The Discovery Process
Spiritual and Secular Parallels

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Scientific discoveries and the implementation of technological know-how have played a major role in the development of the modern world. European adaptation of three technological innovations—the compass, gunpowder, and the printing press—were crucial in the development of Western society, which has spread in varying degrees to many parts of the earth. The compass permitted the great explorations, including Columbus's discovery of America, while gunpowder ensured European dominance. The dissemination of knowledge by the printing press was crucial to the Reformation and the Scientific Revolution of the sixteenth and seventeenth centuries.

The Scientific Revolution, in turn, provided the basis of modern science and the intellectual underpinnings for the eighteenth-century Enlightenment. The Industrial Revolution in the late eighteenth century, drawing on new sources of energy, inaugurated the machine age, and succeeding waves of technological and scientific development have transformed society, bringing us to the world in which we live—with systems of transportation and communication and information technology that have shrunk the world to a global village. Although there has been an unequal distribution of wealth between industrially advanced and less developed nations, and between social groups within nations, the general trend has been toward greater economic well-being for the peoples of the earth, control of disease and longer life, the extension of literacy, and the spread of freedom. At the same time, technological development has facilitated the ruthless exploitation of primitive societies, multiplied the devastation and destruction of war, and created widespread pollution with grave concerns for the environment.[1] The application of technological and scientific knowledge to human society,

according to some historians, has been the most powerful force of the modern era for good and for ill.[2]

In the Lord's plan, the Restoration of the gospel, its spread around the globe, and the preparation of the earth for the Second Coming have been major priorities of the modern era (see D&C 65). Latter-day prophets have taught that, despite the tumultuous nature of modern times, the development of science and technology has facilitated the accomplishment of this divine mission. Indeed, prophets have proclaimed God's role in the discovery process and reaffirmed the role of modern inventions in forwarding the work of the Lord. Throughout this chapter, we will draw on statements of Presidents of the Church, Apostles, and other General Authorities, and those of scientists and others involved in the secular pursuit of knowledge, to explore the nature of the process of discovering truth in both the secular and spiritual realms. Remarkably, those who have been involved in the creative process in scientific and technological fields have observed a procedure not far different from that employed in the spiritual realm. The parallels between the path of divine inspiration and the secular pursuit of knowledge underline the conclusion that God is at the base of both processes. Prophetic statements further indicate that the outpouring of secular knowledge in conjunction with spiritual knowledge is unique to this dispensation.

Modern Revelation

One of the unique characteristics of The Church of Jesus Christ of Latter-day Saints is its belief in continuing revelation. In his 1842 letter to John Wentworth of the *Chicago Democrat*, the Prophet Joseph Smith wrote that the restored Church believed in gifts of the Spirit, including the gift of prophecy (see Articles of Faith 1:7), and in a new work of scripture, the Book of Mormon (see Articles of Faith 1:8). He also stated that to preach the gospel and administer its ordinances, one must be called of God "by prophecy, and by the laying on of hands" by those in authority (Articles of Faith 1:5). The belief in continuing revelation was affirmed: "We believe all that God has revealed, all that He does now reveal, and we believe that He will yet reveal many great and important things pertaining to the Kingdom of God" (Articles of Faith 1:9).[3] The Restoration of the gospel was viewed as fulfilling the prophecy of Joel: "And it shall come to pass afterward, that I will pour out my spirit upon all flesh; and your sons and your daughters shall prophesy, your old men shall dream dreams, your young men shall see visions" (Joel 2:28; see also Joseph Smith—History 1:41). The glorious message was that the heavens were no longer closed, and that God has renewed His communications with man, revealing both spiritual and secular truths.[4]

The principle of revelation is thus central to the beliefs of Church members. The prophet, as President of the Church and the presiding high priest over the priesthood of God, receives revelation for the whole Church (see D&C 21:1, 4–6, 107: 64–67). Leaders holding priesthood keys are both entitled and expected to receive revelation for their responsibilities. Indeed, all are expected to seek and receive inspiration for their own well-being and those for whom they have stewardship. The gospel was restored, among other things, so that "every man might speak in the name of God the Lord," that "faith also might increase in the earth" (D&C 1:20–21) and that the gifts of the Spirit might be generalized among the faithful membership of the Church (see Moroni 10:7–25). All members after their baptism receive the gift of the Holy Ghost by the laying on of hands by those who hold the Melchizedek Priesthood (see Articles of Faith 1:4) with the promise that, if they seek it, the Holy Ghost "will show unto you all things what ye should do" (2 Nephi 32:5).

The Restoration of the gospel entailed not just the renewal, by the principle of revelation, of

all of the keys and glories of the primitive church, but also the concept of a new gospel dispensation, one in which all things would be brought together in Christ, prior to His Second Coming. This would herald a time in which all truth would be revealed, including a knowledge of all things pertaining to the earth, and the laws by which it is governed (see D&C 121:28–31). Indeed, President Gordon B. Hinckley has identified this last dispensation of the gospel as a glorious age in which knowledge in secular fields has been poured out from heaven to hasten the latter-day work and bless Heavenly Father's children.[5]

All Truth from God

The classic Latter-day Saint definition of truth is that "truth is knowledge of things as they are, and as they were, and as they are to come" (D&C 93:24), or an understanding of "things as they really are" (Jacob 4:13). From the Latter-day Saint point of view, one of the most significant ways in which God intervenes in human affairs is in the disbursement of knowledge, whether spiritual or secular. Joseph F. Smith, sixth President of the Church, taught: "The Father, Son and Holy Ghost, as one God, are the fountain of truth. From this fountain all the ancient learned philosophers have received their inspiration and wisdom—from it they have received all their knowledge. If we find truth in broken fragments through the ages, it may be set down as an incontrovertible fact that it originated at the fountain, and was given to philosophers, inventors, patriots, reformers, and prophets by the inspiration of God."[6]

As Elder Harold B. Lee affirmed, "All truths, whether called science or religion, or philosophy, come from a divine source."[7] President Brigham Young stated that "all wisdom, and all the arts and sciences in the world are from God, and are designed for the good of his people."[8] President Young also reminded us that we are obligated and indebted to God for the benefits that flow to us from the truths He has revealed to us, whether "scientific or religious."[9] In short, prophets have taught that God is not limited in His knowledge, or in what He reveals to man, to that which the world considers spiritual. As God is omniscient, His gospel encompasses all truth of every discipline, and, ultimately, as Harold B. Lee taught, "All truth is part of the gospel."[10]

Latter-day prophets have also taught that the process God uses to reveal secular knowledge to his children is fundamentally the same as that by which He reveals the spiritual. President James E. Faust, a member of the First Presidency, affirmed that "searching and inquiring are a means of coming to a knowledge of all truth, whether that truth be spiritual, scientific, or moral."[11] Elder Howard W. Hunter declared, "In reality, scientific research is an endeavor to ascertain truth, and the same principles which are applied to that pursuit are used in the quest to establish the truth of religion as well."[12] Noted Latter-day Saint scientist Henry Eyring reported, "Of necessity I use the same mind and the same method of proving and testing to come to my scientific convictions that I use in coming to my religious faith."[13] Finally, world-renowned scientist Albert Einstein shared his opinion that "real faith, either to a scientist or a businessman or a minister of religion, involves the problem and struggle of searching."[14]

But why is the process of seeking truth in both "spiritual" and "secular" cases basically the same? Merrill J. Bateman, a member of the Seventy and former president of Brigham Young University, explained, "All truth is spiritual, and thus the so-called secular truths may be discovered by revelation as well as by reason."[15] As the Lord has said, "All things unto me are spiritual" (D&C 29:34). Thus, whether one is a scientist seeking knowledge of a chemical principle or a follower of Christ seeking to understand more fully grace or humility, the process of seeking knowledge requires searching and reflection. The basic elements of this process, "Seek, and ye shall find" (Matthew 7:7), can be traced in the

quest for knowledge of scientists, regardless of their religious belief, as well as in those seeking spiritual enlightenment.

Prophets and apostles have often specifically identified inspired inventions that aid us in our day-to-day living. Elder Joseph Fielding Smith stated: "The great *discoveries*, *inventions*, the pouring out of *learning*, theory and principle both true and false, by which many are deceived, are signs and wonders which are given us and which we should heed. The *airplane*, . . . the *radio*, . . . the great *engineering and mechanical undertakings*, . . . the building of skyscrapers and the harnessing of *electricity* and making it work, . . . the great *medical discoveries* . . . have all been given through the will and power of God."[16] And Elder Neal A. Maxwell taught that "since all truth comes from our Heavenly Father, when we celebrate truth in creative breakthroughs, whether in new understanding of molecular structure or in the beauty of new sculpture, painting, or poetry, we acknowledge the resplendent order in God's universe."[17]

Not only are we indebted unto God for all that we know and have, but we should also remember that it is only through Him that we are able to make discoveries. President Young said: "Who taught men to chain the lightning? Did man unaided of himself discover that? No, he received the knowledge from the Supreme Being. . . . [From heaven] we received the knowledge to construct the labor-saving machinery for which the present age is remarkable. . . . From [God] has every astronomer, artist and mechanician that ever lived on the earth obtained his knowledge."[18] Elder Hunter explained, "The knowledge explosion of which the world is so proud is not of man's creation. It is his discovery of portions of the unlimited knowledge and information which is part of God's knowledge."[19] He further wrote, "Our breakthrough in scientific achievement is the result of discovery, through research, of laws which have always been in existence, but hidden from man until this enlightened day."[20] Everything we know now, He knew first. President Young explained that technological advancements revealed in modern times "have existed from all eternity and will continue to all eternity, and the Lord has revealed them to his children."[21]

While man cannot of his own efforts cause revelation to happen, his actions can prepare him to receive it. God reveals truth to those who earnestly seek. The divine injunction "Seek and ye shall find" has a much broader and more universal application than many of us may have supposed. However, only when man is prepared to use the knowledge for the benefit of mankind or for the building of God's kingdom will God reveal truth. The Lord is in control of all truth that is passed down to His children. He knows His purposes and reveals truth and knowledge that will advance toward those ends. He reveals only that which is expedient for us to know (see Alma 29:8).

