Revelation as Scientific in its Method: Science, Diversity, Consultation, and Learning in Action[1]

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Abstract
This paper is an exploration of Shoghi Effendi's statement that Bahá'u'lláh's Revelation is "scientific in its method," starting from the various ways that scientific methods are implemented and including perspectives from the philosophy of science. We examine the role of diversity in achieving scientific objectivity and escape from bias, and consider how the Bahá'í process of action, reflection, consultation, and study is consistent with modern understandings of the scientific method. Because this form of learning in action can be used by everybody, and because ethical, moral, and spiritual practices are part of its way of doing things, it provides a powerful extension of science and its methods that is available to everyone and allows ready integration of spiritual values into the process.

Résumé
Le présent article explore la déclaration de Shoghi Effendi selon laquelle la révélation de Bahá'u'lláh est « scientifique dans sa méthode », en prenant comme point de départ les diverses façons dont les méthodes scientifiques sont mises en œuvre et en intégrant les perspectives issues de la philosophie des sciences. Nous examinons le rôle de la diversité dans l'atteinte de l'objectivité scientifique et l'évitement des préjugés, et nous voyons comment le processus bahá'í caractérisé par l'action, la réflexion, la consultation et l'étude est conforme aux conceptions modernes de la méthode scientifique. Comme tous peuvent utiliser cette forme d'apprentissage dans l'action et que les pratiques éthiques, morales et spirituelles en font partie intégrante, elle permet une expansion importante de la science et de ses méthodes accessibles à tous, et facilite l'intégration des valeurs spirituelles dans le processus.

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Resumen
Este artículo es una exploración de la declaración de Shoghi Effendi que la revelación de Bahá'u'lláh es "científico en su método", empezando de varias maneras que los métodos científicos se implementan e incluyendo perspectivas de la filosofía de la ciencia. Examinamos el papel de la diversidad en el logro de objetividad científica y el alejarse del sesgo, y considerar como el proceso Bahá'í de acción, reflexión, consulta y estudio es consistente con el entendimiento moderno del método científico. Por la razón que esta forma de aprendizaje en acción puede ser utilizado por todos, y porque las prácticas éticas, morales y espirituales son partes de su manera de proceder, provee una poderosa extensión de la ciencia y sus métodos disponibles a toda persona y permite una integración de valores espirituales en el proceso.

Introduction

In June of 1933, Shoghi Effendi wrote a letter to the British High Commissioner for Palestine saying that "the Revelation proclaimed by Bahá'u'lláh, His followers believe, is divine in origin, all-embracing in scope, broad in its outlook, scientific in its method, humanitarian in its principles and dynamic in the influence it exerts on the hearts and minds of men."

What does it mean for a Revelation to be scientific in its method? Does it mean that it uses a well-defined scientific method? If so, what scientific method? Or does it mean that it uses methods that are similar to those used in the sciences? If so, does this mean the methods of the natural sciences?[2] The social sciences? Or both? Or does it mean that we systematically develop rational understandings of the themes of Revelation and assess and refine our understanding through actions, evaluations, implementations, observations, and experiments?

To answer such questions, we explore what is meant by the phrase "scientific method" and consider the now prevalent view that there is no one single such method, but a diversity of methods. We proceed by looking at new understandings from the philosophy and history of science and then draw on the growing understanding of the power of consultation and learning in action in Bahá'í communities throughout the world.

It is worth noting at the start that the Bahá'í Faith strongly affirms the importance of science, a background for the claim by the Guardian that Bahá'u'lláh's Revelation is "scientific in its method." Science and religion,

2 Science casts a wide net, and its activities range from studying the origins of the universe to exploring the crowning complexity of consciousness and people acting together. My experience as a scientist is that of an experimental physicist pursuing an understanding of the quantum mechanical properties of light. I draw on that as it is what I know best. However, as I hope this article makes clear, understandings from the social sciences, from the philosophy of science, and from a diversity of other perspectives are needed if the questions at the heart of this paper are to be answered more fully.

according to its teachings, are "complementary systems of knowledge and practice by which human beings come to understand the world around them and through which civilization advances" (Universal House of Justice, 2 Mar. 2013). True science and true religion are in harmony with each other ('Abdu'l-Bahá, *Promulgation* 44:8). Science and religion are "the two most potent forces in human life" (Shoghi Effendi, *World Order* 204) and, as such, they must work together:

> Religion and science are the two wings upon which man's intelligence can soar into the heights, with which the human soul can progress. It is not possible to fly with one wing alone! Should a man try to fly with the wing of religion alone he would quickly fall into the quagmire of superstition, whilst on the other hand, with the wing of science alone he would also make no progress, but fall into the despairing slough of materialism. ('Abdu'l-Bahá, *Paris Talks* 44:13)

According to the Bahá'í teachings, "there is no contradiction between true religion and science" ('Abdu'l-Bahá, *Paris Talks* 44:3). Notably, "religious belief which is not conformable with scientific proof and investigation is superstition" ('Abdu'l-Bahá, *Promulgation* 44:8). If we "say religion is opposed to science, we lack knowledge of either true science or true religion, for both are founded upon the premises and conclusions of reason, and both must bear its test" (44:8).

Bahá'ís believe that when religion "shows its conformity with science," then will there be "a great unifying, cleansing force in the world which will sweep before it all wars, disagreements, discords and struggles" ('Abdu'l-Bahá, *Paris Talks* 44:23).

The Bahá'í understanding of the validity and utility of science is fully warranted given the power of science. Science reliably produces information and usable knowledge. Through its discoveries, it laid the basis for creating the technologies and systems of modernity. It unveils the facts of various matters and, in many cases, anticipates what will happen in the future. Atmospheric science, for example, can predict the likelihood of rainstorms and give warnings of flooding, tornados, hurricanes, violent winds, heat waves, and the like, saving lives and protecting environments (Cappucci).

The universality and reproducibility of scientific investigations create a common ground for belief and shared knowledge that fends off superstition and can forge unity and cooperation. And "beautiful ideas" from the sciences—such as complementarity, relativity, symmetry, and invariance—bring depth to philosophy and insights into the spiritual aspects of being (Wilczek 75; Phelps).

Science brings more than technical prowess and the accumulation of facts to the table. It also brings systematicity and the use of both rational and empirical methods to generate new

understandings and new knowledge. Logical ideas, rational developments, and exploration of implications are developed conceptually and explored empirically. Science, accordingly, cannot be understood as a system for generating knowledge without reference to the methods by which it proceeds.

