

Seeking Truth through Science and Religion: Being Disciple Scholars

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Sensitive topics are those that appear to be at odds with our cultural standards, religious beliefs, political opinions, or personal biases. By this definition, some topics addressed in science courses are sensitive. Examples of scientific explanations that some church members consider controversial include the "Big Bang" model of the universe, a 4.6-billion-year-old Earth, and the evolutionary origin of the human body. Students and others frequently ask us how we reconcile our professional lives as scientists with our faith. Almost invariably, they want help knowing how to resolve apparent conflicts between scientific and revealed truth about the origins of the universe, the Earth, and the human body. We suggest that the individuals best prepared to appropriately address these topics are those who correctly understand the nature, strengths, and limitations of both revealed and scientific truth, and who approach learning as both faithful disciples and wise scholars.

UNDERSTANDING AND USING REVEALED AND SCIENTIFIC TRUTH

What is truth? "…Truth is knowledge of things as they are, and as they were, and as they are to come" (D&C 93:24). Revelation and scientific discovery represent complementary approaches to obtaining truth (Scott, 2007). Heavenly Father expects us to be skilled at using both study and faith (D&C 88:118) to learn how the physical world works (D&C 88:78–80). Finding, embracing, and using truth wisely are among the most important things we can do in this life (John 8:32; D&C 93:36, 130:18–19).

The space limitations of this article do not allow detailed descriptions of revealed and scientific truth—topics that have been explored extensively elsewhere. Our descriptions provide a brief introduction. Because you already understand the nature of revealed truth, we focus this introduction primarily on the characteristics of scientific truth.

The processes of discovering truth through science and revelation are similar in that both involve foundational assumptions and experimentation. However, there are important differences in their respective tests for truth. How do we identify revealed and scientific truth? And what do we mean when we say something is true—in our religion and in science?

REVEALED TRUTH

God knows all truth and reveals it according to His will. Revealed truth incorporates both prophetic revelation, which gives us official doctrine, and personal revelation, which allows individuals to know that a particular doctrine is true. "The official doctrine of the Latter-Day Saints is clearly defined and readily accessible to all. Doctrines are official if they are found in the standard works of the Church, if they are sustained by the Church in general conference, or if they are taught by the First Presidency as a presidency" (Robinson, 1998). The Holy Ghost can confirm the truthfulness of official doctrine through

powerful subjective experiences available to anyone who pays the price. What God reveals to us through the Holy Ghost we know with great certainty.

Revealed truth provides instructions for salvation, moral standards, and knowledge of God's will, but rarely provides knowledge about how things work, including how the physical world works. While God could choose to reveal anything, He rarely reveals what we can discover on our own. The atonement illustrates some of the strengths and limitations of revealed truth: we know with absolute certainty the atonement is true and we know what to do to qualify for its saving power, but we understand very little about how it works. Scriptural accounts of the creation of the physical world are also illustrative: the accounts provide us with the identity of the Creator, the purposes of the creation, and a general outline of what was created, but tell us very little about how the creation was accomplished or how the physical world works.

SCIENTIFIC TRUTH

We can also find truth using the methods of science (Scott, 2007). Scientists typically use the methods of science more formally than others, but we all use them many times each day as we ask questions, observe the world around us, and make decisions. In order to understand what scientific truth is and how it is discovered, we must understand how science uses the terms *empirical observation, scientific law, hypothesis,* and *theory.* (For deeper coverage of these topics see Tonks 2007).

Empirical observations are factual descriptions of the physical world gathered through experiences anyone can duplicate, and are made directly with the physical senses or with instruments that extend the senses. The validity of empirical observations does not depend on an observer's philosophical perspective, personal opinion, or mood. Indeed, science does not accept many sensory experiences as observational data. Does this mean that subjective observations are not meaningful? Not at all: it means that science can only answer questions based on empirical observations. Science is not anti-religion or anti-God. It simply cannot answer questions based on subjective observations.

Scientific laws are generalized statements that represent many empirical observations, and are often represented as mathematical formulas. Scientific laws do not describe why or how a process occurs; they describe what occurs. An example will illustrate. Newton's Law of Universal Gravitation is expressed mathematically, as follows: $F=(Gm_1\ m_2)/r^2$. This law is used to describe the amount of gravitational force between objects. As a law it is a "super-observation" in that it is a generalized observation about many specific observations. This law explains what the effects of gravity are, but does not describe why it exists or how it is generated.