Satan, however, will often take the outpouring of knowledge that was intended for the benefit of man and use it for destructive purposes. President Hinckley, in his recent book *Standing for Something*, underscores how divinely appointed knowledge can be misused for evil purposes. "Television," he writes, "is perhaps the greatest medium ever discovered to teach and educate and even to entertain. But the filth, the rot, the violence, and the profanity that spew from television screens into our homes is deplorable. It is a sad commentary on our society."[22] Satan's works of darkness may be accomplished by men with evil intents as he reveals to them evil uses to be made of divinely revealed knowledge (see Helaman 6:26–31). Great ills of the world have flowed over the centuries as a consequence of man's misuse of divinely bestowed knowledge.

Categories for Comparison

Revelation from God comes to people in many ways. Sometimes, after long study and re-

flection, we may have a burning in our bosoms that will provide a sense of rightness, or we may experience a clarification of our thoughts. Sometimes we receive flashes of intelligence. Sometimes we feel a sense of peace and an assurance that a certain course of action is correct. Sometimes the promptings of the "still small voice" (1 Kings 19:12) come to us in ways so subtle that we are not aware of the divine influence (see 3 Nephi 9:20). Sometimes we stumble onto solutions totally unaware. Other times, less frequently, we may receive more overt manifestations such as dreams or even visions.

Likewise, as an organizing principle, for the sake of comparison, methods of discovery in the secular world may be classified into four main categories:

- those accompanied by sudden flashes of insights;
- those following patient study and observation that is so subtle that there is no discernible moment of truth;
- those of chance discovery by those whose minds are prepared; and
- those of more overt experiences such as dreams, whether in sleep or a state of partial consciousness.[23]

Let us now examine each of these means of discovery, comparing in turn their spiritual and secular manifestations. The order of treatment is only for the sake of presentation and does not necessarily reflect the relative importance of each category.

Flashes of Intelligence

A significant means of receiving revelation is by way of sudden flashes of insight or intelligence. First, let us examine how this sudden insight comes in spiritual settings. The Prophet Joseph Smith revealed, "A person may profit by noticing the first intimation of the spirit of revelation; for instance, when you feel pure intelligence flowing into you, it may give you sudden strokes of ideas, so that by noticing it, you may find it fulfilled the same day or soon."[24] Elder Boyd K. Packer wrote that revelation "comes as thoughts, as feelings, through impressions and promptings."[25] Elder Lee explained that when we heed the sudden thoughts which are revelation, we learn better how to recognize them and receive them more frequently.[26]

Interestingly, the most common way through which scientists and inventors report developing new ideas is in moments or flashes of insight. According to a study by Platt and Baker, who, however, did not separate dreams from insights, as many as "83% of scientists receive help from sudden insights and alogical thinking—what they termed 'hunches.'"[27] Perhaps the discovery process is best explained by Dr. Edmund Starbuck in a lecture that he gave more than seventy years ago, as reported by the *Church News*:

> The scientist studies his problem, saturates his mind with it, puzzles over it, dreams about it, but seems to find progress impossible, blocked as it were by a black, impenetrable wall. And then at last and suddenly as if out of the nowhere, there comes a flash of light, the answer to his quest. His mind is now illumined by a great discovery. The professor was positive that no great discovery had ever been made by pure reasoning. Reason would lead to the borderline of the unknown, but could not tell what was within.[28]

Two patterns can be discerned. The first is when scientists are working on their problems and the answer suddenly appears to them in such a way that they marvel that they were able to think of it. The second is when individuals are not thinking about their problem and then the answer suddenly occurs to them. Often such inspiration comes in quiet, contemplative settings. Quite frequently the answer will appear when the individual has consciously decided *not* to think about the problem.

Scientific accounts are full of the first instance in which thoughts have come "like a flash of lightning," as the inquirer pondered a question. "On a Sunday afternoon's walk across Glasgow Green, James Watt had a sudden insight on how to make an effective condenser, which in turn led to the production of a much improved steam engine."[29] The steam engine provided the motor power for the ensuing industrial revolution.

Philo T. Farnsworth, the inventor of television, a Latter-day Saint scientist, had a remarkable experience as an Idaho farm boy. "Plowing his father's potato field in 1921, the 14-year-old lad, already dead set on inventing TV, was lost in concentration as he pondered the next piece of the puzzle. Suddenly he saw his answer in the parallel furrows he was carving: A TV image likewise could be electronically scanned, row by row, onto a picture tube."[30] In 1927 "he transmitted the image of a horizontal line across the room in his San Francisco lab," laying the foundation for the most powerful communication tool of the twentieth century. "The brainstorm of a prodigy at his plow, TV in the present day still works the way Farnsworth imagined it that morning."[31]

One of the most famous scientists of the twentieth century, Albert Einstein, felt that his and others' ideas came in similar manner. He wrote:

> When I think and reflect how my discoveries originated and took form, a hundred times you run, as it were, with your head against the wall (meaning a hundred failures) in order to lay your hands upon and define and fit into a system what, from a merely indefinable premonition, you sense in vain. And then suddenly, perhaps like a stroke of lightning, the salient thought will come to you and the indescribably laborious task of building up and expanding the system can begin.[32]

Other scientists have had moments of discovery when their minds were on other things. Charles H. Townes, who shared a Nobel Prize for physics in 1964, said: "The laser was born one beautiful spring morning on a park bench in Washington, D.C. As I sat in Franklin Square, musing and admiring the azaleas, an idea came to me for a practical way to obtain a very pure form of electromagnetic waves from molecules."[33] Melvin Calvin, who received in 1961 the Nobel Prize in chemistry, wrote that his realization of a missing compound came suddenly and unexpectedly: "I was waiting, sitting at the wheel, probably parked in the red zone, when the recognition of the missing compound occurred. It occurred just like that—quite suddenly—and suddenly, also in the matter of seconds the cyclic character of the path of carbon became apparent to me . . . in a matter of 30 seconds. So there is such a thing as inspiration, I suppose, but one has to be ready for it."[34]

An individual who had answers come unexpectedly as flashes of insight in several recorded instances was the French mathematician and physicist Henri Poincaré. On one occasion, Poincaré was working on some mathematical questions when he took a few days off to go to the seashore. He was preparing to board the bus for his trip when unexpectedly, "at the moment I put my foot on the step, the idea [I had been seeking] came to me, without anything in my former thoughts seeming to have paved the way for it. . . . I felt a perfect certainty."[35] Another time he sought the answer to some mathematical questions unsuccessfully for a while. He wrote, "Disgusted with my failure, I went to spend a few days at the seaside, and thought of something else. One morning, walking on the bluff, the idea came to me, with just the same characteristics of brevity, suddenness and immediate certainty."[36] A third time, Poincaré was working on Fuchsian functions once more, and somewhat stumped, he left to go to military service. He recorded, "One day, going along the street, the solution of the difficulty which had stopped me suddenly appeared to me."[37] On the nature of

such "illuminations," Poincaré wrote, "These sudden inspirations . . . never happen except after some days of voluntary effort which has appeared absolutely fruitless and whence nothing good seems to have come, where the way taken seems totally astray."[38]

As Elder Packer has explained, "Inspiration comes more easily in peaceful settings."[39] When one's mind is temporarily freed from the usual constraints and worries, it is more open to the quieter impressions from the Lord: Townes was admiring the azaleas; Calvin was waiting in the car; Poincaré was walking along a bluff. Man may go as far as he can, but it still is not far enough to obtain all knowledge on the merits of his own efforts. Elder Ezra Taft Benson wrote that "there are 'hidden treasures' of knowledge—truths beyond the reach of reason alone (see D&C 89:19). . . . There is an unseen source of power and truth. Eminent scientists recognize this glorious fact."[40]

Despite the appearance of sudden insights, it is easy to fail to see the hand of God. Though it is singular that certain thoughts may appear in a scientist's mind, it is difficult to determine what particular thoughts are from God. However, latter-day prophets have provided a standard by which we may discern which thoughts are the results of revelation, affirming that any new truth is from the Lord. President Young explained:

> There is no ingenious mind that has ever invented anything beneficial to the human family but what he obtained it from the one Source whether he knows or believes it or not. There is only one Source whence men obtain wisdom, and that is God, the Fountain of all wisdom; and though men may claim to make their discoveries by their own wisdom, by meditation and reflection, they are indebted to our Father in Heaven for all.[41]

And as Joseph Fielding Smith has taught, "Without the help of the Lord [scientists and inventors of modern times] would have been just as helpless as the people were in other ages."[42]

Scientific Inquiry and the Light of Christ

A second method of discovery is that in which knowledge is obtained by scientists after many hours diligently searching for the answer with no obvious moment of insight. In such cases, one may be inclined to think that the discovery process is a purely human activity. But modern revelation helps us appreciate that truth seekers who follow correct principles may be enlightened by the Light of Christ without their knowing it.

Each branch of science has its own particular method of inquiry. Most require that one study all that is known and then move to the forefront of new knowledge. Characteristics of modern science which distinguish it from the learning of the ancients are the development of better methods of observation and measurement and the attempt to describe the laws of nature mathematically. Also associated with modern science is a systematic method of inquiry, often referred to as the scientific method.[43] The major steps in the scientific method as presented in a college chemistry textbook are:

1. Obtaining data;
2. Correlating data in terms of a law (a generalization correlating some aspect of the physical environment);
3. Developing a hypothesis to account for the law;
4. Testing the predictive power of the hypothesis;
5. Formulating a general theory if the hypothesis is found to predict correctly.[44]

While such an approach may have value in one branch of science, it may not be of universal application. The psychologist may apply statistical methods and models not applicable to the

study of chemistry; the geologist, who cannot replicate geological time frames, can only piece together the remaining rock and fossil records; while the theoretical physicist may be able only to verify hypotheses by secondary effects. The use of the computer in the past generation has revolutionized both the method of discovery with the widespread use of models and the capacity to analyze unprecedented quantities of data. The traditional method in scientific discovery thus appears to be heading toward a new paradigm. The identification of a research problem, the formulation of a hypothesis and the devising of some means of testing it nonetheless have remained as core elements in the research process.