An exploration of scientific methods comes at once to a central question. Is there a universal and agreed-on definition of the scientific method? In turn, this gives rise to other questions: What is the role of diversity—the diversity of personalities, cultural backgrounds, genders, and worldviews—in science? What moral, ethical, and spiritual values are involved—or should be involved—in our understanding of the role of science and its methods?

A powerful way of approaching these questions is by considering science as a social process, an approach popularized by Thomas Kuhn's *The Structure of Scientific Revolutions*, published to landmark acclaim in the 1960s. Kuhn emphasized the importance of scientific communities, within which scientists work together based on shared values and agreed-on procedures. In his view, a given community also operates within a specific paradigm of thought, which may well be incommensurable with the paradigm of a different scientific community within the same discipline. While the emphasis on incommensurability has receded, the relevance of social phenomena to the understanding of science retains its force; indeed, there is a growing consensus that ignoring the social aspects of science can lead to problems ("Overcoming").

Keeping the social in mind, we first briefly survey scientific methods. What we find is that there is not one single method for doing science, but a wide diversity of methods. Drawing on the work of philosophers of science Sandra Harding, Helen Longino, and coworkers, we conclude that this diversity plays an important—even an essential—role in the development of scientific objectivity. Following this, we then consider the Bahá'í approach to consultation and the widely used Bahá'í process of learning in action.[3]

The Scientific Method

The unique and fruitful capabilities of science are often ascribed to the scientific method. The mathematician William Hatcher, for example, wrote extensively on the relationship between science and religion in the Bahá'í teachings. He describes science as an activity "characterized by its method":

3 For perspectives on similar issues complementary to the approach taken here, we recommend papers in this *Journal* written by Andres Elvira Espinosa on the use of Bahá'í consultation for bias mitigation (forthcoming), by Whitney White Kazemipour on the role of the clash of differing opinions in consultation (in this issue), by Roger Neyman and Charlotte Wenninger on transformative dialogue as a way to deepen discourse (forthcoming), by Robert Sarracino on spiritual values (forthcoming), and by Todd Smith on "reading reality" and the interplay of different learning modes (in this issue).

> One may . . . ask to what the efficiency and productiveness of modern science is due, and I believe that here there is one basic answer: scientific method. . . . Indeed, we can say that science as an activity is characterized by its method, for the immense diversity of domains which are now the object of scientific study defies any intrinsic characterization in terms of unity of content. (231–32)

Here we look at various definitions of the scientific method, considering whether there is one scientific method or many. Finding the latter to be the case, we look for underlying fundamentals that make a method scientific and note that there is considerable leeway in the use of those fundamentals.

One important way to think about the statement that the Bahá'í Revelation is scientific in its method is to consider the role of the sciences, the applied sciences, and the engineering sciences in the implementation of the vision of humanity's future that is outlined in Bahá'u'lláh's Revelation. Realization of this vision will require new processes, new institutions, new training systems, new social and economic advances, wider deployment of discourse, and the like. These, in turn, will require new scientific understandings (Brooks) as well as new technological advances (M. Weinberg).[4]

The Myth of the Single Scientific Method

The Merriam-Webster online dictionary defines the scientific method as follows:

4 A useful and concise overview of how science, engineering, and innovation necessarily go together is given in Brooks:

> Science, technology and innovation each represent a successively larger category of activities which are highly interdependent but distinct. Science contributes to technology in at least six ways: (1) new knowledge which serves as a direct source of ideas for new technological possibilities; (2) source of tools and techniques for more efficient engineering design and a knowledge base for evaluation of feasibility of designs; (3) research instrumentation, laboratory techniques and analytical methods used in research that eventually find their way into design or industrial practices, often through intermediate disciplines; (4) practice of research as a source for development and assimilation of new human skills and capabilities eventually useful for technology; (5) creation of a knowledge base that becomes increasingly important in the assessment of technology in terms of its wider social and environmental impacts; (6) knowledge base that enables more efficient strategies of applied research, development, and refinement of new technologies.
>
> The converse impact of technology on science is of at least equal importance: (1) through providing a fertile source of novel scientific questions and thereby also helping to justify the allocation of resources needed to address these questions in an efficient and timely manner, extending the agenda of science; (2) as a source of otherwise unavailable instrumentation and techniques needed to address novel and more difficult scientific questions more efficiently. (477)

> Principles and procedures for the systematic pursuit of knowledge involving the recognition and formulation of a problem, the collection of data through observation and experiment, and the formulation and testing of hypotheses.

This definition succeeds, as others often do not, in that it identifies key components—systemization, problem statements, empirical testing, and data acquisition—as principles and procedures commonly found in various formulations of the scientific method.

If you look through the internet or introductory science books, you will find definitions of the scientific method that suggest it is an uncomplicated process with a fixed number of steps (ranging typically from three to seven).

For example, consider the celebrated Khan Academy, an educational institution providing free world-class education via the Internet used by more than one hundred and forty million people around the world. The Khan Academy characterizes the scientific method for biology and science in general as the following:

> At the core of biology and other sciences lies a problem-solving approach called the scientific method. The scientific method has five basic steps, plus one feedback step:
> - Make an observation.
> - Ask a question.
> - Form a hypothesis or testable explanation.
> - Make a prediction based on the hypothesis.
> - Test the prediction.
> - Iterate: use the results to make new hypotheses or predictions.

This, they claim, is the approach common to all the sciences:

> The scientific method is used in all sciences—including chemistry, physics, geology, and psychology. The scientists in these fields ask different questions and perform different tests. However, they use the same core approach to find answers that are logical and supported by evidence.

The model described by the Khan Academy includes hypothesis generation, prediction, empirical testing, and iteration. But it is presented in an outdated Baconian form suggesting that science always starts with an observation, which is followed by a fixed set of step-by-step processes. In practice, this is not how things are typically done. In the work of experimental physicists, for instance, more often than not the hypothesis comes first, then a literature review, and then a funding search. If funding is available, then there is experimental design and fabrication, data taking, analysis, article writing, review with coworkers, submission for publications, and talks at conferences. The ordering is not fixed and may vary as required. Iterations are often left to others.

