

Science and Mormonism: Historical Perspective and Future Outlook

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“The Religion that is afraid of science dishonours God and commits suicide.”
[From Ralph Waldo Emerson’s journal, cited in J. L. Davis, J. T. Frederick, and
F. L. Mott, *A Treasury of American Literature*, vol. 1, Grolier, New York, 1948,
pg. 703].

Introduction

In this volume, Stan Larson has done a valuable service to modern LDS scholarship by publishing the heretofore little-known writings of Dr. Sterling Talmage on the topic of science and religion. In reading over them, one is struck in how relevant and perceptive they remain even today. This is partly because several of the issues that Sterling Talmage addressed in these writings, namely the challenges presented to conventional Latter-day Saint beliefs by modern geology, paleontology and evolutionary biology, are still before us.

One might think that at this point in time the great antiquity of the earth, as well as the reality of the various geological and biological processes that have shaped our world through the eons, would no longer be topics of controversy in the LDS community. They certainly are not topics of controversy among the vast majority of LDS scientists, who have successfully reconciled their religious faith with their scientific knowledge. But to many in the more orthodox sector of the Church, these topics remain controversial. As a single example, BYU religion professor Joseph Fielding McConkie recently wrote, “This world will know seven thousand years of temporal history. ... To argue for a longer time is to suggest ages for which God has forgotten to call for accountability.” [Joseph Fielding McConkie, *Answers: Straightforward Answers to Tough Gospel Questions*, Deseret Book, Salt Lake, 1998, pg. 165].

Further, scientific research has most certainly not stood still in the 70 years since Dr. Talmage wrote this material. These decades have seen the elucidation of the molecular structure of DNA, the development of the “standard model” of physics (the current theory that accounts for all known fundamental particles and forces), the discovery of evidence for a “big bang”, breathtaking photos of distant planets and galaxies, the development of astoundingly powerful computer and information technology, and other marvels too numerous to mention. With these exciting developments, many devout members of the faith, especially college-age youth, are torn between their devotion to what they assume to be orthodox LDS theology on one hand, and principles emanating from the world of scientific research on the other hand.

What will the future bring? Will the LDS Church be able to retain the essence of its distinctive theology in the face of challenges from science? Will it be able to retain its large cadre of professional scientists? Will LDS youth be able to deal with these challenges?

Before attempting to answer these questions, it is useful to first examine these issues in historical perspective. This is but a brief overview. Additional information can be obtained in works by Jeffery and Paul [Duane Jeffery, "Seers, Savants and Evolution: The Uncomfortable Interface," *Dialogue*, vol. 8, no. 3 (Autumn 1974), pg. 41-75; Erich R. Paul, *Science, Religion, and Mormon Cosmology*, University of Illinois Press, 1992].

Past

At a time when other Christian faiths were still smarting from the Copernican revolution, Joseph Smith's revelations, as recorded in LDS scriptures, include frequent reference to God's vast creations -- "worlds without number" [D&C 76:24, 88:37-39, 93:10; Moses 1:29-35; Abraham 3:9]. In another departure from traditional Christian orthodoxy, he taught that God works in accordance with natural laws, rather than by transcending natural laws: "True science is a discovery of the secret, immutable and eternal laws, by which the universe is governed." [*Times and Seasons*, vol. 4, pg. 46 (Dec. 15, 1842)]. He specifically denied creation *ex nihilo*, teaching instead that matter is eternal [D&C 93:33].

Other early leaders of the Church expressed similarly progressive views. Orson Pratt, who authored a number of scientific and mathematical works, endorsed the view that humans discover scientific truths known to God as their knowledge progresses [*Journal of Discourses*, vol. 7, pg. 157 (Feb. 12, 1860)]. His brother Parley P. Pratt taught that the LDS theology encompasses all of human knowledge, including "philosophy, astronomy, history, mathematics, geography, languages, the science of letters." [Parley P. Pratt, *Key to the Science of Theology*, London, 1855, pg. 2].

Brigham Young, in his many speeches recorded in the *Journal of Discourses*, was highly positive towards the pursuit of scientific knowledge, emphasizing its beauty, practical value and divine origin. He was particularly open-minded about such issues as the age of the earth and how literally one should read Biblical scriptures on scientific questions. Here are just a few excerpts:

Every discovery in science and art, that is really true and useful to mankind, has been given by direct revelation from God, though but few acknowledge it. It has been given with a view to prepare the way for the ultimate triumph of truth, and the redemption of the earth from the power of sin and Satan. We should take advantage of all these great discoveries, the accumulated wisdom of ages, and give to our children the benefit of every branch of useful knowledge, to prepare them to step forward and efficiently do their part in the great work. [JD, vol. 13, pg. 247-248].

What does the philosophy of the Christian sects, or many of them, not all, teach? "God made the world in six days, out of nothing!" This is very wrong; no child should be taught any such dogma. God never did make a world out of nothing; He never will, He never can! There is no such principle in existence. [JD, vol. 14, pg. 116].