Scientists seek to explain or interpret observations and laws. This requires making certain assumptions about how the physical world operates, e.g., that humans can understand the universe, mathematical relationships can accurately describe the physical universe, observations result from mechanistic laws, and the laws of nature apply throughout the history of the universe and everywhere in the universe. While reasonable and supported by strong evidence, science can neither prove nor disprove these foundational assumptions. Therefore, at its foundation, science relies on faith.

How can we know if a scientific claim is an observation or an interpretation? Here's one useful way: Ask the question "How do you know that statement is true?" If the question can be answered solely by pointing at something, then the assertion is an observation. If, however, the answer requires an explanation, then the

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assertion is an interpretation. For example, suppose we observe a triangular-shaped feature within a layer of rock that has the size and shape of a shark's tooth. The observation is the description of the feature and its attributes—the things we can point to. To say that the feature is the fossilized remains of an ancient shark's tooth is an interpretation.

There are two kinds of scientific interpretations: hypotheses and theories. Scientists use these terms differently than most of the general public. Hypotheses are untested or little-tested explanations often referred to as educated guesses that are based on empirical observations, scientific laws, and logical thinking. Hypotheses that are not testable are not scientific; they are speculations. Theories are hypotheses that have withstood intense scrutiny and numerous independent tests. They are accurate descriptions of the observations against which they have been tested. Science considers theories to be strong or weak, not right or wrong. Strong theories have withstood more tests and therefore explain a larger body of empirical observations than weak theories.

Both hypotheses and theories share a critical characteristic that distinguishes science from other areas of human inquiry: they predict what we should observe if the interpretation accurately describes reality. Predictions allow science to test its interpretations and lead scientists to make new observations that would not have been made (at that time) without the interpretation. If the predicted outcome is not observed, the interpretation is falsified. If the predicted outcome is observed, then our confidence that the interpretation is true grows.

In addition to being tested, scientific conclusions must be subjected to critical, independent peer-review before they can be considered valid. Peer-review minimizes the chances that flawed methods, unsupported conclusions, or biased results will be accepted, and increases the probability that a scientific conclusion is true.

Scientific theories perform three critical functions. First, they provide useful explanations of how nature operates. In addition to satisfying curiosity, these explanations improve the human condition. Examples include advances in medicine and technological innovations such as refrigerators, vehicles, and computers. Second, scientific theories connect otherwise unrelated observations. For example, the theory of evolution ties together observations of antibiotic resistant bacteria, the distribution of plants and animals on the Earth, molecular genetics, and the fossil record. Finally, theories guide future research, helping us learn more about nature.

Science cannot prove that its interpretations are true; it can only prove them false. This means that science can never be completely certain that a theory represents absolute truth. Science can and does, however, discover absolute truth—there's just no way to know when an absolute truth has been found. Since science cannot know when a particular theory is absolutely true, scientists continually test theories against new observations. As a result, science is self-correcting: continual testing increases confidence in theories, causes better theories to be developed, and brings us closer to absolute truth.

In short, science provides us with a powerful, self-correcting way to discover how the physical world works. Scientific theories are accurate descriptions of the observations against which they have been tested, but science cannot determine which scientific explanations are absolutely true. As new observations are made, scientists expect theories to strengthen or be replaced by better explanations of reality. We know a scientific conclusion is valid if it has been observed empirically or if it explains a set of related observations, and is not disputed by other empirical evidence.

Seeking Truth through Science and Religion

Heavenly Father has provided us with the means to find truth through revelation and through science. The analogy of a toolbox helps us see the significance of knowing that both approaches have great value, and when each approach should be used.

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A useful toolbox contains many tools because each tool is designed to do a specific job. Each tool's strengths and limitations derive from its design. We could, for example, try to use a sledge hammer to remove the lug nuts from a car's wheel, but let's not: we're likely to damage something; the hammer is the wrong tool for the job. Still, we don't throw the hammer out; there are other jobs the hammer does best. We must understand the strengths and limitations of each tool if we are to use them (individually or in combination) without breaking things. Similarly, it is essential to use revelation and scientific discovery for the jobs they were designed for: revelation mostly provides access to truth about salvation, God's will, and the purposes of life, while the methods of science provide access to truth about how the physical world works. For example, only revelation can answer the question "Is there a God?", and scientific discovery best answers the question "How can I make a computer processor faster?" On the other hand, some questions require both approaches: scientific and revealed truth both shed light on the question "How can I become a better learner or teacher?" The most challenging questions are those for which the answers provided by scientific discovery cannot be fully reconciled at present with the answers given by revelation. One such question is "How was the universe formed?" At present, we do not know enough to fully harmonize the scientific and revealed truths that are pertinent to answering this question.