Henry Cowles, writing in *The Scientific Method: An Evolution of Thinking from Darwin to Dewey*, criticizes the step-by-step model of the scientific method. The "idea of a set of steps that justifies science's authority has persisted in the face of constant denials of its existence." It persists because the scientific method is "a myth—and myths are powerful things" (1–2). Hepburn and Andersen, writing in *The Stanford Encyclopedia of Philosophy*, say that science is sometimes characterized by "the legend of a single, universal scientific method" and taught as if that method were a well-defined step-by-step procedure. What is important, they note, is the appropriate use of "systematic observation and experimentation, inductive and deductive reasoning, and the formation and testing of hypotheses and theories." It is these that help distinguish scientific activity from non-science. Appropriate usage is, they note, defined by the community of practice.

The Diversity of Scientific Methods

If the idea of a single scientific method is a myth, how do we explain the remarkable success of science? The current perspective is that there are many different methods of doing science, not just one. We illustrate this through the testimony of scientists and reports by philosophers of science.

Nobel Prize-winning physicist Steven Weinberg describes simplistic characterizations of the scientific method as artificial rules:

> Descartes and Bacon are only two of the philosophers who over the centuries have tried to prescribe rules for scientific research. It never works. We learn how to do science, not by making rules about how to do science, but from the experience of doing science. (214)

Steven Pinker, widely read for his advocacy of science, agrees:

> What then distinguishes science from other exercises of reason? It certainly is not "the scientific method," a term that is taught to school children but that never passes the lips of a scientist. Scientists use whichever methods help them understand the world: drudge like tabulation of data, experimental derring-do, flights of theoretical fancy, elegant mathematics modeling, kludgy computer simulation, sweeping verbal narrative. (392)

The *American Association for the Advancement of Science*, the world's largest scientific society, holds that "the various scientific disciplines are alike in their reliance on evidence, the use of hypothesis and theories, the kinds of logic used, and much more" (Rutherford and Ahlgren 3). However, "scientists differ greatly from one another in what phenomena they investigate and in how they go about their work; in the reliance they place on historical data or experimental findings and qualitative or quantitative methods;

in their recourse to fundamental principles, and in how much they draw on the findings of other sciences" (3–4).

Philosophers of science line up in support of this perspective. Paul Feyerabend, famously provocative in *Against Method*, makes the point as follows:

> The idea of a method that contains firm, unchanging, and absolutely binding principles for conducting the business of science meets considerable difficulty when confronted with the results of historical research. We find, then, that there is not a single rule, however plausible, and however firmly grounded in epistemology, that is not violated at some time or other. (14)

"It is clear," he writes, "that the idea of a fixed method, or of a fixed theory of rationality, rests on too naive a view of man and his social surroundings" (18).

Naomi Oreskes, the widely respected historian of science, holds that "there is now broad agreement among historians, philosophers, sociologists, and anthropologists of science that there is no (singular) scientific method, and that scientific practice consists of communities of people, making decisions for reasons that are both empirical and social, using diverse methods" (55).

The Ingredients of Science

If there is no one scientific method, but rather a plurality of methods used in a variety of ways, what makes science powerful, a source of truth, and a unifying process? What makes its essential features worthy of emulation? There are many ways to answer the question. Those we consider here are more general and inclusive, broadening the scope of our understanding of science.

A traditional approach to explaining the power of science—one still celebrated in scientific circles—is outlined by Steven Shapin in his description of physics in the early 1960s (around the time that Thomas Kuhn wrote *The Structure of Scientific Revolutions*):

> Science was seen as the instantiation of rationality, objectivity, open-mindedness, and progressiveness. Science methodically compared theoretical expectations against observational and experimental evidence; it purged itself of bias and prior expectations; its knowledge was cumulative; the quality of that knowledge was guaranteed by explicit methodological standards shared throughout the scientific community; the various bits of science were part of a fundamental unity, whether of concepts, facts, or methods; it arrived at, or at least approached, truth. (32)

Another approach is that given by Paul Hoyningen-Huene.[5] He argues

5 For a detailed treatment see Paul

that the special status of science is not due to a unique scientific method (or even scientific *methods*) but to rules of procedure. In ancient times, the rule of procedure for science was to use proofs derived logically from evident axioms. In the first parts of the scientific revolution, induction from observation was added to the rules list, and science based on logic and induction was thought to offer a reliable source of knowledge. Starting in the nineteenth century, confidence in such rules weakened, although science kept its special status. In our era, the belief in a special scientific method that gives science its authority has eroded further, especially among philosophers. He concludes that it is "highly plausible that scientific methods with the characteristics [posited in earlier times] do not exist" ("Systematicity" 168).

If rules of procedure are inadequate as a way to explain what makes science unique, where else can we look? Hoyningen-Huene argues that we must look to systematicity. "Scientific knowledge differs from other kinds of knowledge, especially from everyday knowledge, by its higher degree of systematicity" (169). If something is systematic, he notes, it is *not* purely random, accidental, arbitrary, unmethodical, unplanned, or unordered. Rather, it embraces interrelated dimensions of description, explanation, prediction, defense of knowledge claims, epistemic connectedness, completeness, knowledge generation, and representation of knowledge. "The whole of science," Hoyningen-Huene concludes, borrowing a phrase from Einstein, "is nothing more than a systematization of everyday thinking" (180).[6]

A similar characterization is supported by the philosopher Susan Haack in *Defending Science-within Reason: Between Scientism and Cynicism*. Borrowing from Charles Peirce, she describes science as "Critical Commonsensism." "It is similar to common sense, but of a special critical kind:"

> The core idea of Critical Commonsensism is that inquiry in the sciences is like empirical inquiry of the most ordinary, everyday kind—only conducted with greater care, detail, precision, and persistence, and often by many people within and across generations; and that the evidence with respect to scientific claims and theories is like the evidence with respect to the most ordinary, everyday claims about the world—only denser, more complex, and almost always a pooled resource. (iv)

This does not mean that science lacks special qualities. Although science works in ways common to other forms

Hoyningen-Huene article, "Systematicity: The Nature of Science," published in *Philosophia*, vol. 36, and his book *Systematicity: The Nature of Science*.

6 It should be noted that systematization is a principal component of Bahá'í processes of personal and collective transformation. See for example Universal House of Justice, *Social Action*, no. 149.

of inquiry, it differs "in the degree to which it requires broad and detailed background knowledge and a familiarity with a technical vocabulary that only specialists may possess." There is "no uniquely rational mode of inference or procedure of inquiry used by all." Rather, there are "many and various scientific methods, constantly evolving, and often local to this or that area of science" (iv).

