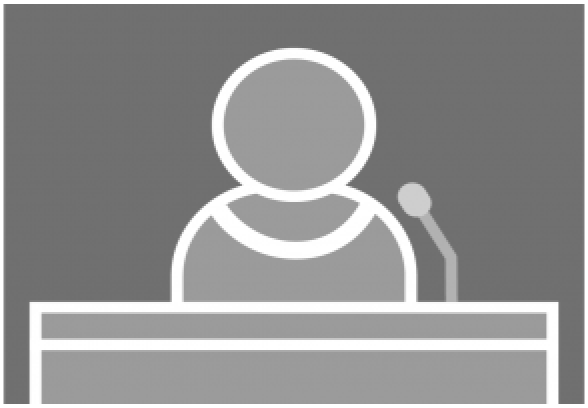
Worthy of Serious Study



Robert N. Winget
Professor of Biology
David O Mckay Lecture
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Dr. Robert N. Winget has been a professor of biology at BYU-Hawaii since 1985. He earned his bachelor's and master's degrees in zoology and entomology, and his Ph.D. in biological sciences — all from the University of Utah. Soon after he began teaching and then doing fulltime environmental research at BYU in Provo before joining the BYU-Hawaii faculty.

In Laie Dr. Winget, who is originally from Monroe, Utah, has been active in Scouting, school and community organizations; and he enjoys gardening, photography, reading and dart throwing. All seven of his children have attended BYU-Hawaii, five of them graduating from the university. His wife, Linda, reports that in his spare time he loves spending time with their grandchildren.

INTRODUCTION

I consider being chosen to give this lecture as a great honor and hope the content is in harmony with David O. McKay's memory. I have always held President McKay in the highest esteem, not only as prophet but also as an exemplary husband and father, and a friend to many. I remember as a young boy sitting on my grandpa Archibald William Young's knee on his birthday. He showed me a birthday card he had received from President McKay. Grandpa and David O. McKay served together in the same mission. Grandpa was so excited over a note, included in the card from President McKay, saying that a branch of the church in Scotland where they had worked, had received a new organ in their chapel. President McKay annually sent a card with a personal note enclosed, and Grandpa treasured each one.

A few years later, while a freshman at the University of Utah, I worked parking cars in the Hotel Utah garage. One special memory of working there . . . no, not denting the fender of that brand new white Cadillac . . . but rather of getting the call to get President McKay's shiny black car. I hurried into the basement and drove the car up the ramps and parked it in front of the entrance to the hotel. I went inside hoping to see President McKay. This was 1960 and President McKay was getting a little feeble and already had that beautiful head of wavy white hair. President McKay, accompanied by a man in a dark suit, was making his way down the long stairway from the penthouse. Near the bottom of the stairs, President McKay temporarily lost his balance but quickly regained it. The escort alertly grabbed his arm, but President McKay pulled his arm free, turned to the man and said: "I can make it, sonny!" And he did.

President McKay was an educated man, and he had a conviction of learning throughout one's life. His love of education was a great strength to me during the 1960's. I had just graduated from high school and started right out in a heavy science curriculum at the University of Utah -- the same school David O. McKay attended. I was immediately confronted with what some would call conflicts between science and religion.

Following completion of a mission to the Gulf States, I returned to the University of Utah and continued my educational pursuit, although I changed my major to biology. I developed a close friendship with a freshman from Delta, Utah. He was an avid fossil collector and a firm believer in evolution. He had been raised in a good LDS home and had a testimony of the basic teachings of the gospel, but he had a hard time understanding the contention people displayed when discussing what he was learning in geology and paleontology. Why did people get so defensive when he mentioned evidences supporting the age of the earth being in the billions of years and of extinct species of plants and animals that had lived millions of years before the time Adam and Eve lived in the Garden of Eden? My friend and I spent many hours discussing science and religion. We read related materials written by church leaders and scientists, and we attended firesides and devotionals when subjects were applicable. One fireside I remember was given by Melvin A. Cook, an explosives expert in the school of engineering at the University of Utah. Dr Cook claimed the earth was only 13,000 years old and dating techniques such as carbon dating were erroneous. He also claimed many principles of evolution were wrong. Although not especially helpful to our quest for understanding, Cook did present a point of view regarding the creation of the earth. Although ridiculed by many of the scientific community, there were some that accepted Dr. Cook's views as being founded in science and they welcomed a voice in support of the scriptural account of the creation. Evolution was not as strongly grounded in scientific research in the early 1960's as it is now. Criticism of the scientific explanation of the creation of the earth and the creation of life was common, making it difficult for those of us trying to come to grips with being scientists and still maintaining our relationship with the church.