In these respects we differ from the Christian world, for our religion will not clash with or contradict the facts of science in any particular. You may take geology, for instance, and it is a true science; not that I would say for a moment that all the conclusions and deductions of its professors are true, but its leading principles are; they are facts--they are eternal; and to assert that the Lord made this earth out of nothing is preposterous and impossible. God never made something out of nothing; it is not in the economy or law by which the worlds were, are, or will exist. There is an eternity before us, and it is full of matter; and if we but understand enough of the Lord and his ways, we would say that he took of this matter and organized this earth from it. How long it has been organized it is not for me to say, and I do not care anything about it. As for the Bible account of the creation we may say that the Lord gave it to Moses, or rather Moses obtained the history and traditions of the fathers, and from these picked out what he considered necessary, and that account has been handed down from age to age, and we have got it, no matter whether it is correct or not, and whether the Lord found the earth empty and void, whether he made it out of nothing or out of the rude elements; or whether he made it in six days or in as many millions of years, is and will remain a matter of speculation in the minds of men unless he give revelation on the subject. If we understood the process of creation there would be no mystery about it, it would be all reasonable and plain, for there is no mystery except to the ignorant. [JD, vol. 15, pg. 127].

In the early twentieth century, LDS authority Brigham H. Roberts frequently addressed scientific topics in his writings. In his monumental opus *The Truth, the Way, the Life*, he attempted at length to harmonize modern secular and scientific knowledge with LDS theology [Brigham H. Roberts, *The Truth, the Way, the Life: An Elementary Treatise on Theology*, 1930; ed. Stan Larson, Smith Research Associates, SLC, 1994]. He included many details of the current understanding of astronomy and astrophysics, even Hubble's expanding universe and Einstein's relativity, which were both quite new at the time. He acknowledged the great antiquity of the earth and the existence of pre-Adamic life, including beings resembling modern-day humans. He repeatedly emphasized that both science and revelation are indispensable in the search for ultimate truth. For example, he wrote

On the other hand, to limit and insist upon the whole of life and death to this side of Adam's advent to the earth, some six or eight thousand years ago, as proposed by some, is to fly in the face of the facts so indisputably brought to light by the researcher of science in modern times, and this as set forth by men of the highest type in the intellectual and moral world; not inferior men, or men of sensual and devilish temperament, but men who must be accounted as among the noblest and most self-sacrificing of the sons of men -- of the type whence must come the noblest sons of God, since "the glory of God is intelligence" (D&C 93:36); and that too the glory of man. These researchers after truth are of that class. To pay attention to and give reasonable credence to their research and findings is to link the church of God with the highest increase of human thought and effort. On that side lies development, on the other lies contraction. It is on the former side that

research work is going on and will continue to go on, future investigation and discoveries will continue on that side, nothing will retard them, and nothing will develop on the other side. One leads to narrow sectarianism, the other keeps the open spirit of a world movement with which our News Dispensation began. As between them which is to be our choice? [pg. 364].

However, by about 1930 (the approximate date of some of Sterling B. Talmage's writings in this volume), this generally positive approach to science in the LDS Church began to give way to a more fundamentalist approach. This can be seen in the dispute, mentioned in this volume, between Brigham H. Roberts, Joseph Fielding Smith and James E. Talmage (Sterling Talmage's father) over the question of the Church's official stance towards evolution [Richard Sherlock, "We Can See No Advantage to a Continuation of the Discussion: The Roberts/Smith/Talmage Affair," *Dialogue*, vol. 13, no. 3 (Fall 1980), pg. 63-78]. This dispute arose when Roberts attempted to gain permission to publish his manuscript *The Truth, the Way, the Life*, which was opposed by Joseph Fielding Smith due to its mention of "pre-Adamites." The matter ended inconclusively in 1931 when the First Presidency blocked publication of Roberts' book and issued a memorandum declaring, "Leave geology, biology, archaeology and anthropology, no one of which has to do with the salvation of the souls of mankind, to scientific research, while we magnify our calling in the realm of the Church." [Sherlock 1980, pg. 71].

Some LDS authorities, mainly those of scientific or intellectual backgrounds, continued to advocate a positive and open-minded approach to scientific questions. One of these was James E. Talmage. As one can see clearly from the letters and other material in this volume, the senior Talmage attempted on several occasions to preserve a progressive view on scientific issues in the LDS Church. Perhaps his most memorable commentary on this topic is the speech "The Earth and Man", which was later published by the Church. After mentioning countless generations of living organisms that populated the earth long before Adam, he noted,

The opening chapters of Genesis, and scriptures related thereto, were never intended as a textbook of geology, archaeology, earth-science, or man-science. Holy Scripture will endure, while the conceptions of men change with new discoveries. We do not show reverence for the scriptures when we misapply them through faulty interpretation. [Tabernacle address, Salt Lake City, Utah, Sunday, August 9, 1931, published in pamphlet form by LDS Church].

Another LDS authority of this era who attempted to maintain a positive perspective towards scientific issues during this era was John A. Widtsoe, one of Mormonism's first academically trained scientists and an apostle for several decades. In *Evidences and Reconciliations* he discussed, among other things, the increasing weight of evidence for a very old earth and even presented a detailed tutorial on the technique of uranium isotope dating [John A. Widtsoe, *Evidences and Reconciliations*, Bookcraft, SLC, 1951, pg. 149]. In an article published in the *Improvement Era*, Widtsoe mentioned the existence of "human-like" beings before Adam, and explained that "the mystery of the creation of Adam

and Eve has not yet been revealed.” [John A. Widtsoe, “Were There Pre-Adamites?” *Improvement Era*, vol. 51, no. 5 (May 1948), pg. 205].