William Hatcher, as noted at the outset, has explored the relationship between science and religion in the Bahá'í writings in great depth, and agrees with much of what Hoyningen-Huene and Haack have to say. Writing in the 1960s and 1970s, Hatcher came to understand the scientific method as "self-conscious common sense":

> Instead of relying on chance happenings or occasional experiences, one systematically invokes certain types of experiences. This is experimentation (the conscious use of experience). Instead of relying on naive reasoning, one formalizes hypotheses explicitly and formalizes the reasoning leading from hypothesis to conclusion. This is mathematics and logic (the conscious use of reason). Instead of relying on occasional flashes of insight, one systematically meditates on problems. This is reflection (the conscious use of intuition). (233)

The scientific method, according to Hatcher, is systematic, organized, directed, and conscious:

> What distinguishes the scientific method of knowing, it seems to me, is the systematic, organized, directed, and conscious nature of the process. However, much as we may refine and elaborate our description of the application of scientific method in some particular domain such as mathematics, logic, or physics, this description remains essentially an attempt on our part to bring to ourselves a fuller consciousness of exactly how we apply our mental faculties in the course of the epistemological act within the given domain. (232)

This leads Hatcher to a definition of the scientific method:

> [The] scientific method is the systematic, organized, directed, and conscious use of our various mental faculties in an effort to arrive at a coherent model of whatever phenomenon is being investigated. (232–33)

This broad description implies, among other things, that we should talk about the scientific method based on a more generalized—and more accurate—understanding of how science is done. Where older descriptions of the scientific method outline a fixed set of steps or well-defined rules of procedure, Hatcher's definition captures a more general perspective that sees science as the systematic use of the rational faculty. This perspective, which

is consistent with the extensive comments by ‘Abdu’l-Bahá on the topic, has the important implication that the scientific method is not limited to material or social phenomena.

What this survey of scientific methods shows is that there is a wide variety of ways of doing science and a diversity of scientific methods. Instead of considering the scientific method to be a single well-defined step-by-step procedure, we join scientists and philosophers of science who deny that there is only one scientific method.

By way of summary, then, we can say that science uses approaches that are systematic, directed, and organized, employs inductive and deductive reasoning, uses modeling, hypotheses, and theses, conducts background studies, relies on systematic observation and experimentation, requires analysis of data and observations, and requires verification of results through consultation and review. A particular investigation, of course, does not have to incorporate all of these features to be accepted as scientific—for example, theoretical papers have theory as a result and do not require experiments—but if the methods used do not fit into the broad perspective outlined by Hatcher, for instance, it is unlikely that they will be seen as scientific. Nor does this general list include the wide variety of sub-methods and sub-components of scientific methods to be found in specific scientific disciplines, and which may or may not be useful for a given project.

There are interesting implications of this way of looking at science. One, as noted, is that science is not limited to material and social phenomena. The wide range of methods, united by the systemic use of the rational faculty, guarantees that such limitations cannot be imposed. Certain specific and common components of science, however, may be limited in their application. Specifically, measurements and observations require something physical to measure or observe. Lacking a physical basis of measurement, there can be no empirical tests or observations.[7]

In the next section of this paper, we look at the role of diversity, a central aspect of the social nature of scientific endeavor. Diversity, we will see, plays a vital role in overcoming bias and creating objectivity if properly harnessed, and thus contributes to both Bahá’í consultation and learning in action, as well as shedding light on the way that Bahá’u’lláh’s Revelation is scientific in its method.

The Social in Science: The Role of Diversity

Science, as noted at the outset of this paper, is a social phenomenon. Isaac Newton achieved extraordinary success in inventing calculus, deriving the laws of gravity, and demonstrating the photon theory of light (Westfall). None of these discoveries achieved the status of scientific results, however, until his mathematical predictions were

7 For a discussion of the study of spirituality in the social sciences, see Sarracino (forthcoming).

evaluated empirically and verified by others. Without the astronomical observations of Tycho Brahe and Johannes Kepler's recognition that planetary orbits were elliptical, Newton's genius could not have borne fruit. Lacking the social phenomena of sharing data, the movements of the sun, stars, and planets could not have been studied systematically in light of Newton's insights.

This account, limited as it is, makes it apparent that social phenomena play a significant role in scientific endeavors. A full grasp of science, therefore, requires an understanding of the social processes that animate its strengths and underlie its weaknesses.

Some Social Aspects of Doing Science

The social nature of science often goes unnoticed. This is partly because we conceive of science as the discovery of universal truths that transcend subjectivity. However, developments in the philosophy of science, science studies, history of science, sociology of science, and other areas of thought are bringing social issues to the fore. Here we explore some that are current.

Much of modern thinking about the social dimensions of science is rooted in the nineteenth-century writings of John Stuart Mill. In *On Liberty*, he addresses a critically important problem. If humans are fallible, how is it possible to do objective science? He concludes that objectivity requires unobstructed opportunities for critical discussions that are motivated by the desire to root out falseness and partiality. Charles Sanders Peirce, the American founder of pragmatism, developed a similar perspective and concluded that truth is what is agreed on by a community of inquirers engaged in critical discussion.

Karl Popper, in the mid-twentieth century, was often taken to be the leading philosopher of science. He emphasized that criticism—a social activity—is necessary for the establishment of scientific truth. He argued that a proper scientific theory must be falsifiable, meaning that critics must be able to prove a theory wrong. For example, Popper looked at Freudian psychoanalytic theory and concluded that it was *not* scientific. Its hypotheses, he argued, cannot be shown to be wrong and therefore must be discarded as non-scientific.

Helen Longino, a modern philosopher of science focusing on the social nature of science, goes further, stating that "scientific knowledge *is* social knowledge" (231, emphasis added). It is "social both in the ways it is created and in the uses it serves" (76). It neither belongs to an individual nor is it the sum of individual contributions. Rather, it is produced by communities that engage in collective dialogue:

> What is called scientific knowledge, then, is produced by a community (ultimately the community of all scientific practitioners) and transcends the contributions of any individual or even of any sub-community within the larger community. Once propositions, theses, and

> hypotheses are developed, what will become scientific knowledge is produced collectively through the clashing and meshing of a variety of points of view. (69)

A major implication of this perspective is the importance of diversity in the pursuit of science.

Turning the Tables on Subjectivity through Diversity

The work of Longino and others has highlighted the ways in which the social aspects of science influence the perspectives of scientists. Suppose a science—say, an evolutionary science exploring eugenics—were to be done exclusively by white northern European males. Would we be surprised if it concluded that white northern European males were more advanced from an evolutionary standpoint than others? Leading thinkers in the evolutionary sciences at the turn of the nineteenth century were indeed white males, and their evolutionary sciences frequently concluded that the nonwhite races were not only less advanced but a threat to progress. Eugenic practices were recommended to resolve the "problem" (A. Rutherford; Kevles).

