lead for secular powers and governments and individuals in the aggressive failure to value and defend human life.

Turning to a specific issue mentioned by Weinberg as evidence of the moral failure of religion, the US abolition of slavery; it seems to me that Weinberg shows selective reading. I believe he is wrong when he says, "Where religion did make a difference, it was more in support of slavery than in opposition to it." The dominant forces in the north in the issue of antislavery were religious communities. The abolitionist Beecher family is a particularly salient example. Daughter of a minister and sister to others, Harriet Beecher Stowe skillfully de-

scribed the horrors of slavery in *Uncle Tom's Cabin*. Lincoln greeted Harriet Beecher Stowe, saying, "So you're the little woman who started the big war." In the antebellum south, antislavery preachers were intimidated, murdered, and expelled. The division over slavery split many American churches. The hegemonies which the rich and powerful promoted co-opted religion as much as possible. It is remarkable that in high slaveholding areas in the south there were any religious people who were antislavery. But there were.

It is also true that many preachers in the antebellum South told their congregations what they wanted to hear. As a Latter-day Saint I am used to the practice of our church and the presumption that a lay ministry is superior to paid ministries, particularly those paid by and, hence, in some degree beholden to a central government. Protestant pastors in Germany, however, see the matter differently. They think that their paid position has a moral advantage over that of their American counterparts. Since they do not have to look to prosperous people in the congregation for support, they can tell people truths they may not want to hear. The Book of Mormon talks of apostate groups who wanted their preachers to be "popular" and supported by the people. Such preachers told the people just what they wanted to hear, and this was surely also a problem in the antebellum south.

But were scientists any better in this time? Many were not. The concept of the "European" race was partially a scientific invention. Many of the prominent promoters of separation of races and the supposed superiority of one race over another in the early twentieth century were scientists. It was only after the horrors of fascism had been fully disclosed that scientists rejected racism and discovered scientific reasons to justify their revulsion. Such after-the-fact discoveries, however welcome, seem far more a product of political necessity than of scientific method.¹⁶

Weinberg believes that the moral tone of religion benefited more from the spirit of the times than the spirit of the times benefited from religion. What is the source of the spirit of the times? It is difficult to tease this out. In most Christian countries the development of a moral sense and restraint has been strongly mediated by religion.¹⁷ Before there was secular humanism, there was the religious

16. If a critic of science like Appleyard were to challenge certain social sciences as being the product, at least in part, of willful choices rather than of an unbiased interrogation of natural phenomena, this physical scientist might agree.

17. The Roman Empire found it strange that Jews and Christians connected morality to religion. In the traditional communitarian pagan religions, religious piety was about sacrificing to the Gods and supporting religious festivals and events. It had nothing to do with abstaining from sexual contact. Many religions had exactly the opposite attitude toward sex, promoting ecstatic rites. The pagan religions most definitely did not promote serving the poor as the ideal of a religious life. By the third century CE, however, carrying for the despised was expected of religious communities. We know this because when Emperor Julian (the Apostate) sought to reinvigorate the Empire by promoting the old Roman religion, he gave grain to the priests of the gods and told them to feed the poor as the Christian bishops had been doing. The priests, however, were confused as this was not part of the old time religion.

humanism of Reassure and of St. Francis of Assisi, which helped lay the groundwork for humanism of later ages.¹⁸ I believe this rephrasing of Weinberg is more accurate, "As far as I can tell, the spirit of the times and the current moral tone of religion grew out of the people's religious and secular past."

In the final analysis, I believe it is as damaging to live one's life totally by science as it is to live it totally by religion. I was told of a sociology professor who tried to live entirely by science and who, though he was an academic success, ended his life rather than go on through personal troubles. There are, of course, people who have committed suicide because of their allegiance to religion. Steering a middle course has much to recommend it.