Ronald S. Lenox classifies researchers into two groups, the "guessers" and the "accumulators." The group classified as guessers are those who have elements of intuition or insight and then devise hypotheses to test them. This coincides with the recognized pattern of divine inspiration as discussed above. In the latter group, however, are those who patiently accumulate knowledge, applying in varying degrees the scientific method, and arriving at solutions in a calm, unremarkable way. To them there is no visible moment of insight.[45] But the scientific method, remarkable tool that it is in structuring research, fails to describe the whole process, even for the accumulators. The problem of "what data to collect or what particular problem to investigate,"[46] and the actual means of getting insight for hypotheses are intellectual activities, transcending the inert environment of the lab, and involve the application of intelligence to a problem. This also may represent a form of inspiration, though not identifiable by the recipient.

Arduous Work and Deep Pondering

In almost every case, there are long hours of work accompanying research. Most of the well-known scientists became such because of long hours of work and assiduous effort. As Henry Wadsworth Longfellow wrote in "The Ladder of St. Augustine," "The heights by great men reached and kept / Were not attained by sudden flight, / But they, while their companions slept, / Were toiling upward in the night." Such "toiling upward in the night" is surely a characteristic of Thomas Alva Edison, as exemplified through the formation of his own carbolic acid plant. Determined to produce carbolic acid from a plant of his own, he started a project that others said would take at least six months. "He spent three days and nights looking up and examining the different known processes of making synthetic carbolic acid. . . . Finally, at the end of the third day, he had fixed on a certain one." He set his men working eight-hour shifts around the clock. Plans were developed in a week, and the first carbolic acid was produced only seventeen days later.[47] The process that others said would take six months was completed in twenty-seven days. Edison was not only a very hard worker but also extraordinarily persistent. He tried over three thousand substances when developing the light bulb. Reflecting his eternal optimism and willingness to continue working hard throughout his life, Edison once wrote, "I'll never give up for I may have a streak of luck before I die."[48]

A sustained effort involving continual pondering is an important key to discovery. Isaac Newton related that in order to acquire knowledge, "I keep the subject constantly before me, and wait 'till the first dawnings open slowly, by little and little, into a full and clear light.'"[49] A biographer of Walther Nernst, the famous German chemist, wrote, "If Nernst had been asked how he made his discoveries he probably would have concurred with Newton, who, when asked that question, replied: 'By always thinking unto them.'"[50]

The parallel in spiritual matters is apparent. Just as in the secular acquisition of knowledge, in spiritual matters, individuals must seek diligently, acquiring all the knowledge they can on the subject, and then ponder possible solutions.

Assiduous in-depth study and research are vital components in spiritual inquiry, sometimes overlooked. The words *seek*, *study*, and *search* appear frequently in scripture (see Topical Guide, 459–60, 506, 455). "Search the scriptures," the Savior told the unbelieving Jews, for "they are they which testify of me" (John 5:39). Nephi, whose visions encompassed future events to the end of the earth (see 1 Nephi 11–15; 2 Nephi 25–30), was "left to mourn because of the unbelief, and the wickedness, and the ignorance, and the stiffneckedness of men; for they will not search knowledge, nor understand great knowledge, when it is given unto them in plainness'' (2 Nephi 32:7). Imagine, for example, how knowledgeable we would become in spiritual matters if we were to devote as much of our time to the pursuit of spiritual knowledge as we do to secular learning.

In this dispensation, the Prophet Joseph Smith was instructed to "seek learning, even by study and also by faith" (D&C 88:118). On the necessity for mental effort, the Lord told Oliver Cowdery, "But, behold, I say unto you, that you must study it out in your mind; then you must ask me if it be right, and if it is right I will cause that your bosom shall burn within you; therefore, you shall feel that it is right" (D&C 9:8). Elder Joseph B. Wirthlin spoke about pondering in general conference in 1982: "Pondering, which means to weigh mentally, to deliberate, to meditate, can achieve the opening of the spiritual eyes of one's understanding."[51] President Spencer W. Kimball noted that the 1978 revelation to extend the priesthood to all worthy males "came to him after extended meditation and prayer in the sacred rooms of the holy temple" (Official Declaration 2).

The type of insight that comes to the recipient in unremarkable ways, or even unnoticed, while actively attempting to solve a problem may also be considered a form of inspiration. As Joseph Fielding Smith said in general conference in 1926: "The inspiration of the Lord has gone out and takes hold of the minds of men, though they know it not, and they are directed by the Lord. In this manner he brings them into his service that his purposes and his righteousness, in due time, may be supreme on the earth."[52] As Elder Benson wrote: "When men, in their energetic search for truth, make new discoveries, these will always be in harmony with all fundamental and eternal truths. Yes, truth is always consistent, whether it be revealed direct from God to man through His inspired prophets, or comes from the laboratory through the diligent searching of His children and the influence of the Spirit of the Lord upon them."[53] Similarly, Elder Mark E. Petersen of the Quorum of the Twelve wrote that "it is through this light [the Light of Christ] that men make discoveries, that they invent, that they achieve all types of beneficial things in their lives."[54] Though there are scientists who refuse or simply fail to acknowledge the source of their enlightenment, it is nonetheless of divine origin.

The Light of Christ as the bridge. The Light of Christ is the bridge between the apparently human-centered approach to discovery and the idea that all truth comes from God.[55] As the spiritual offspring of Deity, humans are endowed with divine gifts and attributes and are capable of acquiring truth and using it for their benefit, growth and development. But, Christ is "the true light that lighteth every man that cometh into the world" (D&C 93:2). The Lord revealed to Joseph Smith the all-encompassing influence of the Light of Christ, that "the light which shineth, which giveth you light, is through him who enlighteneth your eyes, which is the same light that quickeneth your understandings; which light proceedeth forth from the presence of God to fill the immensity of space—the light which is in all things, which giveth life to all things, which is the law by which all things are governed, even the power of God who sitteth upon his throne, who is in the bosom of eternity, who is in the

midst of all things" (D&C 88:11–13). As President Joseph F. Smith taught:

> "There is a spirit in man; and the inspiration of the Almighty giveth them understanding." [Job 32:8] It is this inspiration from God, proceeding throughout all his creations, that enlighteneth the children of men; and it is nothing more nor less than the spirit of Christ that enlighteneth the mind, that quickeneth the understanding, and that prompteth the children of men to do that which is good and to eschew that which is evil; which quickens the conscience of man and gives him intelligence to judge between good and evil, light and darkness, right and wrong.[56]

The Light of Christ is given to all of us to enlighten our intelligence, allowing us to learn and understand truth. If I look out my window and see a tree with identifiable characteristics that I can define, did I not learn about it on my own? Yes, I did. But the Light of Christ gave me life and enlightened my intelligence to allow me to be an observer, so God played a primary role in my discovery. What a person thus observes and perceives is an act of volition on his part, but the capability to do so flows from a divine gift. One may thus say that, in this duality, all truth comes from God, as the Light of Christ has quickened our minds to be able to perceive it, even though the human factor is vital to the process. The question of determining the relative role of the individual and of God in the discovery process is one that is difficult to resolve. Undoubtedly, each individual is endowed with unique gifts, characteristics, and abilities, some of which may have been the heritage of growth and development in the preearth life phase of existence. At the same time, each individual has the Light of Christ, which makes operative these gifts and talents. As new knowledge is received, neither the bystander nor the individual is fully able to delineate the role of the truth seeker and that of the divine. This may well be the case because, as a result of the divine spark in each individual, the two components are tightly integrated.

In the application of the scientific method or other known learning procedures, individuals proceed on their own as far as they can go. They proceed with existing knowledge, work out hypotheses, develop experiments, and discover new verifiable truth. Has the Lord played any role in the process? Beyond the fact that the Light of Christ has allowed them to so function and to follow a process of discovery, they may not be aware of any moment of insight. Promptings of the Light of Christ are not always identifiable or recognizable in either the spiritual or secular realm. One may be enticed by the Light of Christ to do good and not know it in a moral, ethical, or spiritual sense. This may apply to those who believe in Christ, do not believe in Christ, or do not believe in God. President Young said the divine influence on the discovery of knowledge may be unacknowledged, and yet the divine will may be done as new truths are revealed.[57] To conclude, we turn again to what Elder Lee said: "The saving thought which comes to the scientist in arriving at new conceptions, it is . . . to the same end. Without the Lord and his inspiration you can do nothing."[58]

In scientific inquiry, much of the scientist's time is spent devising experiments to test various hypotheses and to verify the results of his findings. Similarly, in spiritual matters, the verification process is very important, in that for the verification of the word of God, one needs to rely on the testimony of witnesses (see 2 Corinthians 13:1, D&C 6:28) and to verify the truth of one's information by personal prayer and revelation (see Moroni 10:3–5). Also the earnest truth seeker is invited to do an experiment on the word, to put it into application and to test the results (see Alma 32:26–43). The pragmatic test is to be found in the lives of individuals who make practical application, for as Jesus told those Jews who believed in him, "If ye continue in my word . . . ye shall know the truth, and the truth shall make

you free" (John 8:31–32).