This raises an important question. Scientific knowledge is generated by a community of individuals, each with their own biases of race, class, ethnicity, and gender, and these biases can erode the objectivity of science. How can science be objective when its contributors are biased?

Longino and her co-workers turn this question on its head. Instead of taking it as a given that the social nature of science undermines objectivity, they ask how our social nature increases objectivity. The thrust of their conclusions is that objectivity is best achieved by bringing a wide variety of perspectives and standpoints to bear. If the "perspectives of women, people of color, the working classes, and many others" are not included, this leads to the "obvious sexism, racism, and class bias of many past scientific theories" (Harding 50). Bringing those perspectives into the discussion increases the points of view available on an issue under consideration:

> Our personal experiences—of wealth or poverty, privilege or disadvantage, maleness or femaleness, heteronormativity or queerness, disability, or able-bodiedness—cannot but influence our perspectives on and interpretations of the world. Therefore, *ceteris paribus,* a more diverse group will bring to bear more perspectives on an issue than a less diverse one. (Oreskes 50)

Just as the objectivity of a scientific community can be weakened by too much homogeneity, it can be strengthened by increased heterogeneity.

Longino argues that science corrects itself, becomes more objective, and improves its fidelity to the realities it aims to understand through a process she labels *transformative*

interrogation. This works through "the give and take of ideas—the challenging, the questioning, the adjusting and amending" that scientists use to interrogate "their colleagues' work, offer up criticisms, and contribute to the growth of warranted knowledge" (Oreskes 51–52). This means that

> [t]he objectivity of individuals in this scheme consists in their participation in the collective give-and-take of critical discussion and not in some special relation (of detachment, hardheadedness) they may bear to their observations. Thus understood, objectivity is dependent upon the depth and scope of the transformative interrogation that occurs in any given scientific community. (Longino 79)

Objectivity, viewed through this lens, comes from community practices that reduce the influence of prejudices, biases, and background assumptions. If we accept this as true, it follows that it will be helpful—even necessary—to have diversity and heterogeneity in our scientific communities. This does not mitigate all problems, but "objectivity is likely to be maximized when there are recognized and robust avenues for criticism, such as peer review, when the community is open, non-defensive, and responsive to criticism, and when the community is sufficiently diverse that a broad range of views can be developed, heard, and appropriately considered" (Oreskes 53). Transformative interrogation can help decide which "background assumptions are, in a given context, appropriate and helpful or inappropriate and unhelpful" (54). This form of epistemology "soundly refutes the claim that the social character of science makes it subjective," instead showing that "science is fundamentally consensual" (55).

In summary, then, scientific objectivity is arrived at by social processes, it is the property of communities, and it is improved by a diversity that creates better evaluations and critiques of background assumptions, empirical analyses, and biased perspectives. Given the strong emphasis on diversity in Bahá'í consultation and learning in action, we can expect these important components of the Bahá'í approach to learning to benefit from these advantages as well. We will discuss these next.

Bahá'í Consultation

Given the leading role that communities play in the activities of science, it is important to consider the ways that individual members of these communities communicate, share information, allocate resources, make decisions, initiate and carry out actions, review results, and plan further actions. Consultation—between individuals, in and between communities, and in and between institutions—is widely used to achieve these ends. Accordingly, it is a vital component of doing science and, as we will see, learning in action.

Consultation in Modern Usage

Before exploring consultation as it is understood by Bahá'ís, it is worth briefly reviewing how the term is used outside of the Bahá'í community. Consultation is defined in the *Cambridge English Dictionary* as "the process of discussing something with someone in order to get their advice or opinion about it." It can also be the "act of exchanging information and opinions about something in order to reach a better understanding" or to make a decision.

A broader definition by *The Consultation Institute*, a British non-profit, defines public consultation as

> the dynamic process of dialogue between individuals or groups, based upon a genuine exchange of views, with the clear objective of influencing decisions, policies, or programmes of action. (Jones and Gammell 115)

Core aspects of consultation, they write, are dialogue, genuine exchange, and consultation in the public arena aimed at exercising influence. Much of this is essential to scientific study. In particular, dialogue and verbal exchange are how ideas and analyses are shared and discussed, and the vehicle for review and validation to take place.

Bahá'í Consultation

Given the significant role of consultation in the activities of Bahá'í communities and institutions around the world and given the correspondences to roles that consultation plays in science, it makes sense to look at what the Bahá'í writings say about consultation in general and about Bahá'í consultation for community activities and institutional decision-making in particular.

The Bahá'í writings recommend the use of consultation "in all matters." It is "the lamp of guidance which leadeth the way, and is the bestower of understanding" (Bahá'u'lláh, *Tablets* 11:15). "No welfare and no well-being," Bahá'u'lláh asserts, "can be attained except through consultation" (qtd. in "Consultation" no. 2). "In all things it is necessary to consult" (no. 5). According to 'Abdu'l-Bahá, consultation is not only to be used for "ordinary and personal matters" but for "affairs which are general in nature and universal" (qtd. in "Consultation" no. 16).

Just as there is no one way to do science, there is no one way to consult. There are, however, a wealth of general guidelines for Bahá'í consultation, all emphasizing the centrality of seeking truth and achieving unity.

Bahá'í consultation does not work in the same way as other forms of consultation, having its own detailed and specific definitions in the Bahá'í writings. For Bahá'í institutions, consultation is used for decision-making and is "the means by which agreement is to be reached and a collective course of action defined" (Universal House of Justice, 24 Jan. 1993). To be effective, "consultation must have for

its object the investigation of truth" ('Abdu'l-Bahá, *Promulgation* 31:2). It is motivated by a spirit "very different from that current in the decision-making processes of non-Bahá'í bodies" (Universal House of Justice, 6 Mar. 1970).

Bahá'í consultation is more than just a means of reaching decisions and investigating the truth, important as that is. According to the Bahá'í writings, consultation is

> spiritual conference in the attitude and atmosphere of love. Members must love each other in the spirit of fellowship in order that good results may be forthcoming. Love and fellowship are the foundation. ('Abdu'l-Bahá, *Promulgation* 31:2)

It seems likely that science done with love and a spirit of fellowship will be more successful.