President McKay was frequently involved in trying to prevent or ease contention between scientists and church leaders, and between church leaders themselves, as they argued such topics as the age of the earth, death before Adam, organic evolution, and other related topics. His response to a request for a clarification to one such situation illustrates his frustration: "Until the Lord speaks directly upon the matter, or until the scientists are able to say that they have the ultimate truth concerning these matters, it would only be confusing for the First Presidency to make any statement regarding such things" (Bergera and Priddis 1985, p. 158).

President McKay was tolerant of those with differing feelings and beliefs, and looked forward to those times when new information would be made available. I am reminded of one of my favorite scriptures regarding the Second Coming of Christ, a scripture frequently quoted by those on both sides of the arguments between science and religion: *"Yea, verily I say unto you, in that day when the Lord shall come, he shall reveal all things--- Things which have passed, and hidden things which no man knew, things of the earth, by which it was made, and the purpose and the end thereof---Things most precious, things that are above, and things that are beneath, things that are in the earth, and upon the earth, and in heaven*

" (D&C 101:32-34).

The feeling I have often perceived in the writings of many is the yearning for a clarification or solution to the arguments, a desire for peaceful, definitive solutions. One thing for sure is that if Christ is going to reveal " . . . hidden things which no man knew. . ." (D&C 101:33), we certainly have some things yet to learn.

President McKay's attitude towards peaceful discussion of differences is shown in the following example. In October 1964, an article called "The Age of the Earth" by P. Cracroft was published in the Improvement Era. Cracroft (1964) quoted several of Melvin A. Cook's claims regarding the creation and age of the earth. Because of a number of criticisms of Cracroft's article (Bergera and Priddis, 1985, p. 159), Bertrand F. Harrison, a professor of botany at Brigham Young University, was asked to write an article elucidating the theory of organic evolution, and submit the manuscript to the Church magazines for publication. The manuscript entitled "The Relatedness of Living Things" (Harrison, 1965) found its way to President David O. McKay by way of one of his sons, David Lawrence McKay. President McKay, read the manuscript and was so impressed by its content that he not only approved its inclusion in the 1965 July edition of the Instructor (Harrison, 1965), but he wrote a short preface. The series of articles it was included in was called the "I Believe" series with the theme taken from 2 Nephi 9:29: ***"But to be learned is good if they hearken unto the counsels of God."*** President McKay included in the preface:"Like other articles in this series, it is presented not as Church doctrine but as a statement **worthy of serious study**, written by a faithful Latter-day Saint who is competent to speak as a scholar in his field" (Harrison, 1965).

The article plainly presents a simplified description of applied organic evolution using artificial selection in enhancing the quality of a herd of dairy cows. Dr. Harrison kept his article focused on the principles of evolution of animals while avoiding evolutionary theories related to the ancestry of man.

The content of this lecture centers on President David O. McKay's preface to Dr. Harrison's article when he wrote that the contents of the article on evolution, even though debatable, were " . . . worthy of serious study" (Harrison, 1965, p. 272). I will not be arguing the truthfulness of specific doctrines or scientific principles, but rather discussing the process of seeking knowledge with the final goal of knowing the truth. At present, science is involved in several areas of study and practice, such as cloning, stem cell research and genetic engineering. Each has avid champions and opponents basing their hypotheses on philosophical debates and research results. Determination of whether the benefits or drawbacks are greater will require further evaluations, but as important as the outcomes are, each are certainly " . . . worthy of serious study."

BECAUSE IT IS TRUE

In Henry Eyring's book, *Reflections of a Scientist*, he stated that scientists "expect the truth to prevail because it is the truth" (Eyring 1983, p. 1-2). Henry Eyring's father took Henry out for a horseback ride to have a father-son talk before Henry left for college. He gave Henry some wonderful advice including admonishing his son to continue living the type of life that allows him to feel comfortable around good people. He also told Henry that " . . . in this Church you don't have to believe anything that isn't true" (p. 1). He admonished his son that when he got to the University of Arizona, he should learn all he could and to know: " . . . what ever is true is a part of the gospel. The Lord is actually running this universe" (p. 1).