Spiritual nature of research. Remarkably, several scientists have identified the spiritual nature of research and pointed to the need for faith and works in its pursuit. Many scientists have held a belief in God. Perhaps this is one reason they have had great success. Sir Isaac Newton, the greatest scientist up to his day, had a profound belief in God and the Bible. "God's active and creative role in the 'wonderful uniformity' of the world was a fact uppermost in his mind."[59] Thomas Edison, who held over 1,300 patents, was a firm believer in a higher power. He said, "When you see everything that happens in the world of science and in the working of the universe, you cannot deny that there is a 'Captain on the bridge.'"[60] Albert Einstein said that "science without religion is lame, religion without science is blind."[61] He further declared: "I assert that the cosmic religious experience is the strongest and noblest driving force behind scientific research. . . . The only deeply religious people of our largely materialistic age are the earnest men of research."[62] Interestingly enough, Einstein wrote: "I believe in intuition and inspiration. . . . At times I feel certain I am right while not knowing the reason."[63] As scientists study, they too must learn "line upon line, precept upon precept" (D&C 98:12).

Samuel Morse prayed for help whenever he "could not see [his] way clearly."[64] To obtain answers to our prayers, we are encouraged like Oliver Cowdery to "ask in faith, with an honest heart, believing that you shall receive" (D&C 8:1; see also Moroni 10:3–5). Do scientists pray? While some such as Samuel Morse have sought answers in prayer and many others continue to do so, it is unlikely that all seek answers in traditional forms of prayer. But if one considers that "prayer is the soul's sincere desire, uttered or unexpressed,"[65] then their seeking and pondering may be viewed as a kind of prayer. The Lord's promise is "Ask, and it shall be given you; seek, and ye shall find; knock, and it shall be opened unto you" (Matthew 7:7). As Alma observed, the Lord "granteth unto men according to their desire" (Alma 29:4).[66]

Some scientists have felt not only that there was a God but that He provided a way for them to understand His mysteries. Johannes Kepler believed that God had created a world of order and "endowed man with a mind which can comprehend these norms." Interestingly enough, he also said, "Those laws are within the grasp of the human mind; God wanted us to recognize them by creating us after his own image so that we could share in his own thoughts."[67] The words of Moses in Genesis, "God created man in his own image" (Genesis 1:27), and Lorenzo Snow's statement, "As man now is, God once was; as God now is, man may be," give us pause for reflection.[68] As Einstein stated, in his now-familiar manner, "I want to know how God created this world. . . . I want to know His thoughts, the rest are details."[69] The attitude common in many university classrooms, that science relies on skepticism and that to discover scientific truth one needs to sweep aside all that cannot be demonstrated by empirical means, falls far short of the historical reality.[70]

Serendipity

Curiously, in the divine economy, not all discoveries in spiritual matters or in science and technology have come because they were sought; some come to those who are not seeking them specifically but who nevertheless are prepared and able to capitalize on them.[71] In spiritual matters, one may cite many examples of the unexpected arrival of divine revelation or inspiration. Moses, for example, appears to have acted only out of curiosity when he approached the burning bush and received his call to deliver Israel (see Exodus 3:1–10). At a later moment, the errant prophet Balaam, on his way to curse the Israelites, does not appear to have been seeking truth when the angel of the Lord told him not to whip his recalcitrant donkey (see Numbers

22:12–35). In this dispensation, the revelation to Joseph Smith regarding the demise of the ancient righteous warrior Zelph, whose burial mound had been uncovered during the 1834 Zion's Camp march, appears to have been coincidental to the discovery of several ancient burial mounds.[72]

One of the problems associated with serendipitous spiritual discovery in scripture is that frequently some elements of the story are missing which might alter one's interpretation as to motives or the nature of the experience. But the widespread nature of the experience on a personal level can hardly be contested. Who, for example, has not sat in sacrament meeting and, as the mind has wandered, had a spiritual insight unrelated to the speaker's message, or had a similar experience while in the temple? Elder John A. Widtsoe, in defining the house of the Lord as a place of revelation, has linked it with the unexpected receipt of revelation as we pursue other sacred objectives.[73] The spiritual preparation of the recipient is of vital significance.

There are many instances of serendipitous discovery in science and technology including such notable examples as the development of penicillin, the process of vulcanization, and a vaccination for chicken cholera. The people to whom these discoveries came were able to capitalize on the insights they received, and society as a whole has benefited.

In 1922, Sir Alexander Fleming was studying a strain of bacteria that was causing his cold. One day, a tear fell from his eye into one of the culture dishes containing bacteria. The next day he noticed the space where the tear had fallen was clear of bacteria. He correctly concluded that his tear had in it a substance that destroyed that strain of bacteria. Though seemingly insignificant, this small incident was to influence his later actions, which in turn led to the development of penicillin.

In 1928, Fleming was studying influenza. One day he noticed "an unusual clear area" in one of the Petri dishes containing bacteria culture. He studied the dish and realized a bit of mold had fallen into the dish exactly in that clear area. Fleming was intrigued as he recalled his experience with the tear in the culture dish many years previously. He described his experience:

> But for the previous experience [with the tear], I would have thrown the plate away, as many bacteriologists must have done before. . . . It is also probable that some bacteriologists have noticed similar changes to those noticed [by me], . . . but in the absence of any interest in naturally occurring antibacterial substances, the cultures have simply been discarded. . . . Instead of casting out the contaminated culture, . . . I made some investigations.[74]

As the years passed, Fleming and others developed from these modest beginnings the properties of penicillin that have since saved millions of lives.

The serendipitous nature of the story does not end there. The development of this substance provides further evidence of the hand of God directing the affairs of discovery. In the late 1930s, Howard Florey, a professor at Oxford University, and Ernst Boris Chain, a biochemist also at Oxford, continued the work begun by Fleming. Florey visited the U.S. Department of Agriculture's Northern Regional Research Laboratory in Peoria, Illinois, to find a large-scale means of production for penicillin. The lab had incidentally been searching for means to dispose of an extract created through the milling of corn. The idea came to him to add the extract to the penicillin culture medium. The results were phenomenal. The addition of the extract increased the penicillin mold output tenfold. The nature of Florey's insight relative to an extract that just "happened to be" waiting for a means of disposal strikes one as a very unusual coincidence.[75]

The vulcanization of rubber developed by Charles Goodyear is another example of an "accidental" discovery. Vulcanization is a common

process for treating rubber through combination with sulfur. Goodyear was experimenting with this mixture when he inadvertently allowed it to touch a hot stove. He noticed that it did not melt and, after a night left outside in the cold, did not become brittle when chilled. As at the time he had been searching for a rubber that stayed flexible at different temperatures, he was thrilled with this somewhat accidental discovery. While this is not serendipity in the strict sense because Goodyear was seeking the combination of elements that he found, there remained an element of chance or fortune that caused it to be burned on the stove.[76] Royston Roberts makes this point in his book *Serendipity* when he writes about the many unusual happenings that caused scientists or inventors to observe a phenomenon different from what they were exploring. He reminds us that "undoubtedly many persons had seen a gas produced unexpectedly, . . . but they did not discover oxygen."[77]

Louis Pasteur stumbled onto the vaccination for chicken cholera. Having left full-strength culture unattended until it became very weak, he decided to inject his chickens with it anyway. He noticed later that when he injected them with full-strength chicken cholera culture, they no longer contracted the disease.[78] Such discoveries seem to happen only by chance, regardless of the observer, but as Louis Pasteur said, "In the fields of observation, chance favors only the prepared mind."[79] Those scientists who have used these unusual phenomena to their advantage "took note of it rather than dismiss it as trivial or annoying."[80] They not only were observant but were also able to use their observations for the good of mankind.

Just as chance favors the prepared mind in obtaining secular knowledge, an increase in spiritual knowledge is more likely when we have prepared ourselves to receive it. From man's perspective, serendipitous discovery is unanticipated and seemingly random, but for God, who knows all, what is seemingly accidental discovery is part of His planned revelation of heaven-sent truth. Revelations, however, are given to those who have first fulfilled the requirements that the Lord has set forth. He does not randomly favor individuals with knowledge that is either unneeded or would be put to better use if given to another individual. He does not reveal the mysteries of the universe to those unable to understand them. In these serendipitous cases of scientific and technological discovery in which the individual was not searching for the answers they received, they were nonetheless prepared for it in some way. In the same manner, those who seek spiritual revelation and answers to problems must be living their lives so that they might receive whatever revelation the Lord has in store for them. The Lord will give revelation to those who are prepared to receive it.

God, the dispenser of all truth, points the way to the path of discovery. Just as a good classroom instructor facilitates the discovery process, He gives us instruction by presenting known information and also by providing, through the arrangement of circumstances, the "cognitive tools" or learning aids necessary for discovery.[81] This is evident in spiritual as well as in secular realms. Many important revelations were received by Joseph Smith, including that on the three degrees of glory (see D&C 76), as he proceeded with the inspired translation of the Bible (see D&C 35:20), and considered the issues raised in that process. Scripture reading and other forms of gospel instruction can serve the same purpose in our individual lives. As we face the issues of life, tailor-made for our growth and advancement, they can point us to the path of spiritual inquiry and discovery, so that we can be taught by the Spirit.

In the secular realm, as the researcher presses his inquiry to the frontier of knowledge, he is then placed in a situation to discover new truths. Some may come, as in the experiences noted above, in a serendipitous or unexpected fashion. Though the world may see some of the

examples presented above as "accidents" or "coincidences" that turned out favorably, the Lord is always involved in new discovery of truth. He also leads and guides those who seek His truths of science and nature. "By small and simple things are great things brought to pass" (Alma 37:6).

Small miracles occur in our lives every day, and the Lord is interested in even the smallest details of our lives. New spiritual insights revealed from the Lord to His children often come through reading the scriptures, when we see things in a way that we had never seen them before. The new insight comes from the Lord. Similarly, we are expected to observe the world around us. However, some of us, "Having eyes, see . . . not [and] having ears, hear . . . not" (Mark 8:18). The influence of God is made manifest in many ways, but only those with eyes open to spiritual things can see it.

Dreams

The fourth category of revelation is less common but perhaps the most interesting. Dreams are a unique source of inspiration, for they come at a time when most of us feel we have relinquished control of our minds. Scientists have studied the brain and attempted to understand how and why we dream. They have discovered much, but will probably never be able to fully track the workings of the mind.[82]

Indeed, the absence of a determination not to let our minds wander from our task at hand is one reason we are able to receive knowledge through dreams. Elder Parley P. Pratt wrote that dreams are a time when our other concerns are swept aside and then we are more open to the impressions of the Spirit.