General Features and Applications of Consultation

There is no single step-by-step method for consultation in the Bahá'í writings or Universal House of Justice guidelines. What we find instead are broad principles. The Universal House of Justice, for example, describes those principles as leading to a

> consultative process which, understood as the collective investigation of reality, promotes detachment from personal views, gives due importance to valid empirical information, does not raise mere opinion to the status of fact or define truth as the compromise between opposing interest groups. (2 Mar. 2013)

This sounds a lot like science. Smith and Karlberg describe some of Bahá'í consultation's properties:

> Bahá'í consultation is, in brief, an approach to collective inquiry and deliberation that is intended to be unifying rather than divisive. Participants are encouraged to exercise freedom of expression and engage in probing, critical analysis, yet they must strive to express themselves with care and moderation and remain detached from preconceived opinions and positions. They are to regard diversity of perspective as an asset and actively solicit the views, concerns, insights, and expertise of others. After ideas are expressed, the ideas are no longer bound to the individuals who express them. Instead, ideas become collective resources that can be freely adopted, refined, or discarded, according to the collective wisdom of the group. (68)

The emphasis on diversity in Bahá'í consultation closely echoes the conclusions of Longino and co-workers that objective scientific knowledge is best achieved by bringing a diversity of perspectives and standpoints to the issues at hand.

There are different forms of Bahá'í consultation. Individuals, perhaps with specific projects in mind, can consult with others "and the truth will be disclosed" (Abdu'l-Bahá, qtd. in "Consultation" no. 16). If "people of a village consult one another about their affairs, the right solution will certainly be revealed." Professionals, those in industry, commerce, and business should consult as it "is desirable and acceptable in all things and on all issues" (no. 16). In all cases—from individuals to groups and from families to formal administrative bodies—those wishing to reach decisions or increase insight and understanding are prescribed consultation.[8]

Bahá'í institutions and communities consult in diverse ways as well. In administrative bodies known as Local Spiritual Assemblies, consultation is often focused on making decisions and planning actions (Universal House of Justice, 2 Mar. 2013). In this, the ideal is a unanimous decision. If that is not possible, a vote is to be taken. Those consulting must "abide by the voice of the majority, which we are told by the Master to be the voice of truth, never to be challenged, and always to be whole-heartedly enforced" (Universal House of Justice, 6 Mar. 1970). However, if circumstances change or added information becomes available, decisions can be reviewed, and adjustments made (White Kazemipour). There are, as well, provisions for appeal of institutional decisions (Universal House of Justice, *Constitution*).

Free Expression and Search for Truth

According to Shoghi Effendi, "consultation, frank and unfettered, is the bedrock" of the Bahá'í order (qtd. in "Consultation" no. 27). The Universal House of Justice advises that in consultation, "the friends must balance the principle that 'the honored members must with all freedom express their own thoughts' with the principle that 'he must with moderation set forth the truth.'" Furthermore, "individuals should be guided by their consciences and the circumstances of each situation. Hard and fast rules cannot and should not be laid down" (qtd. in Ruhi, Unit 2, "Consultation").

Centrally important is that discord and ill feelings are to be avoided:

> This can be attained when every member expresseth with absolute freedom his own opinion and setteth forth his argument. Should anyone oppose, he must on no account feel hurt for not until matters are fully discussed can the right way be revealed. The shining spark of truth cometh forth only

8 Speaking generally, Bahá'í consultation can be usefully characterized as *exploratory* "with the purpose of generating collective awareness, insight, and understanding," *advisory* "with the purpose of providing advice, feedback, suggestions, or constructive criticism to those who will be making decisions" and *decisional* where decisions are the end-product (Karlberg 81).

> after the clash of differing opinions. ('Abdu'l-Bahá, *Selections* 44:1)

This aspect of Bahá'í consultation mirrors a basic, if mainly unspoken, adage of science: One should speak freely and truthfully about technical matters but remain friends with one's coworkers.

At the heart of Bahá'í consultation, according to the writings, is the search for truth. In every matter, participants "must . . . search out the truth and not insist upon their own opinion, for stubbornness and persistence in one's views will ultimately hide the truth" ('Abdu'l-Bahá, *Selections* 45:1). Further, they must "carefully consider the views already advanced by others. If he finds that a previously expressed opinion is more true and worthy, he should accept it immediately and not willfully hold to an opinion of his own" ('Abdu'l-Bahá, *Promulgation* 31). A prime requisite is detachment (Shoghi Effendi, 5 Mar. 1922).

The search for truth in every matter is also a prerequisite of science.

The Role of Spiritual Values

Spiritual values, the writings make clear, are central to the success of Bahá'í consultation. Two components—the search for truth as just described, and the high regard held for unity—are particularly important. But other spiritual values are important as well.

'Abdu'l-Bahá writes that those engaging in consultation must "proceed with the utmost devotion, courtesy, dignity, care and moderation to express their views" (*Selections* 45). Further, "the prime requisites for them that take counsel together are purity of motive, radiance of spirit, detachment . . . attraction . . . humility and lowliness . . . patience and long-suffering in difficulties and servitude" (43).

That these spiritual values are important to scientific endeavors as well as to Bahá'í consultation can be seen if we consider which scientific community is likely to progress more effectively: one in which these values are present, or one where their opposite—deceit, distrust, disunity, arrogance, entitlement, and other barriers—dominate.

Outcomes of Consultation: Generating Understanding and Making Decisions

Consultation generates new knowledge and creates new understanding:

> The Great Being saith: The heaven of divine wisdom is illumined with the two luminaries of consultation and compassion. Take ye counsel together in all matters, inasmuch as consultation is the lamp of guidance which leadeth the way, and is the bestower of understanding. (Bahá'u'lláh, *Tablets* 11:15)

Consultation can work like scientific and technological brainstorming. During consultation, our brains light up with innovative ideas, concepts, and connections in powerful and creative

ways.[9] Diversity, support for a free and frank exchange of ideas, supportive and encouraging environments, and experienced facilitation are some of the ingredients that lead to new understandings and growing knowledge. Ancient barriers are swept away.

As noted earlier, decisions arrived at by Bahá'í consultation are ideally unanimous, but if this is not possible, a majority decision is made. Crucially, as "soon as a decision is reached it becomes the decision of the whole Assembly, not merely of those members who happened to be among the majority" (Universal House of Justice, 6 Mar. 1970). Thus, decision-making using Bahá'í consultation has a built-in unifying mechanism.