By simply stating support or non-acceptance of a concept, principal or theory does not make it true or false. Stephen Jay Gould (1987) reminds us**:** "Einstein's theory of gravitation replaced Newton's, but apples did not suspend themselves in mid-air pending the outcome" (p. 64). With a significant amount of the universe's mass and energy yet to be explained, Einstein has not had the last word on gravity, and apples are still falling. A fact of nature is that an apple released from a tree will fall to the ground. The process explaining what happens to the apple is a theory and open to debate. A quote, credited to Einstein, seen hanging on a biochemist's wall at Brigham Young University, states: "No amount of experimentation can prove me right, but only one experiment is needed to prove me wrong" (Heaton, personal communication, July, 2003). Einstein's statement is rephrased by Gould (1987) " . . . absolute certainty has no place in our [scientists'] lexicon" (p. 65). Gould went on to report that the fact of evolution is about as soundly established as anything in science, yet associated theories of evolution are under intense debate. Science is in its healthiest state when intense debates are under way. As stated by Henry Eyring (1983) "If a thing is wrong, nothing can save it, and if it is right, it cannot help succeeding" (p. 2).

There are many things that have been or are being researched by scientists, some subjects more worthy of serious study than others. Hopefully the majority of researchers are honest and competent to speak as scholars in their field (paraphrasing the statement by David O. McKay referring to Dr. Harrison). Dismissing scientific concepts built upon honest evaluations of observed facts should be done with care, especially if we do not know what the ramifications of dismissal may be.

The disagreement between science and religion began before the birth of Christ. The story of the creation, including the workings of the universe, were among the issues in dispute. Pythagoras, a Greek philosopher of the 5th century BC, along with his students, concluded from pioneering mathematical studies that the solar system was heliocentric: the earth was a globe that, along with the other planets, revolved around the sun. Two hundred years later, Aristotle rejected the Pythagorean hypothesis in favor of the belief in a universe with the earth at the center, called Geocentric Cosmology. Over the next several centuries, the Roman Catholic Church accepted the Geocentric Cosmology concept as true. Copernicus, in the 16th century AD, challenged the Geocentric concept when his studies led him to believe in the conclusions of Pythagoras.

A hundred years later, with the help of observations using the telescope, Galileo provided more conclusive evidence to the arguments that the earth and the planets revolve around the sun. Galileo was tried and sentenced to life imprisonment for his unwillingness to accept the Geocentric Cosmology explanation. It finally took the genius of Isaac Newton, working with optics, calculus and the laws of gravitation and motion to produce a model of the structure and operation of the universe that is still largely accepted today. With the salvation of mankind not dependent upon whether the earth is the center of the universe, or whether the earth and planets revolve around the sun, we are left to wonder why the Catholic Church went to such efforts to defend the philosophy of Aristotle.

Chet Raymo (1999), teacher of physics and astronomy, wrote an article titled "Celebrating Creation" in which he discussed the stories of creation of the earth and the universe, including the creation of life. He referred to the early creation stories as including " ... tribal myths, scriptures and church traditions" (p. 22). He then introduced the scientific story of the creation of the world and surrounding universe. The scientific story has arisen following thousands of years of observations, experimentation and debates, and is still under development**,** and changes may never end.

The scientific story of the creation of the universe began with the big bang, set off by some infinite source of energy. New stars with associated planets were formed. Assemblages of atoms became able to self-replicate. Life formed, and evolved over billions of years resulting in ever more complex organisms. Millions of species evolved with periods of extinctions followed by evolution of new species. At last, humanity appeared with a consciousness and the ability to create stories. One such story is the explanation of the creation based upon observation and experimentation. The scientific story has become the universal story, accepted by educated peoples of all nations, with scientists of varied cultural and religious backgrounds applying the same criteria to test the validity of the current thoughts about the creation. As part of the scientific method, they are trying to disprove hypotheses, and inasmuch as they succeed, our understanding changes and improves.