But voices such as these eventually became a minority view. In 1954, after Talmage, Roberts and Widtsoe had passed away, Joseph Fielding Smith, with the encouragement of several other general authorities, published his manuscript *Man: His Origin and Destiny* [Joseph Fielding Smith, *Man: His Origin and Destiny*, Deseret Book, SLC, 1954]. His philosophies were further developed in subsequent works such as his *Doctrines of Salvation* [Joseph Fielding Smith, *Doctrines of Salvation*, Bookcraft, SLC, 1956]. In these works he promoted a highly literal interpretation of creation scriptures. On the age of the earth, he asserted that the earth’s temporal existence “is to endure for just one week, or seven days of 1,000 years each.” [Smith 1956, pg. 80]. He insisted that Noah’s flood completely immersed the earth [Smith, 1954, pg. 414-436]. He condemned the theory of evolution as “falsehood absolutely” [Smith, 1956, vol. 1, pg. 140]. His views gained even greater circulation when they were cited in Bruce R. McConkie’s popular reference *Mormon Doctrine* [Bruce R. McConkie, *Mormon Doctrine*, second edition, Bookcraft, SLC, 1966, pg. 256].

During the sixties, seventies and eighties, some LDS authorities continued to emphasize a positive outlook on these issues. Pres. David O. McKay, who according to one friend personally accepted the principle of biological evolution, quietly assured those who inquired to his office that the Church had not taken an official position on the issue [Sterling M. McMurrin and L. Jackson Newell, “McMurrin’s Heresies, History, and Humor,” *Sunstone*, vol. 18, no. 1 (April 1995), pg. 55-62; William L. Stokes, “An Official Position,” *Dialogue*, vol. 12, no. 3 (Winter 1979), pg. 90-92]. In a talk given at BYU, he noted that evolution could be seen in a positive light, as evidence that we are destined for eternal life [David O. McKay, “A Message for LDS College Youth,” BYU Extension Publications, Provo, Oct. 10, 1952, pg. 6-7; *Conference Report*, April 1968, pg. 92; *Gospel Ideals*, Improvement Era Publications, SLC, 1953, pg. 49]. In his memoirs, Hugh B. Brown declared, “We should be in the forefront of learning in all fields, for revelation does not come only through the prophet of God nor only directly from heaven in visions or dreams. Revelation may come in the laboratory, out of the test tube, out of the thinking mind and the inquiring soul, out of search and research and prayer and inspiration.” [Edwin B. Firmage, *The Memoirs of Hugh B. Brown: An Abundant Life*, Signature Books, SLC, 1988, pg. 139].

But most other LDS leaders during this time emphasized the dangers of science. Mark E. Petersen raised concern about the “tenuous and fragile theory that the universe and all life came about in some mysterious spontaneous, accidental manner.” [Mark E. Petersen, “Creator and Savior,” *Ensign*, May 1983, pg. 63-65]. Harold B. Lee listed “science so-called” with communism as among the sources of “untruth” challenging the world [Harold B. Lee, *Conference Report*, April 1964, pg. 21-25; also, Oct. 1968, pg. 59-62]. Bruce R. McConkie listed Darwin’s theory of evolution as one of the “seven deadly heresies” [Bruce R. McConkie, “The Seven Deadly Heresies,” BYU Fireside, June 1, 1980, transcript]. Ezra Taft Benson urged members to use the Book of Mormon to combat

falsehoods such as “socialism, organic evolution, rationalism, humanism.” [*Conference Report*, April 1975].

Present

The present situation is somewhat mixed. On one hand, some LDS authorities continue to favor a rather literalist approach to scientific questions. One example is a talk given by Boyd K. Packer at a BYU Book of Mormon symposium in 1988:

It is my conviction that to the degree the theory of evolution asserts that man is the product of an evolutionary process, the offspring of animals -- it is false! ... And, I am sorry to say, the so-called theistic evolution, the theory that God used an evolutionary process to prepare a physical body for the spirit of man, is equally false. ... How old is the earth? I do not know! But I do know that matter is eternal. How long a time has man been upon the earth? I do not know! But I do know that man did not evolve from animals. ... When confronted by evidence in the rocks below, rely on the witness of the heavens above. [Boyd K. Packer, “The Law and the Light,” in Nyman and Tate, *To Learn With Joy*, BYU, 1990. This published copy of the 1988 speech was prefaced with a strongly worded disclaimer].

In spite of the fundamentalist tone in these excerpts, note however that Elder Packer does not completely rule out the possibility that plants and animals are the product of an evolutionary process, nor does he rule out an old earth. In this regard his position seems slightly more flexible than some others of the past few decades.

There are other indications that the literalism which has dominated LDS literature during the last fifty years may have peaked. In 1987, in response to numerous inquiries from readers on the subjects of fossils, the age of the earth and related issues, the editors of the *Ensign* asked Morris Petersen, a professor of geology at BYU, to respond. He replied with a straightforward scientific explanation of the geological record, including evidence for the earth’s great antiquity and the progression of fossils from primitive to highly advanced forms [Morris Petersen, “Fossils and Scripture,” *Ensign*, Sep. 1987, pg. 28]. The fact that such an article could be published in the Church’s official organ, which requires numerous official committee reviews, indicates that at least part of the current LDS leadership is now comfortable with the conventional scientific picture of an old earth.

Another example is the student lesson manuals used in the Church Education System. The Old Testament manual currently used in institute classes, which was revised in 1981, takes a highly literalist approach. On the question of the age of the earth, the manual cites the work of Velikovsky and Cook in defense of the position that the earth is only a few thousand years old. On the question of evolution, the manual includes several quotes by certain general authorities, which appear to rule out any possibility of a reconciliation with LDS doctrine, while leaving other viewpoints unmentioned. These quotes are followed by a 22-paragraph excerpt from the writings of an evangelical creationist [*Old Tes-*

tament: Genesis -- 2 Samuel Student Manual, LDS, 1981, pg. 28-29, 33-36]. Similar commentary appears in several other places.