'Abdu'l-Bahá explains why this is the case, noting that if the members "agree upon a subject, even though it be wrong, it is better than to disagree." Even though "one of the parties may be in the right and they disagree, that will be the cause of a thousand wrongs, but if they agree and both parties are in the wrong, as it is in unity the truth will be revealed and the wrong made right" (qtd. in "Consultation" no. 12). Furthermore, "if in one case they take a wrong decision, in a hundred other cases they will adopt right decisions, and concord and unity are preserved. This will offset any deficiency and will eventually lead to the righting of the wrong" (no. 15).

9 For a stimulating article on creativity in business settings, see Amabile and Khaire.

Consultation and Science

The weighty station that consultation holds in the Bahá'í writings leads many Bahá'ís "to believe that consultation is the preeminent tool for achieving . . . constructive communication" (Smith and Ghaemmaghami 458). This has implications for the relationship between consultation and science. Without constructive communication of the kind enabled by consultation, it is unlikely that the experimentalist will benefit from the understanding of the theorist, or that the theorist will be able to obtain experimental verification from the experimentalist. Neither will benefit from the understanding of colleagues, and the process of review and group validation would miss the important component of human interaction. Consultation clearly is a part of the way that science is done, albeit an often overlooked one. It is not the whole, but it plays a vital and necessary role.

With respect to the work of Longino and others who take into account the social aspects of objectivity, we see that objectivity is enhanced by "the collective give-and-take of critical discussion" and "the depth and scope of the transformative interrogation that occurs in any given scientific community" (Longino 79). The search for truth and unity characterizing Bahá'í consultation looks very much like a key ingredient for that give-and-take to fruitfully take place. The emphasis on the "shining spark of truth" coming forth "only after the clash of differing

opinions," combined with the need to maintain unity, seems to be necessary for any successful sustainable engagement in enterprises of truth-seeking like science (ʻAbdu'l-Bahá, *Selections* 44:1).

Even if conclusions are wrong in Bahá'í consultation, they can be improved on and modified to be more correct in future consultations. This captures one of the key features of science—its capacity for self-correction over time.[10] In a Bahá'í context, the unity of the community making the decision and the emphasis on systematic and ongoing reflection and study in the learning in action mode (which we consider next) strengthens and institutionalizes this self-correcting capability. It does so by putting a collective, consultative decision into practice with an understanding that deficiencies will be modified as needed as improved understandings unfold.

Consultation, however, does not by itself incorporate many of the features of science discussed above. We therefore now consider learning in action, of which consultation is a key component, as a process that shares many of the essential features of science. We conclude that it is learning in action in its entirety, not consultation alone, that makes Bahá'u'lláh's Revelation scientific in its method.

Learning in Action

Bahá'í consultation is a tool that helps make decisions, plan activities, and generate new knowledge and understanding, but it is not an end in itself. As noted before, when used as part of a process known as learning in action, it leads to a "collective investigation of reality [that] promotes detachment from personal views, gives due importance to valid empirical information, does not raise mere opinion to the status of fact or define truth as the compromise between opposing interest groups" (Universal House of Justice, 2 Mar. 2013). Learning in action is a process underway in Bahá'í communities worldwide.

According to the Universal House of Justice, learning in action is "characterized by action, reflection, consultation, and study." The study part includes "not only constant reference to the writings of the Faith but also the scientific analysis of patterns unfolding." Maintaining the process of learning in action is "the object of regular examination" (2 Mar. 2013).

The process of learning in action is used to address the important questions facing the community. For example, how is it possible to "bring people of different backgrounds

10 Science is self-correcting, and therefore a reliable source of knowledge, through several processes. These include the critiquing of results in the light of what is known, repeated testing and retesting, thorough reviews of theory and experimental results by qualified interrogators, and by replication, repetition, and reproduction of results. For a current discussion of the self-correcting aspects of science, see Peterson and Panofsky and the references included.

together"? How is it possible "to administer the affairs of a community in which there is no ruling class with priestly functions that can lay claim to distinction or privilege" (2 Mar. 2013)? Questions at a local level, such as how to increase participation in community activities, are equally addressable.

The methods used in learning in action in some of its implementations have strong similarities to those used in science. To contextualize these, we first explore the role of learning in the Bahá'í Faith.

Learning and Bahá'u'lláh's Revelation

Learning and the promotion of knowledge are particularly important aspects of the Bahá'í Revelation. Promotion of knowledge is a duty imposed on all Bahá'ís, according to 'Abdu'l-Bahá (*Selections* 97:2). Learning is the mightiest pillar supporting the Bahá'í Faith:

> There are certain pillars which have been established as the unshakable supports of the Faith of God, the mightiest of these is learning and the use of the mind, the expansion of consciousness, and insight into the realities of the universe and the hidden mysteries of Almighty God. (97:1)

The Universal House of Justice summarizes the role of learning vis-à-vis the Bahá'í Revelation as follows:

> Bahá'u'lláh's Revelation is vast. It calls for profound change not only at the level of the individual but also in the structure of society. . . . Only as effort is made to draw on insights from His Revelation, to tap into the accumulating knowledge of the human race, to apply His teachings intelligently to the life of humanity, and to consult on the questions that arise will the necessary learning occur and capacity be developed. (Riḍván 2010)

Learning—and its systemization—are thus essential if we are to draw on the insights of Revelation. From this standpoint, learning is a "mode of operation . . . that fosters the informed participation of more and more people in a united effort to apply Bahá'u'lláh's teachings to the construction of a divine civilization" (Riḍván 2010).

An important aspect of such learning is that it "is not limited to study and evaluation . . . [but] comes about in combination with action. The believers must regularly engage in consultation, action, reflection—all in the light of the guidance inherent in the teachings of the Faith" (Lample 129).

A vital component of Bahá'í activity over the last many years, not surprisingly then, has been addressing the need to develop processes of learning. Shoghi Effendi, and subsequently the Universal House of Justice, has "operated in a systematic learning mode that has continually derived and synthesized new knowledge from the accumulating

experience of the community and all its collaborators" (Karlberg and Smith 466). Initially focused internally, this learning mode was later externalized in interactions with governmental agencies, NGOs, social and economic development projects, as well as a variety of other activities (466).[11]

Learning as a Mode of Operation

As previously mentioned, in Bahá'í institutions learning is often done using learning in action processes—defined by the Universal House of Justice as "a mode of operation characterized by action, reflection, consultation, and study—study which involves not only constant reference to the writings of the Faith but also the scientific analysis of patterns unfolding" (2 Mar. 2013).