> When the outward organs of thought and perception are released from their activity, the nerves unstrung, and the whole of mortal humanity lies hushed in quiet slumbers in order to renew its strength and vigor, it is then that the spiritual organs are at liberty, in a certain degree, to assume their wonted functions, to recall some faint outlines, some confused and half-defined recollections, of that heavenly world and those endearing scenes of their former estate from which they have descended in order to obtain and mature a tabernacle of flesh. . . . Spirit communes with spirit, thought meets thought, soul blends with soul. . . .
>
> In this situation, the spiritual organs are susceptible of converse with Deity or of communion with angels and the spirits of just men made perfect.[83]

President Wilford Woodruff confirmed these words when he explained, "There are a great many things taught us in dreams that are true, and if a man has the Spirit of God he can tell the difference between what is from the Lord and what is not."[84] He also stated that "the Lord does communicate some things of importance to the children of men by means of visions and dreams as well as by the records of divine truth."[85] Elder Henry D. Taylor of the First Quorum of the Seventy noted, "Ofttimes messages are conveyed by dreams."[86]

The scriptures provide additional support to the prophets' statements on the revelation of truth through dreams. The Bible records Jacob's dream of the ladder reaching to heaven, Joseph of Egypt's dream of his family's sheaves making obeisance unto him, Pharaoh's dreams of the seven years of plenty and seven years of famine, Nebuchadnezzar's dream and Daniel's interpretation, and others (see Genesis 28:12, 37:5–10, 41:1–28; Daniel 2). Pilate's wife dreamed a dream after which she called Jesus "just" and asked her husband not to condemn Him (Matthew 27:19).

The Book of Mormon also presents records of dreams. Nephi recorded the words of his father Lehi when he related to his sons the Lord's command that they return to Jerusalem. He said to his sons, "I have dreamed a dream" (1 Nephi 3:2). A few chapters later, he elaborated on that idea as he described his experience learning

about the tree of life: "I have dreamed a dream; or, in other words, I have seen a vision" (1 Nephi 8:2). Throughout the scriptures, man has been warned and advised in dreams.

Dreams and visions remain an important part of the spiritual heritage of the current dispensation. Joseph Smith had numerous visions and dreams related to the great work of Restoration and some of a more personal nature. In 1836 he saw a vision of his deceased brother Alvin in the celestial kingdom and was instructed that "all who have died without a knowledge of this gospel, who would have received it if they had been permitted to tarry, shall be heirs of the celestial kingdom of God" (D&C 137:7). On another occasion, in 1844, he had a dream of apostates who, in overtly seeking his destruction, had moved beyond his power to help them.[87] President Young also had dreams as he assumed the prophetic mantle following the death of Joseph Smith. In one of these he saw the Prophet Joseph Smith, who urged him to "tell the people to be humble and faithful, and be sure to keep the spirit of the Lord and it will lead them right."[88] In 1894, President Wilford Woodruff, speaking of impending destructions on the earth, noted that he had had "the vision of the night opened continually" before his eyes.[89] President David O. McKay, while on an Asian tour in 1921, had a vision of the heavenly city in which he was instructed that all those who arrive at that glorious location "are they who have overcome the world—who have truly been born again."[90] The revelation of spiritual knowledge through dreams continues today.

One of the most prominent scientists or inventors to receive a direct answer through a dream is Friedrich August Kekulé, an organic chemist famous for his work with the molecular structure of carbon compounds, especially benzene. He was pondering upon the nature of the structure but was not progressing, as his "thoughts were elsewhere." He wrote, "I turned my chair to the fire and dozed. Again the atoms were gamboling before my eyes. . . . But look! What was that? One of the snakes had seized hold of its own tail, and the form whirled mockingly before my eyes. As if by a flash of lightning I awoke; and this time . . . I spent the rest of the night in working out the consequences of the hypothesis."[91] The result of his dream was a breakthrough understanding of the circular nature of the benzene compound. In another less-famous account, he detailed a similar experience. He recorded, "I fell into a reverie, and lo, the atoms were gamboling before my eyes. . . . I saw how the larger ones formed a chain, dragging the smaller ones after them but only at the ends of the chain. . . . The cry of the conductor: 'Clapham Road,' awakened me from my dreaming; but I spent a part of the night in putting on paper at least sketches of these dream forms. This was the origin of the 'Structural Theory.'"[92]

Such dreams are not uncommon among other scientists. The discovery of the chemical mediation, or transmission, of nerve impulses came to physiologist Otto Loewi in a dream. However, when he awoke after the dream, he could not remember the details of it. Fortunately, he had the same dream again and was able to record and test it before the details were lost to him.[93] In another instance, a distinguished professor in New York was working on a formula but seemed unable to move forward:

> One night in his sleep he had a dream in which the formula was fully worked out. He woke up in great excitement and got up in the darkness to write it down. All he could find was a piece of paper handkerchief; on this he scribbled the formula. But in the morning, alas, he could not read his own scribbling. Each night thereafter on going to bed he concentrated his hopes upon dreaming the dream again. Fortunately, after some nights he did, and he then wrote the formula down for good.[94]

Johannes Kepler is another famous dreamer. He was the first to realize that the orbit of Mars

was an ellipse. Upon receiving that knowledge, he wrote, "I awoke as if from sleep."[95] The brilliant Scottish physicist James Clerk Maxwell, who wrote the equations of electromagnetic theory, was once asked how he solved his problems. He replied, "I dream about them."[96] In a study of researchers in a variety of fields, as many as 70 percent reported help from dreams.[97]

Dreams must be tested while awake to assure their validity. Each scientist who has profited from knowledge gained in this manner has tested the ideas received in their dreams in the laboratory. In the *Journal of Chemical Education* in 1987, U. Weiss and R. A. Brown wrote that "ideas for highly significant scientific research can indeed appear during sleep."[98] Nearly thirty years earlier in the same journal, O. T. Benfey expressed his opinion that not only can dreams be beneficial but that one can cultivate the ability to dream. He wrote, "Let us learn to dream, gentlemen, then perhaps we shall find the truth. But let us beware of publishing our dreams till they have been tested by the waking understanding."[99] Indeed, there are many dreams which have no relation to divine revelation of knowledge, and it takes a discerning judgment to determine which is the case. Elder Lee addressed this issue, humorously commenting at a BYU devotional, "I'm not here to tell you that every dream you have is a direct revelation from the Lord—it may be fried liver and onions that may have been responsible for an upset nervous disorder." However, he warned of the tendency to fail to recognize that some dreams really are from divine inspiration and continued by stating: "I fear that in this age of sophistication there are those of us who are prone to rule out all dreams as of no purpose, and of no moment. And yet all through the scriptures there were recorded incidents where the Lord, by dreams, has directed his people."[100]

Secular Theories of Discovery

Various secular theories of the discovery process related to theories of psychology exist. Albert Szent-Gyorgyi explained the process of discovery by stating, "Discovery consists of seeing what everybody has seen and thinking what nobody has thought."[101] In the cognitive theory, discovery is associated with the differing experiences of the researcher, whose skills, circumstances, and experiences may permit him to see things in a different light.[102] Another approach is to consider the creative insights widely reported by researchers as a product of the subconscious mind. After an initial preparation in the thinking process, there follows an incubation period in which the subconscious mind, freed from the restraints of the conscious mind, provides the answer in an illumination stage, which the researcher follows by a verification stage in which he verifies the results of his findings.[103]

The nature of creative thinking has also been related to the bilateral structure of the brain. The buzzwords "thinking outside the box" used in the pursuit of new and creative solutions in science, technology, and other endeavors, invite seeing things in new relationships to each other. Some have attributed this so-called lateral thinking, in which a new usage is found for an existing object or structure, to the creative right side of the brain.[104] Such theories provide working hypotheses, and possible explanations as to how the discovery process may work: they do not explain the source of new insight that is external to the experience of the truth seeker, nor recognize the unique creative genius of the searcher.

The scriptures are replete with information on the gifts of the Spirit, that every person is given a gift, that they are "for the benefit of the children of God," and that "every good gift cometh of Christ," the Lord "dividing to every man severally as he will" (D&C 46:8–26; Moroni 10:6–18; 1 Corinthians 12:4–11). Also God-given are those gifts of mind and character that permit the great discoveries, as well as other creative

accomplishment for the benefit of mankind. Gifts of the Spirit referred to often in scripture are the "word of knowledge" and the "word of wisdom" (in all the above references), which if interpreted broadly may also apply to the discovery process. Theoretical knowledge is the proper province of science, while wisdom may apply to the practical application of knowledge in technology. Indeed, President Joseph F. Smith decried the lack of recognition by many talented people that the gifts given to them which allow them to make important discoveries are of divine origin.[105]

There can be little doubt that "truth begets truth" in both the spiritual and the secular worlds. The convergence of ideas and circumstances may lead to the development of new ways of thinking.[106] Joseph Smith went to pray to resolve the problem of which church to join after reading the divine injunction in James 1:5, "If any of you lack wisdom, let him ask of God" (Joseph Smith—History 1:7–14), while many of the revelations came either as he pondered new information in the inspired translation of the Bible (see D&C 76) or responded to issues raised in one circumstance or another (see D&C 89). Knowledge is cumulative. The accumulation and cross-fertilization of scientific ideas in the discovery process also appear to be a major factor, as in the case of Newton's discoveries,[107] while the convergence of circumstance may lead to new and creative ideas, as in the case of textile production in the industrial revolution.[108] Much work yet remains to be done before we know everything about how God reveals truth to His children.[109] But the glimpse of the process provided should suffice to show that the revelatory process in both spiritual and secular fields has many commonalities and that God is at the base of both processes.