By contrast, the Old Testament manual currently used for seminary classes, which was revised in 1990, does not include any of the above material. Its only mention of evolution is in a brief question, to be considered by the student, regarding the scripture “whose seed could only bring forth the same in itself, after his kind” (Abraham 4:12). The manual concludes its discussion of the creation with the admonition, “There are still many unanswered questions about how the earth was created, but these will be answered in the Lord’s own due time.” [*Seminary Old Testament Student Manual*, LDS, 1990, pg. 18-19].

A third indication of a softening in the prevailing views on scientific issues is given in the *Encyclopedia of Mormonism*, which has at least semi-official status due to its sponsorship and rigorous review by the LDS Church [Daniel H. Ludlow, ed., *The Encyclopedia of Mormonism*, Macmillan, New York, 1992]. The article “Science and Religion” briefly summarizes LDS commentary on the subject, and then concludes that Latter-day Saints “look forward to a time when more complete knowledge in both areas will transcend all present perceptions of conflict.” The article “Origin of Man” emphasizes that there are differing views on this issue, and that the official position of the Church on man’s origin is “not definitive” [“Science and Religion,” vol. 3, pg. 1270-1272; “Origin of Man,” vol. 3, pg. 1053-1054].

The article “Evolution” is also telling [“Evolution,” vol. 2, pg. 478]. It is just a few paragraphs long, mainly a quote of the First Presidency’s neutral statement in conclusion to the 1931 Roberts-Smith-Talmage dispute (“Leave geology, biology, archaeology and anthropology, no one of which has to do with the salvation of the souls of mankind, to scientific research, while we magnify our calling in the realm of the Church.”). For this particular article, at least three much longer earlier drafts were reviewed and rejected by the First Presidency and other Church leaders. The First Presidency then supplied the 1931 letter from their files, and the ensuing *Encyclopedia* article contains little more than the short statement above. Incidentally, a slightly abbreviated version of this article is now distributed to persons inquiring about evolution to the Church’s headquarters.

Also encouraging to many scientifically-minded LDS is the success that BYU faculty and administration officials have had in resisting periodic efforts to impose creationist biology at the school [Gary J. Bergera and Ronald Priddis, *Brigham Young University: A House of Faith*, Signature Books, SLC, 1985, pg. 131-171]. Along this line, in 1992 the BYU Board of Trustees approved a packet of information regarding evolution to be provided for interested students at the library. It includes only a few statements by First Presidencies of the Church, omitting a large number of less conciliatory (and less authoritative) statements by other Church leaders.

Most recently, many LDS scientists took heart by a talk given by Russell M. Nelson in the April 2000 general conference [“The Creation”, *Conference Report*, April 2000]. In this talk he advocated, among other things, a rather flexible notion of the seven “phases”

of creation: "Whether termed a day, a time, or an age, each phase was a period between two identifiable events -- a division of eternity."

But these developments are shallow victories, given that most members still hold highly fundamentalist beliefs on many scientific questions. For example, over 80% of BYU students in a 1973 survey disbelieved that the creation involved evolution [Armand L. Mauss, *The Angel and the Beehive*, University of Illinois Press, Chicago, 1994, pg. 179].

Future

One day it may be lamented that such a large amount of intellectual energy was expended during the twentieth century debating evolution and the age of the earth, while other, potentially more significant questions were ignored. For it now seems clear that the twenty-first century will bring a host of new issues to the forefront. Here is a listing and brief discussion of some of these issues:

The recent discovery of an "ozone hole" over Antarctica, and the evidence that this phenomenon is due to fluorine compounds emitted by the industrialized nations, has convinced many observers that the environmental crisis must be taken seriously [Owen B. Toon and Richard P. Turco, "Polar Stratospheric Clouds and Ozone Depletion," *Scientific American*, vol. 264, no. 6 (June 1991), pg. 68-75; Sasha Nemecek, "Holes in Ozone Science," *Scientific American*, vol. 272, no. 1 (Jan. 1995), pg. 26-27]. Other looming crises include the steadily growing levels of atmospheric carbon dioxide (which is believed to be causing global warming), the destruction of tropical rain forests, and the ongoing extinction of numerous species of plant and animal life.

Are there scriptural suggestions of these calamities? How should world governments respond? Is it prudent for the LDS Church to become involved in environmental matters?

Hand in hand with the environmental crisis is the burgeoning world population. LDS authorities have historically discouraged the practice of birth control, although the Church's current official position on this issue is more moderate [Lester E. Bush, Jr., *Health and Medicine Among the Later-day Saints*, Crossroad, NY, 1993, pg. 152-159; Smith, 1956, vol. 2, pg. 87; Ezra Taft Benson, *Conference Report*, April 1969, pg. 10-15; Mark E. Petersen, *The Way to Peace*, Bookcraft, SLC, 1969, pg. 266; Ludlow, 1992, vol. 1, pg. 116-117]. In any event, the question of worldwide population control is coming explosively to the fore as it appears that the green revolution of the last few decades may have run its course, and the food supply cannot be increased much further without serious environmental damage [John Bongaarts, "Can the Growing Human Population Feed Itself?" *Scientific American*, vol. 270, no. 3 (March 1994), pg. 36-43]. In China, for example, even though a draconian birth control program has reduced the country's annual population growth rate to only 1.4%, the nation grows by 17 million persons per year. Analysts project that by the year 2030, China alone could consume all the surplus grain produced in the world today, just to meet the most basic nutritional needs of its population [Eugene Linden, "Showdown in Cairo," *Time*, vol. 144, no. 10 (Sept. 4, 1994), pg. 52-53].