How does one live with both the knowledge science brings and those experiences very alive in the self that we call spiritual or religious? How should I live? David says "For years I walked in a cul-de-sac by trying to compartmentalize science and religion; every turning brought me back to the original problem. What I heard in religion did not square with what I saw, not in history and not in practice." He brings up the issue of compartmentalization in the first paragraph of his essay. "The contention is that science and religion can be made to co-exist by compartmentalization, that is, by carefully limiting the scope of each so that neither intrudes on the sphere of influence of the other. Such an approach is folly."

I feel called to examine and to ask myself, "Is that what I do?" Consciously, I see no profit in compartmentalization, but it is possible to fool one's self. I have done that on occasion. So I ask, "Do I carefully limit the scope of science and religion so as not to allow the one to intrude upon the other?" I have not thought this to be the case, but I acknowledge that there have been times when I've not let my values critique my scientific work and other times when I could have examined my religious beliefs more thoroughly. I also see that the knowledge of the world which I gain by reading and study often runs together with the personal experiences of my life, my reading of scripture, etc. I often reflect on both kinds of things in the same periods of meditation. (But then, I don't keep a neat desk either. Things get mixed up there as well.) The effect can be both disconcerting and exhilarating. I have no detailed, complete and comprehensive picture of the universe, and I have many questions and some speculations. Some are the kind that I feel I can share with my gospel doctrine class. Some are not.¹⁹

18. The invention by certain so-called "Christians" of a new enemy, "secular humanism" is lamentable. I would rather have the company of a "secular humanist" with a sense of irony than a "Saint" who was out to see that I always use my "agency" properly. Dyson's definition of a secular humanist is interesting. "Roughly speaking, a secular humanist is someone who believes in science and humanity but not in God. If that is the correct definition, I do not qualify as a scientific humanist. I cannot regard humanity as a final goal of God's creation." *Infinite in All Directions*, 8-9.

19. Consider the length of time the universe and the earth have existed. Geological time is vastly longer than people thought based on scriptural accounts. If Christ came in the meridian of time, are we to think that this means geological time? It has been about 4.5 billion years since the creation of the earth, 14 billion years since the probable creation of the universe we can see. Does

When I was a teenager, my father brought me an article on multiple working hypotheses from a trade magazine. The article taught that early in an investigation it might be useful to hold in mind several of the various hypotheses that can account for phenomena. Experiments are made and observations; then the ways in which these observations support the various hypotheses are noted. Judgment is deferred. I have made a habit of deferring judgment. Here are some of the data that seem important to me.

While I have found various "proofs of the existence of God" from the natural world not to be compelling, some are inviting. I have tried to live with an open mind, observing the variety of phenomena. I have had experience with blessing the sick, and I have had hands laid upon my head and felt the pain go away. I have had sudden flashes of illumination and felt the warmth of the Holy Spirit within me. I see beauty in the world, a phenomenon that transcends biological need and eludes any obvious evolutionary basis. I meditate on the wonder of being an individual who can communicate with other beings.²⁰ These experiences are anecdotal, not scientific, but they have moved me and left me thoughtful. I also feel that I have been in the presence of a being who loves me and accepts my love, and that experience has been transforming.

So I do not conclude from our increasing knowledge of the universe that there is no God. I believe in God because of having a relationship with my divine parents. I find in the increasing size of the known universe, humility and wonder.²¹ Wonder that we can understand so much of it, small as we are com-

that mean that the end is also to be reckoned in geological time, perhaps another 4.5 or even 14 billion years from now? If so, isn't the second coming a very long way off as well as our own resurrection and judgment day? Doesn't this render all our "last days," "latter-day" talk kind of silly?

20. Here are four things about the universe which cause me to wonder.

1. How is there beauty in things which do not provide air, drink, food, or reproductive potential, things which in fact by their very nature are deadly, big enough to kill us?

2. How is there such a thing as communication possible at all? People talk about how interesting it would be if there were such a thing as telepathy. It would be magic. But in fact any communication between two separate beings is remarkable.