The Outpouring of Spiritual and Secular Knowledge in This Dispensation

The study of the history of mankind reveals that progress of scientific and technological development has been relatively slow over much of human history. The pace of progress quickened somewhat in early modern Europe, and the world has witnessed an acceleration of pace since the 1800s and a virtual knowledge explosion since the 1950s. The question arises, for what purpose has the Lord revealed so much scientific and technical knowledge to His children in the modern era? What is the link between these developments and the Restoration of the gospel and, more recently, the vast movement underway to take its message to all the world?[110]

The Lord told Abraham, "I rule in the heaven above, and in the earth beneath, in all wisdom and prudence, over all the intelligences" (Abraham 3:21). His great purpose is "to bring to pass the immortality and eternal life of man" (Moses 1:39). He is aware of the needs of all His children. As President Young observed, "All the creations are his work, and they are for his glory and for the benefit of the children of men; and all things are put into the possession of man for his comfort, improvement and consolation, and for his health, wealth, beauty and excellency."[111] The benefits of modern science and technology are not intended for the benefit of any one people but are intended for the benefit, edification, and blessing of all His children everywhere. Since the Lord has revealed "all the truth that is now in the possession of the world," we are indebted unto Him for it and accountable for the use we make of it.[112]

But the Lord's prophets have revealed that, in addition to the material blessing of all mankind, the great outpouring of scientific and technical knowledge of modern times has been revealed with the specific purpose of helping to build up the kingdom of God on the earth. In the words of President Young, "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."[113] President Faust likewise declared "that scientific knowledge, the marvels of communication, and the

wonders of modern medicine have come from the Lord to enhance His work throughout the world. As an example, the Church's FamilySearch Web site has more than seven million hits a day."[114] Prophet leaders have in fact identified how modern technology continues to assist in the accomplishment of the threefold mission of the Church: to proclaim the gospel, to redeem the dead and to perfect the Saints.

President Kimball ardently advocated the concept that technology was developed to be used by the members of the Church to help in the spread of the gospel. He said:

> I believe that the telephone and telegraph and other such conveniences were permitted by the Lord to be developed for the express purpose of building the kingdom. Others may use them for business, professional or other purposes, but basically they are to build the kingdom. I believe that the television and radio have been released to general knowledge by the Lord for the special purpose of building His kingdom, to produce programs which will build the testimonies of the Church members and take messages to numerous people.[115]

Not only will the Church thus be able to reach more people than ever before, but the gospel message will be able to reach those which it formerly could not, such as the illiterate. President Kimball declared:

> I am confident that the only way we can reach most of these millions of our Father's children is through the spoken word over the airwaves, since so many are illiterate. . . . Our Father in heaven has now provided us mighty towers—radio and television towers with possibilities beyond comprehension—to help fulfill the words of the Lord that "the sound must go forth from this place unto all the world." Even though there are millions of people throughout the world who cannot read or write, there is a chance to reach them through radio and television.[116]

Looking to the future he saw a further development, familiar to those who now "surf the Net" for information on every subject. Said he: "We shall use the inventions the Lord has given us to awaken interest and acquaint people of the world with the truths, to ease their prejudices and give them a general knowledge. We shall need to answer specific questions, and perhaps that can be done by two-way radio and TV perfected to a point beyond our present imagination."[117]

In the area of redeeming the dead, President Hunter testified:

> In recent years we have begun using information technology to hasten the sacred work of providing ordinances for the deceased. The role of technology in this work has been accelerated by the Lord himself, who has had a guiding hand in its development and will continue to do so. However, we stand only on the threshold of what we can do with these tools. I feel that our most enthusiastic projections can capture only a tiny glimpse of how these tools can help us—and of the eternal consequences of these efforts.[118]

One favorable consequence of the modern conveniences available today is the larger amount of free time Church members have today than did our forebears a century and more ago. Though we seem to be living in a faster-paced world, labor-saving tools and conveniences allow us much more discretionary time. President Young prophesied to his daughter Susa Young Gates, who was concerned about her lack of time for temple work, that the Lord would provide labor-saving devices so that we would be able to accomplish the necessary daily tasks in a much smaller amount of time, thereby leaving us time to do temple work.[119] President N. Eldon Tanner, a member of the First Presidency, said that these devices "save us time and personal energy, and we should use our extra time and effort to further God's work as an expression of our appreciation for his goodness to us."[120] Additionally, as a result of technological progress, people in

many areas of the world have more free time to attend Church activities and to engage in Church service, family history research, and temple work.[121] However, instead of using time wisely, many members have become distracted by the many activities and tantalizing amusements and distractions of the world. When we consider what the pioneers were able to do in addition to providing for their families' basic needs, it ought to cause us to reconsider how our time is used.

Another reason why modern inventions have come to pass is the need for the leaders of the Church to be able to manage a worldwide Church, to perfect the Saints in preparation for the Lord's Second Coming. With the ability to communicate easily and usually instantaneously with all parts of the world, the prophet and apostles are able to better instruct and direct the local leaders of the Church. They are also able to personally visit leaders and the Saints worldwide and to learn of conditions firsthand in every part of the world. Through hearing and seeing the prophet on the radio, through satellite or taped broadcast, and even personally as he is able to travel around the world, the Saints are inspired and strengthened. President Kimball declared, "I believe that the airplane was inspired by the need for quick and far away transportation for the missionaries and the Brethren of the Church."[122] The Lord is thus fulfilling the prophecy that the gospel might be proclaimed "unto the ends of the world, and before kings and rulers" (D&C 1:23).

Never before has there been a dispensation that the Lord has promised would not succumb to apostasy. This dispensation is to last until the Lord comes again.[123] Never before in the history of the earth has the gospel of Jesus Christ been spread out over so much of the face of the earth. As such, the creation of a worldwide community of Saints unitedly preparing for the Second Coming is essential. Without the wonders of the modern telecommunications and sophisticated travel, the Church could well face an apostasy similar to that of the primitive Church. Misunderstandings over doctrine or procedure must not be allowed to slip through the cracks despite the size of the Church. Training sessions broadcast via satellite, such as the series of worldwide priesthood leadership training sessions begun in January 2003, now reach the entire leadership of the Church. "The Lord has made possible the technology by which this training is going forward," observed President Hinckley.[124]

Unique to this dispensation. As we prepare for the Second Coming, the inventions and discoveries provided by the Lord will help us in those preparations. Joseph Fielding Smith affirmed that the discoveries and inventions of recent years "belong to the Dispensation of the Fulness of times."[125] Why have these developments taken place as they have? Joseph Fielding Smith has provided the answer: "*Because the time is here; it is ripe. We are ready for these discoveries, these inventions, and they all have a bearing upon the restoration of the gospel* and preparation for the time which is yet future, but which is shortly to come, when Christ shall reign on the earth, and for a thousand years peace shall be established. That is what it is all for."[126]

We are here to prepare for the Second Coming of the Lord. The Lord is accelerating His work. The means to do so are constantly being provided. A graph of the rate of discovery compiled by retired Latter-day Saint scientist C. Grant Ash based on such things as speed of travel and other indexes shows that the discovery process accelerated at the beginning of the nineteenth century, coincident with the Restoration of the gospel; and again, very steeply after the 1950s, as the Church began to assume its worldwide mission.[127] As President Hunter observed: "There has been no other time in the history of the world when knowledge has increased at a more rapid rate than it has in your generation. Today is the sum total of all the knowledge of yesterdays, and the acceleration of learning in the sciences and other fields is staggering to us."[128]

A paragraph must be added at this point to emphasize that the people of our day are not necessarily smarter than those of other days. Joseph Fielding Smith emphasized this fact on several occasions, as he pointed out that revelations intended for our day were not given to people in other dispensations. President Benson said, "God's revelation to Adam did not instruct Noah how to build the Ark. Noah needed his own revelation."[129] Joseph Fielding Smith reaffirmed that "[modern inventions] were *not intended for Abraham's day*, and they would not be known and utilized today if the Lord had not revealed them to men."[130] He also stated in general conference: "I do not believe for one moment that these discoveries have come by chance, or that they have come because of superior intelligence possessed by men today over those who lived in ages that are past. They have come and are coming because the time is ripe, because the Lord has willed it, and because he has poured out his Spirit on all flesh."[131] Later in the same talk, he said, "So it is not because of greater intelligence, but because, no doubt, of the greater accumulations of knowledge together with the inspiration that comes from the Lord as he grants it unto men, that we receive the benefit of these blessings."[132] Speaking of the benefits of the last days, he said: "The time has come for the Father to gather together in one all things in Christ, both which are in heaven, and which are on earth, that the fulness of his work may be consummated. For this reason we are seeing and enjoying the great advantages of our time."[133]

Conclusion

The Lord has sent vast knowledge for discovery and invention to the children of men because "the time is ripe, because the Lord has willed it, and because he has poured out his Spirit on all flesh."[134] Through flashes of insight, studied progress, accidental discoveries, and even dreams, we move forward in our quest of knowledge of spiritual matters to prepare ourselves to greet our Savior and King and to become like Him. The quest for knowledge in temporal affairs follows a similar pattern. As Elder Joseph Fielding Smith observed, "We are living in the dispensation of the fulness of times, when the Lord is gathering all things in one and preparing the earth for the great millennial reign; and, it is necessary now that all these discoveries, these wonderful inventions and conveniences should be made known to the children of men."[135]

The great and marvelous accomplishments of the age, the flowering of the arts, the great advantages of science and technology to which President Gordon B. Hinckley alluded at the turn of the millennium belong "to all mankind"[136] (see D&C 98:5) as a divine heritage and are intended for the blessing of His children all over the earth. Their special mission is to build up the kingdom of God on the earth in preparation for the Second Coming of the Lord.