If pressure continues to build for limiting population around the world, what counsel should be given to prospective LDS parents on the size of their families? Should families in all regions of the world be given the same counsel?

Advances in biological science are certain to bring some significant questions of medical ethics to the fore. An example is the detection of genetic defects by DNA analysis [Philip Elmer-Dewitt, "The Genetic Revolution," *Time*, vol. 143, no. 3 (Jan. 17, 1994), pg. 46-57]. If a person is diagnosed with a genetic defect, should he/she be encouraged to have children? Which defects are serious enough to justify formal or informal restrictions? One key question here is whether or when abortion should be considered for fetuses diagnosed with serious defects. At the present time the LDS Church's official condemnation of abortion excepts cases where "a severely defective fetus cannot survive birth." [Bush, 1993, pg. 159-167; Ludlow, 1992, vol. 1, pg. 7].

A related issue is the possible cloning of human beings [Philip Elmer-Dewitt, "Cloning: Where Do We Draw the Line," *Time*, vol. 142, no. 19 (Nov. 8, 1993), pg. 64-67; Jim Puzanghera, "A Call for Caution in Mammal Cloning," *San Jose Mercury News*, Feb. 24, 1997]. If this becomes possible, under what circumstances should it be allowed? Still another issue along this line is the commercialization of human gene therapies, as well as the creation and patenting of new species by genetic engineering [Richard Stone, "Religious Leaders Oppose Patenting Genes and Animals," *Science*, vol. 268 (May 26, 1995), pg. 1126; Kenneth L. Woodward, "Thou Shalt Not Patent!" *Newsweek* (May 29, 1995), pg. 68-69].

Even though there have been great advances in medical technology during the twentieth century, the pace of progress is likely to accelerate during the twenty-first. While these developments will be a great boon to the majority of mankind, they are certain to pose more and more dilemmas in prolonging the lives of terminally ill patients [C. Everett Koop and Timothy Johnson, *Let's Talk -- An Honest Conversation on Critical Issues*, Zonderman Press, Grand Rapids, MI, 1992, pg. 39-60].

What portion of our resources should be devoted to extending the lives of those who at best have only a few months left, as opposed to measures that will improve the quality of life for others? When does meaningful life end? When should the plug be pulled? Is euthanasia ever warranted? At the present time the LDS Church strongly condemns any form of euthanasia, although it permits artificial life support systems to be disconnected after prayerful consideration [Bush, 1993, pg. 36-39; Ludlow, 1992, vol. 3, pg. 1159-1160].

Recently scientists have found evidence that homosexuality is at least partly determined by heredity and related biological factors [Simon LeVay and Dean H. Hamer, "Evidence for a Biological Influence in Male Homosexuality," *Scientific American*, vol. 270, no. 5 (June 1994), pg. 44-49; William Byne, "The Biological Evidence Challenged," *Scientific American*, vol. 270, no. 5 (June 1994), pg. 50-55; Larry Thompson, "Search for a Gay Gene," *Time*, vol. 145, no. 24 (June 12, 1995), pg. 60-61]. Historically the LDS Church has regarded homosexuality as a sinful lifestyle choice, although the Church's current

official position is more flexible than in the past [Bush, 1993, pg. 173-178; Benson, 1988, pg. 280; Spencer W. Kimball, *The Miracle of Forgiveness*, Bookcraft, SLC, 1969, pg. 78-89; Ludlow, 1992, vol. 2, pg. 655-656]. If the evidence for a biological connection grows stronger, how should the Church respond?

There are striking similarities between humans and certain animals, particularly primates, not only in terms of anatomy, but also in terms of behavior. Some animals have even been taught to use rudimentary language [Carl Sagan and Ann Druyan, *Shadows of Forgotten Ancestors*, Random House, New York, 1992; Eugene Winden, "Can Animals Think?," *Time*, vol. 141, no. 12 (Mar. 22, 1993), pg. 54-63]. To what extent can animals think? What really distinguishes us from the animal kingdom? How much of human behavior derives from an evolutionary past? How much of our darker nature can be overcome? Can scientific research offer any perspectives on the eternal struggle between good and evil, and vice versa?

The big bang cosmological theory is the currently accepted model for the origin and evolution of the universe, although questions remain regarding its evolution since then [Corey S. Powell, "The Golden Age of Cosmology," *Scientific American*, vol. 267, no. 1 (July 1992), pg. 17-22; R. Cowen, "Hubble Telescope Eyes a Younger Universe," *Science News*, vol. 146, no. 18 (Oct. 29, 1994), pg. 278; Michael D. Lemonick and J. Madeleine Nash, "Unraveling Universe," *Time*, vol. 145, no. 9 (Mar. 6, 1995), pg. 77-84]. How can the notion of a finite-age universe be accommodated in LDS doctrine, which has historically taught that matter is eternal, and which has favored a steady-state cosmology? Was God the architect of the universe at the big bang? Does God exist in time and space, as a physical member of this universe, or does He exist elsewhere, beyond time and space? [Robert Wright, "Science, God and Man," *Time*, vol. 140, no. 26 (Dec. 28, 1992), pg. 38-44; Paul Davies, *God and the New Physics*, Simon and Schuster, New York, 1983]. If He exists beyond time and space, how can He influence our present world?