3. How is it that the universe is comprehensible, intelligible at all by a 1.5-kg brain?

4. Abundance. Everything is running down, making heat death appear to be inevitable, but all around us we see great extremes. These extremes make it possible for life, but should there not some day be a heat death of the universe? How is it that with entropy we can hope for eternal life in a finite universe? The preacher observed, "The rivers run into the sea; yet the sea is not full." (Eccl. 1:7) We know of the hydrological cycle but we know of no self-renewing energy creation process in the heavens. Still, there are hints that such a thing may occur in special circumstances.

21. It is particularly sad when people became jaded to awe. Immanuel Kant declared, "Two things fill the mind with ever increasing wonder and awe—the starry heavens above me and the moral law within me." As quoted by Pastor Bruce Booher at <http://members.aol.com/starpastor/Opening-selves.html>. I went to Google and typed "Kant stars wonder" and got this. (As an aside, I am constantly impressed by what the web and fast search engines can find. Google coupled with a fast internet connection is probably the closest most of us will come, in this mortal existence, to having an Urim and Thummim. We stare into our own "sea of glass," and the computer monitor displays to us things panoramic things about our world and others. It even translates pages written in other lan-

pared to stars and galaxies. And wonder that God knows us. "What is man that thou art mindful of him?"²²

I do not feel that I have a final understanding. Our scientific knowledge continues to bring me new vistas of the organization of the universe. Syntheses which any of us produce will be outdated soon because our scientific knowledge continues to change, so we must stay humble. I do not regard my living this way as compartmentalization, but as realistic humility. If we are willing to let the "truths" stay in conversation, I believe we will continue to learn of heaven and earth.

Every person must choose and walk the path that he or she sees open ahead. It is good when each person can do that with the blessings of intelligence, an open mind, good friends and books, thoughtfulness, humility,²³ confidence, and the faith that what we are learning is worth sharing. David has done that here, though he has come to a different place than I.

I believe that many people take a similar approach. David talks about there being proponents of both science and religion who claim comprehensive and exclusive views of the world. This reflects a view of the institutions and their leaders as forceful entities in a position to demand ultimate allegiance. It may be what many people experience some of the time. I cannot, however, support putting institutions or their champions above ordinary individuals.²⁴ Each person must claim his or her eternal agency and deny final allegiance to any human invention, system, or institution be it a business, a political party, a religion, or scientific school. All these will finally fail our most basic human needs; only love can prevail.²⁵

gauges. Still, we must show discipline in what we look for. And avoid looking at what we should not.)

Walt Whitman also spoke of the need for wonder in the midst of learning:

When I heard the learn'd astronomer;
 When the proofs, the figures, were ranged in columns before me;
 When I was shown the charts and the diagrams, to add, divide, and
 measure them;
 When I, sitting, heard the astronomer, where he lectured with much
 applause in the lecture-room,
 How soon, unaccountable, I became tired and sick;
 Till rising and gliding out, I wander'd off by myself,
 In the mystical moist night-air, and from time to time,
 Look'd up in perfect silence at the stars.

22. Psalms 8:4

23. On the topic of humility and arrogance, Dyson says, "On the other hand, as I listen to the arguments raging in recent years between biologists and creationists over the teaching of biology in American schools, I am shocked to hear voices among the scientists sounding as arrogant as the voices of the creationists. . . .The tragedy of (the parents') situation lies in the fact that their religious beliefs are in conflict with the evolutionary doctrines of modern biology. But the scientists, by and large, show no respect or understanding for the human anguish of the parents." *Infinite*, 11.

24. Nor other creatures of flesh and blood. Consider "The Hippopotamus" by T.S. Eliot, *Poems* (New York: Knopf, 1920). (See, for example, <http://www.bartleby.com/199/20.html>) The hippopotamus will go to heaven but institutions cannot.