Notes

1. For widely used university textbooks on the modern period, see Richard W. Bulliet and others, *The Earth and Its Peoples: A Global History*, 2nd ed. (Boston: Houghton Mifflin, 2001); Palmira Brummett and others, *Civilization: Past and Present*, vol. 2, *From 1300*, 9th ed. (New York: Longman, 2000); John P. McKay and others, *A History of World Societies*, vol. 2, *Since 1500*, 5th ed. (Boston: Houghton Mifflin, 2000). For a more Eurocentric view, see R. R. Palmer, Joel Colton, and Lloyd Kramer, *A History of the Modern World*, 8th ed. (Boston: McGraw-Hill, 2001). The rise of Western society and its extension in varying forms to the rest of the world is a major theme of modern history. While aspects of technology, western political thought and capitalism have been exported to much of the world, the culture and religion of many societies have proven to be remarkably resilient. Most historians thus find it necessary to focus not just on western development but on the development of other societies to understand the nature and problems of the current world.

For a recent appraisal of the issues, see Gale Stokes, "The Fate of Human Societies: A Review of Recent Macrohistories," *American Historical Review* 106, no. 2 (April 2001): 508–25.

2. See, for example, Bulliet and others, *The Earth and Its Peoples*; William McNeill, *A World History* (New York: Oxford University Press, 1967). For a definition of the distinctions between science and technology and their differing methods, see the article by Thomas L. Erekson in this book. In a general sense, science has to do with theoretical knowledge of the natural world, while technology is concerned more with the application of knowledge to practical problems. Since the outburst of technical innovation of the industrial revolution, the two have been blended in varying degrees under the rubric of applied science or engineering, so that in many instances, it is now hard to determine where the one ends and the other begins (see Robert E. McGinn, *Science, Technology, and Society* [Englewood Cliffs, NJ: Prentice Hall, 1991], 13–29).

3. Joseph Smith, *History of the Church of Jesus Christ of Latter-day Saints*, ed. B. H. Roberts, 2nd ed. rev. (Salt Lake City: Deseret Book, 1971), 4:540–41.

4. See Joseph Fielding Smith, *Doctrines of Salvation*, comp. Bruce R. McConkie (Salt Lake City: Bookcraft, 1954–56), 1:175–76, 180.

5. See Gordon B. Hinckley, "At the Summit of the Ages," *Ensign*, November 1999, 72–74.

6. Joseph F. Smith, *Gospel Doctrine: Selections from the Sermons and Writings of Joseph F. Smith* (Salt Lake City: Deseret Book, 1919), 30.

7. Harold B. Lee, *Life under Control*, Brigham Young University commencement speech, June 4, 1951, L. Tom Perry Special Collections, Harold B. Lee Library, Brigham Young University, Provo, Utah, 19.

8. Brigham Young, *Discourses of Brigham Young*, comp. John A. Widtsoe (Salt Lake City: Deseret Book, 1966), 247.

9. Brigham Young, *Teachings of Presidents of the Church: Brigham Young* (Salt Lake City: The Church of Jesus Christ of Latter-day Saints, 1997), 17.

10. Merrill J. Bateman, "A Zion University," in *Brigham Young University Speeches 1995–96* (Provo, UT: Brigham Young University, 1996), 126.

11. James E. Faust, "'The Truth Shall Make You Free,'" *Ensign*, September 1998, 4. While the discussion here is focused largely on scientific and technological truths, the same principles apply to other fields of inquiry and human endeavor.

12. Howard W. Hunter, "To Know God," *Ensign*, November 1974, 96.

13. Henry Eyring, "My Father's Formula," *Ensign*, October 1978, 29.

14. Harold B. Lee, "'Sweet Are the Uses of Adversity,'" *Instructor*, June 1965, 217.

15. Bateman, "A Zion University," 127.

16. Joseph Fielding Smith, *Doctrines of Salvation*, 3:21; emphasis in original.

17. Neal A. Maxwell, "Start Making Chips," *New Era*, September 1998, 6.

18. Young, *Discourses*, 246.

19. Howard W. Hunter, *The Teachings of Howard W. Hunter*, ed. Clyde J. Williams (Salt Lake City: Bookcraft, 1997), 174.

20. Hunter, *Teachings*, 175.

21. Young, *Discourses*, 40.

22. Gordon B. Hinckley, *Standing for Something* (New York: Times Books, 2000), 162.

23. Typology of Ronald S. Lenox, "Educating for the Serendipitous Discovery," *Journal of Chemical Education* 62, no. 4 (April 1985): 282, except that we have divided "reverie" from "insight" to create a fourth category.

24. Smith, *History of the Church*, 3:381.

25. Boyd K. Packer, "Revelation in a Changing World," *Ensign*, November 1989, 14.

26. See Harold B. Lee, "Divine Revelation," in *Brigham Young University Assembly Speeches 1952–53* (Provo, UT: Brigham Young University, 1953), 7; see also *Conference Report of the First Mexico and Central America Area General Conference*, 1972, 49.

27. Cited in R. A. Brown and R. G. Luckcock, "Dreams, Daydreams and Discovery," *Journal of Chemical Education* 55, no. 11 (November 1976): 695.

28. *Deseret News*, November 22, 1930.

29. Brown and Luckcock, "Dreams, Daydreams and Discovery," 694.

30. Frazier Moore, "Two New Books Portray Television's Overlooked Inventor," *Kingston Whig-Standard*, June 22, 2002, 7 (reviewing Daniel Stashower, *The Boy Genius and the Mogul: The Untold Story of Television* [New York, Broadway Books, 2002], and Evan I. Schwartz, *The Last Lone Inventor: A Tale of Genius, Deceit and the Birth of Television* [New York: HarperCollins, 2002]).

31. Moore, "Two New Books," 7.

32. Lee, "'Sweet Are the Uses of Adversity,'" 217.

33. Cited in Royston M. Roberts, *Serendipity: Accidental Discoveries in Science* (New York: John Wiley and Sons, 1989), 82.

34. Cited in Roberts, *Serendipity*, 82.

35. Henri Poincaré, "Mathematical Creation," in *The Creative Process: A Symposium*, ed. Brewster Ghiselin (Berkeley: University of California Press, 1952), 26.

36. Poincaré, "Mathematical Creation," 26.

37. Poincaré, "Mathematical Creation," 26.

38. Poincaré, "Mathematical Creation," 27.

39. Boyd K. Packer, "Reverence Invites Revelation," *Ensign*, November 1991, 21.

40. Ezra Taft Benson, *The Teachings of Ezra Taft Benson* (Salt Lake City: Bookcraft, 1988), 117.

41. Young, *Discourses*, 259–60.

42. Smith, *Doctrines of Salvation*, 1:147.

43. For the transition from ancient learning to modern science, see Yves Gingras, Peter Keating, Camille Limoges, *Du scribe au savant: Les porteurs du savoir de l'Antiquité à la révolution industrielle* (Montreal: Boréal, 1998).

44. Lenox, "Serendipitous Discovery," 282.

45. Lenox, "Serendipitous Discovery," 282.

46. Lenox, "Serendipitous Discovery," 282.

47. Paul Israel, *Edison: A Life of Invention* (New York: John Wiley and Sons, 1998), 452.

48. Robert Conot, *A Streak of Luck* (New York: Seaview Books, 1979), vii.

49. Richard S. Westfall, "Newton's Development of *Principia*," in *Springs of Scientific Creativity: Essays on Founders of Modern Science*, ed. Rutherford Aris, H. Ted Davis, and Roger H. Stuewer (Minneapolis: University of Minnesota Press, 1983), 41.

50. Erwin N. Hiebert, "Walther Nernst/Application of Physics to Chemistry," in Aris, Davis, and Stuewer, *Springs of Scientific Creativity*, 227.

51. Joseph B. Wirthlin, "Pondering Strengthens the Spiritual Life," *Ensign*, May 1982, 23.

52. Joseph Fielding Smith, in Conference Report, October 3, 1926, 117.

53. Benson, *Teachings*, 119–20.

54. Mark E. Petersen, *Revelation*, Address at the Convention of Teachers of Religion on the College Level, Brigham Young University, August 24, 1954, typescript, Americana Collection, L. Tom Perry Special Collections, Harold B. Lee Library, Brigham Young University, Provo, Utah, 5.

55. The greater light of the Holy Ghost may also illuminate the researcher's mind. No attempt is made here to delineate the interaction of each revelatory medium as it is virtually impossible to determine the action of each in specific instances. The Holy Ghost may be the source of visible flashes of insight, and the Light of Christ may give more subtle intimations.

56. Joseph F. Smith, *Gospel Doctrine*, 66–67.

57. Young, *Discourses*, 18–19.

58. Lee, "Life under Control," 19.

59. Anthony A. Alioto, *A History of Western Science* (Englewood Cliffs, NJ: Prentice-Hall, 1987), 224.

Newton spent a great deal of time trying to relate the prophecies of Daniel to the history of the world. He also dismissed the triune concept of God in favor of a belief in the separate identities of the members of the Godhead.

60. James D. Newton, *Uncommon Friends* (San Diego: Harcourt Brace Jovanovich, 1987), 30.

61. Abraham Pais, *Subtle Is the Lord: The Science and Life of Albert Einstein* (Oxford: Oxford University Press, 1982), 319.

62. Ronald W. Clark, *Einstein: The Life and Times* (New York: Avon Books, 1971), 516–17.

63. Alice Calaprice, comp., *The Expanded Quotable Einstein* (Princeton: Princeton University Press, 2000), 287.

64. N. Eldon Tanner, "Importance and Efficacy of Prayer," *Ensign*, August 1971, 4.

65. "Prayer Is the Soul's Sincere Desire," *Hymns* (Salt Lake City: The Church of Jesus Christ of Latter-day Saints, 1985), no. 145.

66. Spiritual truth seekers are required to be worthy to receive revelation from God (see D&C 50:29). Do secular truth seekers have to be worthy to receive revelation from God? Examining the motivations of major truth seekers, including Archimedes and Louis Pasteur, BYU technology professor A. Brent Strong concluded that their motivations included those of earning a living, intellectual curiosity, helping others, civic duty, or defending their country, all of which we would consider as worthy (lecture to honors world civilization class at BYU, March 23, 2001). The rules of personal conduct for the acquisition of secular truth, however, do not appear to be as stringent as those for receiving personal revelation.