Current formulations of the big bang cosmology seem to indicate that the fundamental laws of physics are exquisitely tuned to permit the existence of matter, stars and sentient beings [Paul Davies, *The Accidental Universe*, Cambridge University Press, New York, 1982; John D. Barrow and Frank J. Tipler, *The Anthropic Cosmological Principle*, Oxford University Press, New York, 1986; Steven Weinberg, "Life in the Universe," *Scientific American*, vol. 271, no. 4 (Oct. 1994), pg. 44-49]. Are these facts evidence of the existence of a creator, or are there other, more prosaic explanations? Why does the universe exist at all -- why is there something and not nothing? [Andrei Linde, "The Self-Reproducing Inflationary Universe," *Scientific American*, vol. 271, no. 5 (Nov. 1994), pg. 48-55; Paul Davies, *The Mind of God*, Touchstone, New York, 1992, pg. 39-72, 161-193; Steven Hawking, *A Brief History of Time*, Doubleday, New York, 1988].

Quantum theory, a cornerstone of modern physics, draws into question our basic notions of reality. One of its assertions, that there is a fundamental uncertainty in all physical measurements, has been solidly confirmed in a number of recent experiments [Abner Shimony, "The Reality of the Quantum World," *Scientific American*, vol. 258, no. 1 (Jan.

1988), pg. 46-53]. Furthermore, the emerging field of chaos theory tells us that many physical processes exhibit the “butterfly” property: an arbitrarily small change to present conditions can dramatically affect the future state of the system [James Gleick, *Chaos: Making a New Science*, Viking Penguin, New York, 1987]. Thus there appear to be fundamental limits to the ability to predict future events.

How can God’s foreknowledge and the principle of prophecy be interpreted in light of these theories? Do these theories shed any light on the principle of free agency, or do they further complicate the issue?

As was noted above, LDS literature, especially in the nineteenth century, is replete with references to beings on other worlds. Indeed, most scientists today assume that intelligent life is widespread in the universe, and researchers have proposed numerous scenarios for the detection of extra-terrestrial civilizations. Since at present the most reasonable approach appears to be the detection of microwave signals emitted by other societies, extensive astronomical searches of the microwave region of the electromagnetic spectrum are being conducted. Unfortunately, however, these and other scientific searches have so far turned up nothing [Barrow and Tipler, 1986, pg. 576-612; Paul, 1992, pg. 193-227; Carl Sagan, “The Search for Extraterrestrial Life,” *Scientific American*, vol. 271, no. 4 (Oct. 1994), pg. 92-99; Carl Sagan, *Pale Blue Dot: A Vision of the Human Future in Space*, Random House, NY, 1994, pg. 351-365].

Are we alone? If not, where are these other beings? Is their biology based on DNA, like ours, or on a completely different biochemical system? How do they think, communicate and govern themselves? What are their religious beliefs? If these searches continue to come up empty-handed, how might this affect LDS theological discourse? On the other hand, if intelligent life is detected elsewhere, how might this momentous discovery be accommodated?

Many people imagine that the work of a mathematician largely consists of repetitive and mechanical manipulations of mathematical expressions. In fact, the process of mathematical discovery is a highly intuitive process, with deep abstract contemplation followed by sudden bursts of brilliant insight. Often it takes months after this flash of insight to work out all the technical details [John D. Barrow, *Pi in the Sky: Counting, Thinking and Being*, Little Brown and Company, New York, 1992; Robert Kanigel, *The Man Who Knew Infinity*, Washington Square Press, New York, 1992; Barry Cipra, “Princeton Mathematician Looks Back on Fermat Proof,” *Science*, vol. 268 (May 26, 1995), pg. 1133-1134].

How is it possible to intuitively sense the outcome of a long train of very abstract and difficult mathematical reasoning? If, as many philosophers believe, mathematical truths exist independent of the universe, human beings and our particular physiology, how is it that our minds can discover them? Is religious revelation another manifestation of this process? If so, what can be learned about revelation and vice versa? Why does the universe appear to be governed by profound and elegant mathematical laws? [Davies, 1992, pg. 140-160].

A far-reaching discovery by twentieth-century mathematician Kurt Godel rules out the possibility of proving the logical consistency or completeness of formal mathematics. In other words, we can never be absolutely certain that the basic axioms utilized in mathematics are logically consistent; and even if we assume that they are, there will always exist questions which cannot be answered either affirmatively or negatively in the system [Barrow, 1992; Douglas R. Hofstadter, *Godel, Escher, Bach: An Eternal Golden Braid*, Random House, New York, 1979]. In the field of fundamental particle physics, we already are pressing the limits of our ability to construct (and society's willingness to pay for) experiments that can decide between competing theories. Although some scientists remain optimistic that we will soon discover a "final theory," it may be that we will be forever frustrated in this quest. In any event, we can never be absolutely certain that we completely understand the fundamental laws of the universe, or that our formulation of them is the most elegant possible [Steven Weinberg, *Dreams of a Final Theory*, Vintage Books, New York, 1994; John Hor Horgan, "Particle Metaphysics," *Scientific American*, vol. 270, no. 2 (Feb. 1994), pg. 96-106; David Lindley, *The End of Physics*, Basic Books, New York, 1993; Davies, 1992].