Raymo (1999) reported an experience he had in Ireland. He planned on spending a night in a 7th century small stone one-room church, Gallarus Oratory, the oldest still standing building in the country. With no lights, only one doorway, and a small glassless window, the building was extremely dark. After sitting alone in the dark for several hours, Raymo felt a presence in the church so strongly he was impelled to go outside where he was struck by the splendor of the aurora borealis lights. He tried to imagine how the early monks would have felt as they came out of the darkness to be met with such an awe-inspiring sight. He remembered a quote by the nineteenth-century explorer Charles Francis Hall when he first observed the aurora: "My first thought was, 'Among the gods there is none like unto Thee, O Lord; neither are there any works like unto thy works!' ... We looked, we saw, we trembled" (p. 22). The early monks seeing this spectacle must have attributed the lights to some miraculous sign of God's presence. Today we know the lights of the aurora are caused by electrons streaming from the sun causing luminescence, yet we inwardly still experience a form of awe and wonder when seeing the lights, not the same as people with no explanation, but still awe and wonder.

One problem with the scientific story of creation is the assumption that the universe is a closed system, and according to the Second Law of Thermodynamics, in the universe, even though it is orderly and complex, energy is in the process of becoming scattered and less concentrated. The assumption that the universe is a closed system means that it will continue becoming less organized with the energy, although the same amount, becoming more diffuse. When, and if, the universe comes to the state that another "big bang" is needed to start the formation of new suns and planets, there won't be enough energy in a concentrated form sufficient to set off the next "big bang". Eyring (1983), in setting forth a case for believing the Gospel of Jesus Christ, stated that either ". . . there are exceptions to these natural laws we don't know about or the physical universe is not a closed system. . . there is something or someplace outside the physical world from which energy was obtained to fire the big bang" (p. 101). He went on to say that he believed " . . . the combination of intelligence and power . . . that set off the 'big bang'. . . is called the Creator, the Supreme Being, God, and so on" (p. 101). Eyring's concern with justifying a belief in God is not an uncommon practice among scientists and other educated people, with approximately 40% of scientists listed in American Men and Women of Science in 1996 answering "yes" when asked if they believed in a personal God (Scott, 1999). Perhaps the scientific story of the creation is another of those things that President McKay would say: " . . . it is presented not as church doctrine but as a statement worthy of serious study" (Harrison, 1965, p. 272).

Raymo (1999) gives four basic reasons the scientific theory of creation has advantages over all other stories:1) "It works so well that it has become the irreplaceable basis of technological civilization;" 2) "It is a universal story;" 3) "It . . . emphasizes the connectedness of all people and all things;" and 4) "It . . . reveals a universe of unanticipated complexity, beauty and dimension" (p. 23). Physical evidence supports the Scientific Story of creation, but where does a supreme power, a deity, enter into the picture? Do we as members of the church, as did Eyring, need to assume that we don't have all the answers to either religious or scientific questions? Are there exceptions to natural laws or has science yet to either discover new laws or fully understand existing laws?

Henry Eyring (1983) was often asked whether there is any conflict between science and religion. He would answer:"There is no conflict in the mind of God, but often there is conflict in the minds of men" (p. 2). Do our reactions to relationships between religious beliefs and scientific discoveries affect our attitudes and the attitudes of others towards either religion or science? How do we handle perceived conflicts? Eyring (1983) asserts that one of the most harmful things a believer can do is to ". . . support the truth with bad arguments" (p. 103). He states that listeners, in some point in their education, will spot the fallacy of the bad arguments, and as they rid themselves of the erroneous material, may " . . . throw out the baby with the bath" (p. 103). Could a student or child develop doubts in religious truths if those truths have been related to erroneous arguments? What kind of choice is it to have to choose between science and religion? Even the principal of evolution is full of facts and theories, the facts being as well established as most scientific principles, and the theories are continuously undergoing rigorous challenges and debates by qualified scientists. To have gospel truths depend upon the fallacy of evolution, is a losing proposition and a needless one. In the Church of Jesus Christ of Latter-day Saints, all we have to believe is what is true. God has revealed those things essential for our salvation, and regarding the rest, He expects us to continue studying, learning " . . . line upon line, precept upon precept . ."

(D&C 98:12). Henry Eyring (1983) counsels that there will always be many unanswered questions: "In fact, each answer seems to raise more questions . . . Actually, that's what makes science and religion, fun. Faith is feeling good about myself, feeling good about God, and muddling along after truth as best I can . . . I'm a happy muddler" (p. 102-103).