25. 1 Cor. 13: 7-8. The J.B. Phillips paraphrase is instructive. "Love knows no limits to its endurance, no end to its trust, no fading of its hope; it can outlast anything. It is, in fact, the one thing

I wrote earlier that I have many questions and some speculations. Put another way, as our scientific knowledge continues to expand, it brings me new vistas of the organization of the universe. And in the universe, I see echoes of the scriptures. If the past is a guide, any syntheses that we produce will soon be outdated. But it can be enlightening to think about them. I find aspects of the scriptures, which seem to echo insights modern physics brings. I would like to share one such exercise in natural theology.²⁶

My text: "Which Kolob is set nigh unto the throne of God, to govern all those planets which belong to the same order as that upon which thou standest."²⁷

In the last decade there have been a number of studies of the role of Jupiter in the organization, stability, and properties of the solar system, particularly the four inner, that is, the terrestrial planets. It has been pointed out by a number of researchers that Jupiter is likely responsible for many of the characteristics that have made the Earth capable of bearing complex animal and plant life.

Jupiter is a governor. It has an exceptional circular orbit. It is worth noting that, except for the sun, it carries most of the angular momentum in the solar system. Its effect on the planets which lie closer to the sun than it does is to keep their orbits almost circular as opposed to elliptical. This has kept the climate of earth more stable than it would otherwise have been over the eons, allowing more complex animal life and ecosystems to arise, develop, and diversify.

Jupiter is also a protector. "Long-period comets enter the solar system from its outer reaches. Jupiter's gravity slings most of these fast-moving ice balls out of the solar system before they can get close to Earth. So long-period comets are thought to strike Earth only about every 30 million years. Without Jupiter nearby, long-period comets would collide with our planet up to 1000 times more frequently."²⁸

When some of the early computer simulations of the long-term (millions of years) behavior of the solar system were done, the investigators put a planet the size of Saturn in the place of Jupiter to see how this might effect the system. Saturn is a gas giant like Jupiter, not quite as massive, but very large, compared to

that still stands when all else has fallen. For if there are prophecies they will be fulfilled and done with, if there are "tongues" the need for them will disappear, if there is knowledge it will be swallowed up in truth."

26. Natural theology is a neglected discipline. Dyson says, "According to Christian doctrine, God gave us two books in which his actions are recorded. One book is the Bible; the other is the Book of Nature. By reading the Book of Nature we can obtain knowledge of God's work, whether or not we also read the Bible. Natural theology is the reading of God's mind as expressed in the works of Nature." *Infinite*, 3-4. Latter-day Saints are used to finding harmonies between multiple books of scripture. So LDS can claim the right to try to harmonize in humility the Book of Nature and other scriptures.

27. Abraham. 3:9 (partial)

28. From Deborah Byrd and Joel Block, "Friendly Jupiter," *Earth & Sky*, April 23, 2001. "<http://www.earthsky.com/2001/es010423.html>." See also: "<http://learningexplorers.com/mike/Jupiter.htm>" and <http://www.pnas.org/cgi/content/full/98/3/809>."

the terrestrial planets. Nevertheless, it is not nearly as successful as Jupiter in stopping comets. The calculated bombardment rate of KT class, "dinosaur-killer" comets went up by a factor of 10 to 100 on Earth. This would be devastating for higher life on Earth. Comets and asteroids vary in size. Some are smaller. A few are considerably larger. It is the larger ones that are particularly noteworthy. It has been estimated that an object twice the size of the KT object could extinguish all animal life on earth.

Jupiter may also have been instrumental in the initial organization of Earth. It blocked the formation of a planet between it and Mars and, instead, left the matter in smaller chunks.²⁹ There is a suggestion that it brought water to the earth early on by flinging to the Earth chunks from the outer reaches of the asteroid belt where the composition of rocks is about ten percent water. This speculation is based on the isotopic ratio of water on Earth's matching the isotopic ratio of water from some asteroids better than that of water from comets.³⁰ Having just the right amount of water has been essential for higher life on Earth.