In other words, in the two most "certain" and "precise" of the sciences, absolute certainty appears forever out of reach, and there may be questions which can never be conclusively answered. Do these principles have analogies in theology? In particular, is God's knowledge limited in this manner? For that matter, are there limits to potential human knowledge of theological questions?

In recent years some scientists have boldly speculated on the possibility of immortality, proposing various scientific scenarios for how this might be achieved. Some suggest that the remarkable advances now predicted for advanced technology during the next few decades will result, among other things, in medicines that slow or even reverse the aging process. Others look forward to a time when mankind will free itself from its historic reliance on flesh, blood and brainpower [K. Eric Drexler, *Engines of Creation: The Coming Era of Nanotechnology*, Doubleday, New York, 1990; Marvin Minsky, "Will Robots Inherit the Earth?" *Scientific American*, vol. 271, no. 4 (Oct. 1994), pg. 108-113; Frank J. Tipler, *The Physics of Immortality*, Doubleday, New York, 1994]. To what extent can doctrines such as immortality be submitted to scientific examination? Do LDS scriptures and literature offer any insight into these questions?

The phenomenon of human consciousness is being actively investigated by biologists, psychologists, physicists, philosophers and even computer scientists. Some scientists argue that it is fundamentally impossible to model or understand consciousness, while others dismiss such arguments and say it is only a matter of time, for instance, before computers can realistically model human thought [Barrow, 1992; Hofstadter, 1979; Minsky, 1994; Tipler, 1994; John Horgan, "Can Science Explain Consciousness?" *Scientific American*, vol. 271, no. 1 (July 1994), pg. 88-94]. What exactly is human consciousness? What is the relationship between consciousness and the "soul" or "spirit" of LDS theology?

Others? If the breathtaking pace of scientific and technological advancement of the past half century is any clue, we will see new and intriguing developments in the twenty-first century that can now only be dimly imagined. In particular, there are suggestions that scientific issues will encroach even more on social issues, thereby generating additional confrontations between science and religion.

The Challenge of Science

Conflicts between science and religion are as old as recorded history. In the sixth century B.C., a mathematician in the Pythagorean philosophical school was able to prove that the diagonal of a square is incommensurate with its sides. In our modern mathematical terminology, we would say he proved that the square root of two is an irrational number -- it cannot be expressed exactly as the ratio of two whole numbers. This discovery precipitated a major crisis for the Pythagorean school and its numerology-based religion, since one of their fundamental beliefs was the assumption that all reality could be described using whole numbers. The school reportedly drowned one of its number who publicly discussed this unsettling discovery [Bertrand Russell, *Wisdom of the West*, Crescent Books, London, 1959, pg. 22; D. W. Hamlyn, *A History of Western Philosophy*, Viking Penguin, NY, 1987, pg. 18-19].

In the middle ages, growing exposure to ancient Greek and middle eastern writings caused considerable consternation among medieval Christian theologians. As a single incredible example, theologians were once disturbed at the discrepancy between the Biblical value of the ratio between the circumference and diameter of a circle, namely 3.0 (based on the dimensions of the circular pool in King Solomon's temple -- see 1 Kings 7:23 and 2 Chr. 4:2) and the more accurate values (approximately 3.14159) obtained by mathematicians in ancient Greece and medieval Europe. As late as the eighteenth century, Bible commentators were still attempting to explain away this discrepancy, using imaginative (if pathetic) dodges such as speculating that the circular pool in Solomon's temple was really hexagonal in shape [Petr Beckmann, *A History of Pi*, St. Martin's Press, NY, 1971, pg. 75-76. Beckmann references a seven-volume history of mathematics, in German, by Jerome Tropicke, published in 1923. Tropicke in turn quotes some original eighteenth century sources].

The most serious challenge of the expanding corpus of scientific knowledge was to the geocentric, flat-earth cosmology that had been assumed in the Judeo-Christian world for centuries. Many Christian scholars, who noted the numerous instances in the Bible of the "four corners," the "foundations," the "pillars" and the "ends" of the earth, could not see how these scriptures could be reconciled with the scientific notion of a spherical earth [Gen. 1:7; 1 Sam. 2:8; 2 Sam. 22:16; Job 28:24; 38:4; Psa. 75:3; 102:25; 135:7; Isa. 11:12; 48:13; Jer. 10:13; 31:37; Eze. 10:1; Zech. 9:10, Heb. 1:10; Rev. 7:1; and others]. The last straw for these theologians was Copernicus' heliocentric cosmology, in which the earth was but one of several comparatively small planets orbiting the sun. Many felt that this cosmology was so clearly incompatible with numerous Biblical scriptures that both the Bible and the Church would lose their authority if it prevailed [Josh. 10:12-13; Job 9:6-7; Psa. 93:1; 104:5; 104:19; Eccl. 1:5; Isa. 38:7-8; Amos 8:9 and others]. The

Jesuits considered the theory more dangerous than the heresies of Luther and Calvin. The Inquisition forced Galileo to recant his arguments in support of it [Will and Ariel Durant, *The Story of Civilization*, Simon and Schuster, New York, 1961, vol. 7, pg. 600-612]. Martin Luther, who taught that the Bible was the infallible word of God, rejected the Copernican theory because Joshua commanded the sun, not the earth, to stand still [Josh. 10:12-13; Durant, 1961, vol. 6, pg. 858].