How can we best handle these kinds of questions? We suggest that the best approach is to use all available revealed and scientific truth to identify the range of answers that have the greatest likelihood of being true (see Figure 1). This approach assumes that any truth is compatible with all other truth, no matter its source, and that true answers will be compatible with both God's works (i.e., empirical observations of the physical world) and God's words (i.e., official doctrine).

We can use the concepts depicted in Figure 1 to identify the range of possible correct answers to a particular question. The horizontal line represents the range of possible answers. Each of these answers is tested against empirical observations and official doctrine. Any interpretation of God's works that is contrary to official doctrine lies in the "Zone of False Scientific Speculation" and should be discarded. Likewise, any interpretation of God's words about the physical world that is contrary to empirical observations lies in the "Zone of False Religious Speculation" and should also be discarded. The remaining answers, which lie within the "Zone of Truth", are consistent with both God's words and God's works. The dot in the "Zone of Truth" represents the true answer to the question, which will be found in the future.

Two examples illustrate the utility of this approach. First, imagine that someone proposes, based on discovering that physical systems are governed by natural

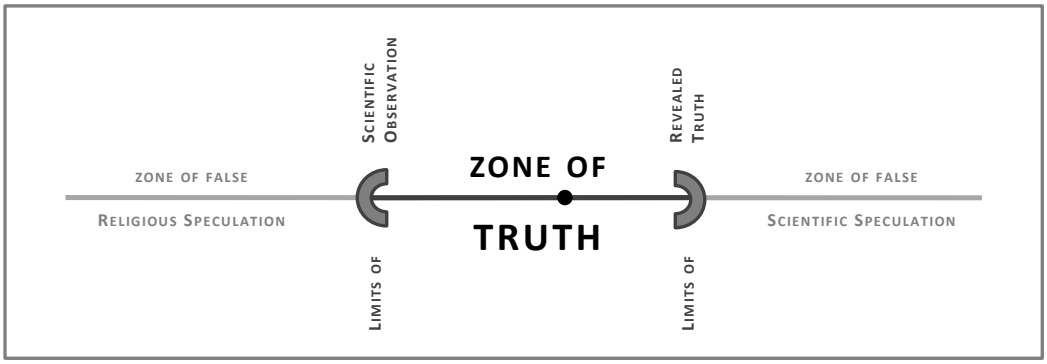

Figure 1. This diagram illustrates an approach to constraining answers to a question that currently cannot be fully resolved by scientific and revealed truth. The line represents all possible answers to the question of interest. Answers based on interpretations of scientific observations that contradict revealed truth are found in the "Zone of False Scientific Speculation". Likewise, opinions based on interpretations of scriptural statements that contradict scientific observations of the physical world are located in the "Zone of False Religious Speculation". The "Zone of TRUTH" contains those answers that are consistent with both revealed truth and scientific observation. The circle in the "Zone of TRUTH" represents the true answer that will be revealed/discovered in the future. This approach provides a faithful and scholarly way to constrain where that truth is mostly likely found for these kinds of questions.