HYPOTHESES ARE FOR TESTING

The following illustrates the formulation of a hypothesis, that hypertension was the result of evolution in the African slave population. This hypothesis raised a lot of questions resulting in debates and testing of the hypothesis using the scientific method.

In 1991 Jared Diamond published an article, *The Saltshaker's Curse*, summarizing a literature survey of articles on the extremely high incidence of hypertension or high blood pressure in African-Americans compared to white Americans. He observed that scientists have reported that American blacks have significantly higher average blood pressure than whites, with a nearly ten times risk of dying from high blood pressure related causes than whites. Diamond hypothesized that besides reported environmental causes, high blood pressure appears to have a strong genetic component. He based this hypothesis upon reported observations that an individual's risk of developing hypertension is correlated with whether one or both parents have high blood pressure. In 1991 there were no verified genetic causes of hypertension, but known dietary and life-style causes of high blood pressure included high salt diets, cholesterol and saturated fats, alcohol consumption, heavy body weight, smoking and inactive life styles.

Supporting the argument that hypertension was mainly caused by environmental factors, is the report that groups of people with extremely different diets and life styles have hypertension rates correlated with their life styles (Diamond, 1991). At one extreme, are the Yanomamö Indians of Brazil, a subsistence people with the lowest known salt consumption in the world. The average adult Yanomamö Indian blood pressure was reported as only 95 over 61, and these Indians had no known cases of hypertension. At the other extreme, the inhabitants of the Akita Prefecture of Japan are the highest known salt consumers in the world. These people eat large quantities of "rice flavored with salt, washed down with salty miso soup, and supplemented with salt pickles consumed between meals" (p. 23). The average adult blood pressure was 151 over 93, and the death rate from stroke, twice that of the Japanese national average. Obviously diet and life style have a noticeable influence on hypertension. The question was still unanswered of how much difference in blood pressure between these two peoples was environmental and how much was genetic, and thus subject to evolution.

Next, Diamond (1991) compared two groups of people living in the same country, African-Americans and white Americans. What could account for blood pressure differences between these two groups? Both groups had similarities in life styles and consumed approximately the same amount of dietary salt, but blacks consumed less potassium and calcium, and experienced more socioeconomic stress than whites, factors attributed to increasing hypertension. Interestingly, blacks were more likely to respond successfully when treated with drugs that caused the kidneys to excrete salt, and less likely to respond successfully when treated with drugs that reduced cardiac output and heart rate. White Americans don't exhibit this same trend. Under low dietary salt intake, it could be said that blacks with slave ancestry have kidneys super-efficient in maintaining sodium, and yet under abundant salt intake, they could be said to have a genetic defect in excreting sodium. Could hypertension in blacks be caused by genetic factors, acquired through evolutionary selection during the years of slavery, as hypothesized by some scientists, including Diamond (1991)?

In 1988 Clarence Grim (as cited in Fackelmann, 1991) proposed a hypothesis that blacks that survived the dispersal of slavery owed their survival to an inherited tendency to conserve salt within the body. Grim theorized that Africans with salt-conserving genes were more likely to survive dehydration during captivity, transport to the New World, and the harsh conditions of plantation life, than those with less efficient kidneys. Estimated mortality rate of African slaves was near 70%; thus mortality was high enough to have possibly caused an evolutionary selection for super-efficient kidneys in surviving slaves. Grim and Wilson (as cited in Fackelmann, 1991) conducted additional studies where they examined genetics and blood pressure of both African-blacks (of slave ancestry) and non-African blacks in the Caribbean island of Barbados. They discovered higher blood pressure in those blacks with slave ancestry.

Grim and Wilson (as cited in Fackelmann, 1991) then conducted a study in a western African village where the forced dispersal of slavery had begun. These African subjects ate a high salt diet comparable to African-Americans, yet the men in Africa had a rate of high blood pressure of only 12% compared to 32% of adult African-Americans.

African blacks' blood pressure did not increase significantly with age, while 60% of African-Americans age 50 or older suffered from hypertension. The lack of salt sensitivity in Nigerian blacks supports the hypothesis that the African-Americans owe their salt sensitivity, at least a significant part of it, to evolutionary selective survival during slave dispersal. Grim stated that the survival hypothesis was only a hypothesis since no one had yet to find a salt conserving gene or genes that increase the risk of a person developing hypertension.