67. Quoted in Hal Hargreaves, *Visions and Discoveries: Reflections on the Nature of Scientific Inquiry* (Lanham: University Press of America, 1990), 145.

68. Quoted in Eliza R. Snow Smith, *Biography of Lorenzo Snow* (Salt Lake City: Deseret News, 1884), 46.

69. Quoted in Morton Wagman, *Scientific Discovery Processes in Humans and Computers* (Westport, CT: Praeger, 2000), 173.

70. This philosophical approach derives from early thinkers, Francis Bacon (1561–1626) and René Descartes (1596–1650) (see Palmer and Colton, *Modern World*, 261–65).

71. Horace Walpole coined the word *serendipity* in a letter to Sir Horace Mann in 1754 when he wrote, "This discovery, indeed, is almost of that kind which I call Serendipity." The word was derived from a fairy tale about "The Three Princes of Serendip" who "were always making discoveries, by accidents and sagacity, of things which they were not in quest of" (Royston M. Roberts, *Serendipity: Accidental Discoveries in Science* [New York: John Wiley and Sons, 1989], ix). Since then it has come to mean "the faculty of making fortunate and unexpected discoveries by accident" (*American Heritage Dictionary of the English Language*, s.v. "serendipity").

72. See Smith, *History of the Church*, 2:79–80.

73. See John A. Widtsoe, "Looking toward the Temple," *Temples of The Church of Jesus Christ of Latter-day Saints* (Salt Lake City: Ensign of The Church of Jesus Christ of Latter-day Saints, 1988), 47; see also "Blessings of Temple Worship," *Ensign*, December 2001, 64.

74. Roberts, *Serendipity*, 160–61.

75. See Roberts, *Serendipity*, 163.

76. Roberts, *Serendipity*, 54–55.

77. Roberts, *Serendipity*, 244–45.

78. See Arthur Koestler, *The Act of Creation*, 2nd Danube ed. (London: Hutchinson, 1976), 112.

79. Quoted in Roberts, *Serendipity*, 244.

80. Roberts, *Serendipity*, 244.

81. See Wouter van Joolingen, "Cognitive Tools for Discovery Learning," *International Journal for Artificial Intellligence in Education* 10 (1990): 385–97. Joolingen writes, "Cognitive tools, defined here as instruments that support or perform cognitive processes for learners in order to support learning, can bridge the difference between environments, like discovery learning environments and traditional supportive instructional environments" ("Cognitive Tools," 385).

82. See Peter Gray, *Psychology*, 4th ed. (New York: Worth Publishers, 2002), 215–16; J. Allen Hobson, *Sleep* (New York: Scientific American Library, 1995).

83. Parley P. Pratt, *Key to the Science of Theology* (Salt Lake City: Deseret Book, 1978), 75–76.

84. Wilford Woodruff, in *Journal of Discourses*, 22:333. Wilford Woodruff further elaborated on the process: "The Lord does communicate some things of importance to the children of men by means of visions and dreams as well as by the records of divine truth. And what is it all for? It is to teach us a principle. We may never see anything take place exactly as we see it in a dream or a vision, yet it is intended to teach us a principle" (in *Journal of Discourses*, 22:333).

85. Wilford Woodruff, in *Journal of Discourses*, 22:333.

86. Henry D. Taylor, "Revelation," *Ensign*, May 1978, 38.

87. See Joseph Smith, *Teachings of the Prophet Joseph Smith*, comp. Joseph Fielding Smith (Salt Lake

City: Deseret Book, 1976), 368–69. See also his dream of his old farm in Kirtland, June 26, 1844 (Smith, *Teachings*, 393–94).

88. Young, *Teachings of Presidents of the Church: Brigham Young*, 41.

89. Wilford Woodruff, *The Discourses of Wilford Woodruff*, ed. G. Homer Durham (Salt Lake City: Bookcraft, 1946), 229.

90. David O. McKay, *Cherished Experiences from the Writings of President David O. McKay*, rev. and enl., comp. Clare Middlemiss (Salt Lake City: Deseret Book, 1955), 102.

91. O. T. Benfey, *Journal of Chemical Education* 35 (January 1958): 21.

92. Benfey, *Journal of Chemical Education* 35:21.

93. See Edmund W. Sinnott, "The Creativeness of Life," in *Creativity and Its Cultivation*, ed. Harold Anderson (New York: Harper, 1959), 23; see also Roberts, *Serendipity*, 81.

94. Rollo May, "The Nature of Creativity," in *Creativity and Its Cultivation*, 62.

95. Quoted in Alioto, *A History of Western Science*, 187.

96. C. W. F. Everitt, "Maxwell's Scientific Creativity," in *Springs of Scientific Creativity*, 133.

97. See Brown and Luckcock, "Dreams, Daydreams and Discovery," 695.

98. U. Weiss and R. A. Brown, *Journal of Chemical Education* 64 (September 1987): 770.

99. *Journal of Chemical Education* 35:21.

100. Harold B. Lee, "Divine Revelation," in *Brigham Young University Assembly Speeches* (Provo, UT: Brigham Young University, 1952), 7.

101. Quoted in Roberts, *Serendipity*, 245.

102. See William H. Middendorf, *What Every Engineer Should Know about Inventing* (New York: Marcel Bekker, 1981), 31–32.

103. See Subrata Dasgupta, *Creativity in Invention and Design* (New York: Cambridge University Press, 1994), 34.

104. See A. Brent Strong, "Why Engineers Should Read Shakespeare and Why Humanists Should Understand Einstein," Karl G. Maeser Distinguished Faculty Lecture, Brigham Young University, Provo, Utah, October 28, 2003. What then of hunches that prove to be false, an issue raised by LDS astrophysicist Hollis Johnson (e-mail from Hollis Johnson to Roy A. Prete, September 23, 2003). Hunches, even if wrong, may help to prepare the recipient for the correct insight as he or she works through the problem. While the approach that one takes may prepare the ground for new insight, the actual acquisition of that knowledge nonetheless may have divine links as insights become evident. Perhaps, the principle of agency requires that we must go as far as we can on our own. Undoubtedly, even with the light of the gospel, many aspects of the discovery process remain obscure.

105. See Joseph F. Smith, *Gospel Doctrine*, 270–71.

106. See Thomas S. Kuhn, *The Structure of Scientific Revolutions*, 2nd ed. (Chicago: University of Chicago Press, 1970) regarding the transformation of paradigms in scientific thinking.

107. See Roland M. Stromberg, *An Intellectual History of Modern Europe* (New York: Appleton-Century-Crofts, 1966), 53–57.

108. See David Landes, *The Prometheus Unbound: Technical Change and Industrial Development in Western Europe from 1750 to the Present* (London: Cambridge University Press, 1969), chapter 2.

109. For a broader consideration of issues in the relationship between science and religion, see John A. Widtsoe, *Evidences and Reconciliations* (Salt Lake City: Bookcraft, 1943); Paul R. Green, comp., *Science and Your Faith in God* (Salt Lake City: Bookcraft, 1958); David L. Clark, ed., *Of Heaven and Earth: Reconciling Scientific Thought with LDS Theology* (Salt Lake City: Deseret Book, 1998).

110. See chapters herein, Thomas L. Erekson, "Preparing the Way: Technological Development in the Nineteenth and Twentieth Centuries," and Robert S. Patterson and E. Dale LeBaron, "Preparing the World and the Church for the Preaching of the Gospel since 1945."

111. Young, *Discourses*, 18.

112. Young, *Discourses*, 2.

113. Young, *Discourses*, 18.

114. James E. Faust, "Of Seeds and Soils," *Ensign*, November 1999, 48.

115. Spencer W. Kimball, in regional representative seminar, April 3, 1975, typescript, Americana Collection, L. Tom Perry Special Collections, Harold B. Lee Library, Brigham Young University, Provo, Utah, 19.

116. Kimball, "When the World Will Be Converted," 10.

117. Spencer W. Kimball, *The Teachings of Spencer W. Kimball*, ed. Edward L. Kimball (Salt Lake City: Bookcraft, 1982), 587.

118. Howard W. Hunter, "We Have a Work to Do," *Ensign*, March 1995, 65.

119. See Archibald F. Bennett, "Put On Thy Strength, O Zion!" *Improvement Era*, October 1952, 720.

120. N. Eldon Tanner, "'Ye Shall Know the Truth,'" *Ensign*, May 1978, 15.

121. See Roy Prete, "A New History for a New Millennium?" paper presented for discussion at the Thursday Research Seminar of the Department of History at Brigham Young University, October 5, 2000, 20.

122. Spencer W. Kimball, in Regional Representatives Seminar, April 3, 1975, 19.

123. See Wilford Woodruff, *Discourses*, 109–10.

124. Gordon B. Hinckley, Priesthood Leadership Training Broadcast, January 11, 2003.

125. Joseph Fielding Smith, in Conference Report, October 1926, 117.

126. Smith, *Doctrines of Salvation*, 1:180–81; emphasis in original.

127. See C. Grant Ash, "You Are Human, Not Animal," unpublished manuscript, 12–16.

128. Hunter, *Teachings*, 175.

129. Ezra Taft Benson, "Fourteen Fundamentals in Following the Prophet," in *Classic Speeches* (Provo, UT: BYU Publications and Graphics, 1994), 1:19.

130. Smith, *Doctrines of Salvation*, 1:145–46; emphasis in original.

131. Smith, in Conference Report, October 1926, 117.

132. Smith, in Conference Report, October 1926, 118.

133. Smith, in Conference Report, October 1926, 118.

134. Smith, in Conference Report, October 1926, 117.

135. Smith, *Doctrines of Salvation*, 1:147.

136. Hinckley, "At the Summit of the Ages," *Ensign*, November 1999, 72–74.