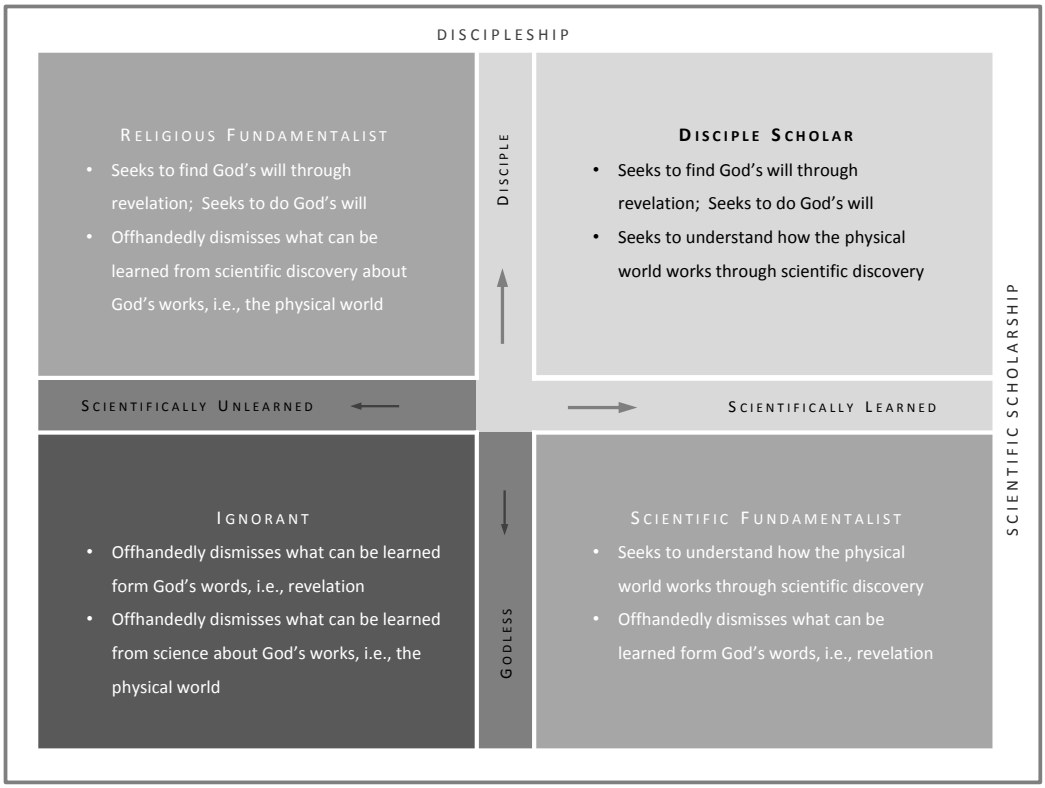

Figure 2. This diagram illustrates various approaches to finding truth. The positive "DISCIPLESHIP" axis represents a strong commitment to finding God's will through revelation and doing it. The positive "SCIENTIFIC SCHOLARSHIP" axis represents the honest search for knowledge of the physical world through study, reason, and research. Common attributes are listed in each quadrant. Heavenly Father expects us to be both faithful disciples and wise scholars.

law, that there is no need for a Creator. That interpretation is falsified by official doctrine, which clearly states that God is the Creator of the universe, a truth the Holy Ghost can confirm to any honest seeker. Of course, the doctrine and our testimonies say little about how Gods create and even less about the specific laws that govern physical systems. The doctrine and our testimonies do, however, falsify the "No-need-for-a-Creator" interpretation. Second, imagine that someone proposes that the Earth is stationary at the center of the universe because of the way they interpret particular scriptures. Empirical observations, including the phases of Venus and parallax of stars, falsify this interpretation. Of course, those observations say nothing about the veracity of the scripture, only that the "Earth-centered-universe" interpretation of that scripture is false. This approach provides us with the ability to identify falsehood without "throwing the baby out with the bathwater". Using the approach requires humility and moderation, but safeguards against "breakage" by encouraging "the appropriate use of tools".

BEING DISCIPLE SCHOLARS

Using both scientific and revealed truth to answer questions requires that we become both dedicated disciples and knowledgeable scholars, as illustrated in Figure 2. The vertical axis of this figure represents "Discipleship", a deep commitment to find and do God's will. The horizontal axis indicates "Scientific Scholarship", the honest search for truths about the physical world through empirical observation.

At its foundation, science relies on faith.

"Disciple Scholars" value both revealed and scientific truth. In contrast, "Scientific Fundamentalists" and "Religious Fundamentalists" are characterized by different versions of one-sided extremism. Those in the "Ignorant" quadrant are characterized by lack of exposure, apathy, and/or foolishness with regard to discipleship and scientific scholarship.

SCIENTIFIC AND RELIGIOUS FUNDAMENTALISM

Fundamentalism is characterized by zealous, unreasoning adherence to one's viewpoint—even in the face of overwhelming evidence to the contrary—and intolerance of other perspectives. Fundamentalists often use "straw man" arguments—developing and then refuting distorted versions of their opponent's ideas—to reinforce false divisions and to paint their opponents as stupid, deceived, or evil. These individuals are often so certain they are right that they feel justified coercing others to think or act like they do. The coercion takes any available form: shaming, mocking, shunning, suing, firing, banning, imprisoning, and/or killing.