Richard S. Cooper regarding the evolutionary hypothesis (as cited in Fackelmann 1991) said: "I think it's a crock, . . . To attribute that magnitude of evolutionary change to a fairly brief period is a kind of fantasy" (p. 255). Wilson countered Cooper's remarks that with a 70% mortality of slaves (as cited in Fackelmann, 1991): "It's a real myth to say evolution must take millions of years" (p. 255). The argument over how much of a population's hypertension is due to environmental conditions and how much is due to genetics, and thus, possibly evolution, continued through the 1990's.

In 1999, Richard S. Cooper, along with associates Rotimi and Ward (1999) reported the results of a large research project spread over Nigeria, Cameroon, Zimbabwe, Jamaica, St. Lucia, Barbados and the United States. They found correlations between life style, diet, body mass index, and rates of hypertension in adult blacks, with hypertension rates ranging from 7% in Nigeria, to 26% in Jamaica, to 33% in Chicago. Their results suggest that: "being overweight and the associated lack of exercise and poor diet, explains between 40 and 50 percent of the increased risk of hypertension that African-Americans face compared with Nigerians" (p. 59).

They also found hypertension higher in urban than rural settings. Rural Africa of today has several similarities to the settings of early human evolution - - rural, subsistence living with heavy physical labor, and low sodium and fat diets. Rural Africans have low average blood pressures and almost non-existent cases of hypertension. Cooper et al. (1999) reported that their findings indicate genetic factors account for 25 to 40 percent of the variability in blood pressure between various groups of people. They also reported that there may be between 10 to 15 genes responsible for blood pressure variation. In concluding, Cooper et al. (1999) reported that hypertension is a complex condition, not controlled by a single gene or environmental condition. A person may have a given mix of genes rendering the individual susceptible to hypertension, but will develop hypertension only under certain environmental settings.

The example of hypertension differences between African and white Americans, although presented in a simplified format, helps illustrate the scientific method used in the search of truth. Observations were made, hypotheses formulated and tested, hypotheses modified and reformulated, discussions between researchers were held, challenges made, more tests run, etc. Current status is that hypertension is a complex condition, resulting from long term ancient evolutionary selection for a cardiovascular system that senses and conserves sodium, a previously rare ion in the human diet. All animals, including man, need salt and other minerals, and they have evolved ways of sensing salt-containing minerals. Selection for an efficient mineral sensing and harvesting neurocardiovascular system increased the fitness of humans living under subsistence circumstances, including high physical activity and low sodium diets. This occurred in many races, including Africans. The noticeably higher rate of hypertension in African-Americans compared to other races in America is probably the result of a combination of environmental conditions including socioeconomic stress plus a genetic component for "super efficient" kidneys selected during the slave dispersal. Defining actual causes of hypertension in African-Americans and other groups of people will continue, resulting in better understanding and treatment, benefiting us all.

While doing a literature search using the keywords "salt taste" and "sodium channels" for papers published between 1995 and 2003, I had over a thousand hits. There is a lot of interest in the scientific community over ways animals sense and obtain specific ions, sodium channels and ways to treat abnormalities in finding and transporting ions, including sodium. Travis (2003) reported on several papers by Liu and his colleagues on several genes controlling taste and uptake of salt in the fruit fly *Drosophila melanogaster.* Their research revealed salt taste mechanisms, both sodium chloride and potassium chloride, by way of ion channels. Their literature review reported discoveries of similar structures known in rodents. Researchers hope that future findings may lead to a better understanding of how humans taste salt resulting in, among other things, production of salt substitutes to be used in the fight against high salt diets and hypertension. Kinnamon (as cited in Travis, 2003) reported that the results of fly and rodent research may not be applicable to humans, for it isn't even known yet whether humans taste and uptake sodium through these same sodium channels that flies and rodents have.

Even with hypotheses proving inaccurate and having to be rejected or modified, the outcome has been a much better understanding of hypertension with some exciting outcomes expected in the near future. The original hypothesis by Diamond (1991), that there was a genetic component of hypertension with evolution playing an important role in its occurrence certainly was "worthy of serious study."

We often won't know what is true and what is wrong with an idea or hypothesis without putting them to the test. Let's follow President McKay's advice and be open to putting worthy subjects to "serious study" before accepting or rejecting them. Science is self-correcting.

Remember what Eyring (1983, p. 2) said: "If a thing is wrong, nothing can save it, and if it is right, it cannot help succeeding."

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