One of the reasons Jupiter's role in maintaining life on Earth is significant is that Jupiter appears to be uncommon as well as special. A decade ago there were no extrasolar planets and planetary systems known. Now we know of more than 100 planets and nearly as many systems.³¹ Most do not resemble our solar system with its Jovian planet (Jupiter) at about five AU with a circular orbit.

Lunine observed that, "The most striking, and oft-quoted, characteristic of the extra-solar menagerie is the preponderance of Jovian-mass planets at small orbital distances from their parent stars. Although the statistical overrepresentation of such tight orbits in the observed cohort of planets is biased by the fact that Doppler spectroscopy is most sensitive to smaller orbital semimajor axes, the mere existence of such objects forces a paradigm shift in our expectations regarding planetary system architectures."³² Many other Jovian planets have elliptical orbits. Jovian planets with elliptical orbits tend to destabilize smaller objects nearby, pumping their orbits to where they collide with their star or another planet or are hurled out of the system into the deep freeze of interstellar space. It appears that governors for terrestrial planets may not be common in the universe.

As this information became available a decade ago, I wondered if Jupiter might not be a type of Kolob, set at the beginning of the solar system to govern and protect the earth. Perhaps the word "govern" in Abraham could be referring to political and social issues, but the physical aspect is more clearly important

29. *Rare Earth*, 235-242, has an excellent analysis of the potential role of Jupiter in keeping the earth habitable for animal life. It also has some comments about the moon's role.

30. See for example, Jonathon I. Lunine, "The occurrence of Jovian planets and the habitability of planetary systems," *Proceedings of the National Academy of Sciences*, 98, no. 3 (2001): 809-814.

31. <http://www.obspm.fr/encycl/catalog.html> Saturday, June 07, 2003. Check Google for the latest count.

32. Jonathon I. Lunine, "The occurrence of Jovian planets and the habitability of planetary systems," *Proceedings of the National Academy of Sciences* 98, no. 3 (2001): 809.

for sustaining life on earth over geological time. It would be worthwhile to consider how the moon has also functioned as a type of Kolob for the earth since its creation over four billion years ago.

Let me end with the Natural Theology pillars of my own faith:

1. The universe is what it seems. God is not trying to fool us. "Subtle is the Lord, but malicious he is not," said Albert Einstein.³³ The world is not like a movie set. For example, it looks old because it is. (I explicitly reject the creationist fantasy that the universe was created just a few thousand years ago but was created to look as if it had come into existence over 10 billion years ago.)
2. We are meant to be able to understand the universe, though diligence, care, cooperation, humility and time are required. It amazes me that the universe is comprehensible, intelligible at all to a 1.5-kg brain? Nevertheless, this does seem possible.
3. Each individual human is more important than the institutions we have created to help us understand, discover, and honor truth. Love and respect are the appropriate way for me to relate to other beings.
4. The divine is accessible to each of us, but the modes and times of access differ as do the details of each individual's experience. Therefore, differed people will come to different conclusions about their experience.
5. God's love is eternal and amazing. God, who knows me, will not leave my soul in the grave. (Psalms 16:10) The universe is so large and full that there is room for miracles, including the survival of the individual soul.

A statement of faith is not a statement of fact, but I'm grateful for the opportunity to write in response to David Tolman's thoughtful paper. If his essay were delivered at a Sunstone Symposium, it could be in a "Pillars of my Faith" session. I love to hear someone with a deep spiritual concern speak from life's experiences, and that is what David has done. The fact that he has concluded there is no God is part of his own kind of affirmation, a statement of faith, in the face of much negative evidence. I hold the greatest respect and reverence for his thoughtful account. What he wrote calls me to examine myself. Our conclusions lie far apart, but I feel that we share a community of intention and that such a community is a natural home for the most challenging questions and most probing and significant kinds of dialogue.

33. This saying, now engraved above a fireplace of the faculty lounge of the Mathematics Department in Princeton, is the translation of "Raffiniert ist der Herr Gott, aber boshaft ist Er nicht." See Denis Brian, *Einstein: A Life* (New York: John Wiley & sons, 1996), 127.