In the nineteenth century, similar warnings were voiced in Catholic and Protestant circles with regards to Darwin's theory of evolution. The same is true to a lesser extent in the twentieth century regarding theories such as the big bang.

If there is a lesson to be learned from these examples, it is that scientific challenges which may seem to present insuperable difficulties for religious faith in one era are almost always seen to be compatible with faith in another. For example, Bibles today still contain the many passages that reflect the geocentric, flat-earth cosmology of antiquity, yet only the most ardent fundamentalists lose sleep over them. It is now widely appreciated that the writers of the Bible wrote from their own world view, often in a poetic style, and no one expects that they could have anticipated every principle of modern science. Along this line, while many are still uncomfortable with the theory of evolution, others now view it as an elegant and effective mechanism utilized by God to achieve the creation. Some further argue that any attempt to read the scriptures as scientific documents, against the intent of the original writers, only obscures the deeper spiritual messages contained in them [Keith E. Norman, "Adam's Navel," *Dialogue*, vol. 21, no. 2 (Summer 1988), pg. 81-97; Karen Armstrong, *A History of God*, Knopf, New York, 1993, pg. 395; John S. Spong, *Rescuing the Bible from Fundamentalism*, New York, 1991, pg. 25-36]. This is certainly the approach advocated by James E. Talmage, who, as noted above, once declared, "The opening chapters of Genesis, and scriptures related thereto, were never intended as a textbook of geology, archaeology, earth-science, or man-science. ... We do not show reverence for the scriptures when we misapply them through faulty interpretation." [Talmage 1931].

A Latter-day Saint Perspective

How can the LDS Church best cope with the challenges of science during the twenty-first century? Some Latter-day Saints may dismiss the need to explore such issues, believing that the second coming of Christ will occur soon, rendering many of these issues moot. But others note scriptures such as "But of that day and hour knoweth no man" [Matt. 24:36] and conclude that we cannot rely on such assumptions, and that pressing issues in the arena of science and religion should not be blithely ignored.

On one hand it seems clear that if the Church adopts a strict, fundamentalist approach, with a rigid "creed" that precludes a harmony between science and religion, then it risks losing many educated members, especially in developed countries such as the U.S., Canada, Europe and Japan. Particularly at risk are young Latter-day Saints at colleges and universities, who usually lack the sophistication to see beyond superficial conflicts to the deeper issues. The tensions that many of these students now experience will only in-

crease if they are required to choose between increasingly well-established scientific knowledge and a narrowly defined religious orthodoxy.

Fortunately, as mentioned above, there are some indications that the scriptural literalism which has dominated LDS science discourse for the past half-century may be giving way to a more open-minded approach. It remains to be seen, however, whether this new approach will be more than passively advocated by Church leaders, and whether it will be accepted by rank and file members, many of whom have adopted a highly literal belief system.

On the other hand, an isolationist approach appears equally doomed to failure in a world that is destined to be increasingly pervaded by science and technology. Some separation of science and Mormonism is certainly appropriate -- surely there is no point in the Church delving into matters that are largely irrelevant to its theology or which are still highly tentative from a scientific point of view. Even in most other cases, it may well be best for the LDS Church, in its official declarations, to simply remain silent. It is certainly unwise for anyone in the Church to make "final" statements with regards to the ever-expanding world of scientific knowledge.

But if Mormonism is completely segregated from science, or if meaningful discussion of scientific topics is ruled off-limits within the Church, then it risks being viewed as sterile and irrelevant, largely disconnected from the real world. John A. Widtsoe warned about such an isolationist approach: "Scientific truth cannot be theological lie. To the sane mind, theology and philosophy must harmonize. They have the common ground of truth on which to meet." [John A. Widtsoe, *Joseph Smith As Scientist*, Bookcraft, SLC, 1964, pg. 156; originally published in 1908]. In a similar vein, physicist-theologian Frank J. Tipler has warned, "if religion is permanently separated from science, then it is permanently separated from humanity and all of humanity's concerns. Thus separated, it will disappear." [Tipler, 1994, pg. 332].

Thus it appears that the LDS Church has no choice but to steer a middle course, applying its collective gifts of intelligence and inspiration to carefully consider these matters and to ponder their significance for the faith. Certainly LDS scientists must participate in this dialogue. Thus we can only hope that the current tense atmosphere will improve before we enter the next century.

Fortunately, the LDS Church has one very important advantage over many other religious denominations in dealing with the challenges of science: its fundamental belief in continuing revelation, as declared in the ninth Article of Faith. One consequence of this principle is that the current Church teachings and policies at any given point in time should never be considered final, absolute, complete or infallible. Instead, they should be considered as representing the best present understanding, and possibly subject to being viewed in a different light as knowledge and understanding grows.

Conclusion

In ancient China, a favorite curse was “may you live during interesting times,” as opposed to those serene periods of history, during stable dynasties, which were pleasant to live in but make rather boring history. Clearly we are living in “interesting” times now. Yet there are distinct advantages to living in these exciting times. As can be seen from the preceding discussion, for every emerging scientific development that poses a difficult challenge to religion in general and to the LDS religion in particular, there is another that suggests genuine faith can be successfully enlarged to accommodate modern scientific discoveries, with both science and religion enriched in the process.

And it is undeniable that there is sublime, spiritually rewarding pleasure in discovering truths previously known only to God. Perhaps it is a good thing that He always holds some of the most fascinating and fundamental truths just beyond our reach, so that we always have something to seek for and wonder about.