Scientific and religious fundamentalists generally believe that every important question can be fully answered by either scientific or revealed truth. They find it easy to dismiss truth from the other side without serious analysis. They draw Figure 1 with only one constraint. These individuals are commonly unlearned about, misunderstand, and/or mistrust truths from the other camp. When exposed to a truth from the other side, they often approach it from a "How can I prove it wrong?" perspective. Fundamentalists tend to overestimate both what is known from their camp's truth and the certainty with which it is known.

Fundamentalist teachers lead their students to believe that scientific and revealed truth are mutually exclusive and encourage or coerce their students to choose one and reject the other. They typically present their position as the only rational or faithful way to understand the issue being studied and are willing (intentionally or not) to place students in situations that create crises of faith.

DISCIPLE SCHOLARS

Disciple Scholars have deep respect for truth learned from the study of God's word and God's works. They understand the strengths and limitations of scientific and of revealed truth, recognize when each is best used, and know how to approach apparent conflicts between them. Disciple Scholars know that both scientific and revealed truth are eternally important, but that the doctrines of salvation are the most important truths. They use this priority structure in making decisions. These individuals approach the search for both revealed and scientific truth with a sincere heart; i.e., they want to know the truth. They also have real intent; i.e., they want to know the truth so much that they intend to incorporate and act on the truth they find. They are willing to let go of their personal opinions and biases to know the truth. This approach qualifies them to "learn the truth of all things" (Moroni 10:4–5).

Disciple Scholars seek to reconcile and harmonize revealed and scientific truth. To be sure, they see areas in which a final answer is currently out of reach, but they are willing to exercise patience and know that current apparent conflicts will resolve themselves through time.

Disciple Scholars are anxious to help others find truth while avoiding the pitfalls of fundamentalism. When teaching, they try to eliminate situations that might damage a student's faith. They make certain their students understand the relative importance of revealed and scientific truth; namely, that the doctrines of salvation are essential for redemption. They do not coerce their students through mocking or shame. They strive to help students harmonize and integrate rather than divide and ridicule. They emphasize approach over opinion by helping students learn how to reconcile truth from both spheres, rather than filling them full of speculations.

Two quotes illustrate the perspective of Disciple Scholars. The first is from rocket scientist Werner von Braun (1965), who said the following about science and religion:

> Science cannot prove that its interpretations are true; it can only prove them false.

> Many people find the churches, those old ramparts of faith, badly battered by the onslaught of three hundred years of scientific skepticism. This has led many to believe that science and religion are not compatible, that "knowing" and "believing" cannot live side by side. Nothing could be farther from the truth. Science and religion are not antagonists. On the contrary, they are sisters. While science tries to learn more about the creation, religion tries to better understand the Creator. While through science man tries to harness the forces of nature around him, through religion he tries to harness the forces of nature within him. (quotation marks and italics in the original text)

The second is from scientist and LDS Apostle John A. Widtsoe (1963), who said the following in a book he wrote to help LDS educators understand the relationship between science and religion:

> Every person of honest mind loves truth above all else. In the proposed exchange of the new for the old, religion has often been in apparent conflict with science. Yet, the conflict has only been apparent, for science seeks truth, and the aim of religion is truth. That they have occupied different fields of truth is a mere detail. The gospel accepts and embraces all truth; science is slowly expanding her arms, and reaching into the invisible domain, in search of truth. The two are meeting daily: science as the child, religion as the mother. Earnest attempts at reconciliation are rewarded with full success. Occasional failures are usually due to the mistake of alone trying religion, the more comprehensive and better established, by the newer and less dependable standards of science. Religion has an equal right to try science. Either method, properly applied, leads to the same result: truth is truth, whether labeled science or religion. (Page 16)

CONCLUSION

Scientific discovery and revelation are complementary paths to truth, and Heavenly Father encourages us to be skilled at obtaining and using truths from both. Scientific discovery helps us figure out how the physical world works, but does not allow us to be completely certain that a particular explanation is absolutely true. Revealed truth provides us with certain knowledge of God's will and how to gain exaltation, but rarely helps us understand how things work. We believe using these approaches together is currently the best way to understand "things as they [really] are" (D&C 93:24).

While we can do little to change the extremists of the world, we can and must do everything in our power to become Disciple Scholars and root out any scientific and religious fundamentalism that may exist in our lives and at BYU–Idaho. We can accomplish this by being humble, tolerant, loving, moderate, respectful, and deeply committed to obtaining and embracing all truth, no matter its source. Being Disciple Scholars will facilitate our deliberate, patient efforts to bring scientific and revealed truth together into one harmonious whole.

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