An overview of Bahá'í social and economic development illustrates one of the ways that learning in action can be effectively used—and reused:

> The mode of operation adopted in the area of social and economic development, in common with other areas of Bahá'í activity, is one of learning in action. When efforts are carried out in a learning mode—characterized by constant action, reflection, consultation, and study—visions and strategies are reexamined time and again. As tasks are accomplished, obstacles removed, resources multiplied, and lessons learned, modifications are made in goals and methods. The learning process, which is given direction through appropriate institutional arrangements, unfolds in a way that resembles the growth and differentiation of a living organism. Haphazard change is avoided, and continuity of action maintained. (OSED)

Another description of learning in action is found in the Bahá'í community's efforts to foster spiritual and intellectual development among adolescents:

> Using reason, intuition, and imagination, [the team] formulated some tentative actions that could be implemented on a small scale and they reflected upon the experience thus generated, all in light of the wider conceptual framework guiding the learning processes of the community. Through an iterative, systematic process of action, reflection on action, and consultation about next steps, subsequent efforts yielded further observations, and the programme gradually widened in scope to include a greater diversity of people in different cultural contexts. (Karlberg and Smith 467)

Communities worldwide have learned to understand their local area—and their situation with respect to their local area—through learning in action iterative processes. They have learned

11 For a detailed discussion of learning and Bahá'í activities, see Karlberg and Smith.

"to read their own reality, see their own possibilities, make use of their own resources, and respond to the exigencies of large-scale expansion and consolidation to come" (Universal House of Justice, 28 Dec. 2010).

Learning in action incorporates many of the activities and processes found in the sciences, including empirical observation, reflection on the implications of empirical results, engagement with others through consultative processes, and the "development of a shared language that enables diverse participants to communicate effectively and reach shared understandings on a global scale" (Karlberg and Smith 467).

A central constituent of learning in action—and Bahá'í consultation as well—is diversity. Diversity, according to the Bahá'í perspective, "characterizes the human family … [and] endows it with richness" (Universal House of Justice, 18 Jan. 2019). It is diversity that saves us from homogeneity.

When "divers shades of thought, temperament and character, are brought together under the power and influence of one central agency, the beauty and glory of human perfection will be revealed and made manifest" ('Abdu'l-Bahá, *Selections* 225:25). Shoghi Effendi writes that "diversity in all created things, whether in kind, in physical appearance, or in station, is the means for their protection, their permanence, unity and harmony" (qtd. in Universal House of Justice, *Social Action* no. 196). Thus "great value is placed on the diversity of perspectives and contributions that individuals bring to the discussion. . . . Diversity is harnessed to enrich collective inquiry and deliberation" (Bahá'í International Community).

Thus, a crucial question for Bahá'í communities is "how to make it possible for decision making to benefit from a diversity of perspectives" (Universal House of Justice, 2 Mar. 2013). This can be done by learning in action processes that explore "how to ensure that growing numbers participate in the generation and application of relevant knowledge, and how to devise structures for the systemization of an expanding worldwide experience and for the equitable distribution of the lessons learned" (2 Mar. 2013).

To illustrate how learning in action can qualify as science, we look at how it maps to the way that physics systemizes learning. The *action* in the *action*, *reflection*, *consultation*, and *study* process might be an experimental test of a phenomenon to be done in a laboratory. *Reflection* on the action can be done by data analysis and comparison to theory. *Consultation* is widely done with the help of colleagues and considers the validity of conclusions, weaknesses in the arguments, assumptions used, and discussions of claims made. This often is done in the weekly review sessions typical of scientific groups and might include planning for the next steps. Finally, *study* is a continuing activity and involves the review of reference materials, the development of models appropriate to what is at hand, and the review of the underlying science. An important part of the process is

publication of the results, presentations at conferences, and discussions with others from different organizations. In sciences other than physics, the procedures will be much the same but adapted to the given discipline's ways of doing things. Learning in action can be used for all these steps.

Learning in action is not the same as science, although it is basically scientific in its methods. It does have an emphasis on the empirical (action, conclusions from empirical studies) and the theoretical (reflection, consultation, and study) that is consistent with key features of scientific methods.

We conclude that learning in action can—and often does—act like science. But to fully do so, it needs to be accepted by an appropriate community. Accordingly, we next consider how community validation is done for learning in action.

Community Validation

The learning in action processes described above often do not fully incorporate a key ingredient necessary if they are to be seen as completely scientific in their method. What is often missing is the public endorsement by a qualified body of people who form a knowledge community. It should be noted that it is not desirable in many cases to have this, especially when activities are in their earliest stages, as it adds complexity, ties down resources, and can hinder spontaneity.[12]

When learning in action is done by a mature community, by an institution, or by an appointed body, then it is more likely that results and conclusions will be reviewed carefully, methodologies noted, and results considered based on their merits. This could well lead to review processes similar or the same as those done by a scientific community. A learning group active together over an extended period—say, a Bahá'í cluster with a quarterly cycle operating over several years—would be an example of a group of people working together as an institution or a community.

Bahá'í international governance institutions—the Universal House of Justice, the Continental Boards of Counsellors, and the International Teaching Center for example—draw data from Bahá'í communities around the world. The International Teaching Center, for example, has the responsibility to "be fully informed of the situation of the Cause in all parts of the world and, from this information, to make reports and recommendations to the Universal House of Justice and give advice to the Continental Boards of Counselors" (Universal House of Justice, 10 Jun. 1998). This is one way that learning in action can feed into validation by qualified institutions.

In its Riḍván 2023 message, the Universal House of Justice refers to "the capacity to engage in systematic learning . . . that draws on insights

12 There might be, for example, a danger of suppressing organic growth by implementation of procedures that would be best introduced later.

arising from the Teachings and the accumulated store of human knowledge generated through scientific inquiry." This indicates that Bahá'í institutions have the capacity to validate scientific or technical knowledge where the veracity of the information is dependent in part on sound verification procedures.

The learning in action method as currently formulated includes a consultation step, and that consultation can be done internally by the learning in action team, or externally by individuals, communities, or institutions. An open question is to what extent external consultation is equivalent to validation as done in scientific communities. Under what situations is validation needed or appropriate? Clearly, information and conclusions derived from learning in action processes can be compiled and studied, and the result shared and evaluated, in the same way as is done in research work or scientific study. This can be extended to include validation, it appears, if the learning in action team or external bodies desire to pursue that path.

Although the full formal apparatus of peer review, community discussion, and the public verification of knowledge is not part of the learning in action process, the means to do validation when needed appears to be available.

Summaries and Conclusions

In this article, we have looked at what it means for Bahá'u'lláh's Revelation to be scientific in its method. In doing so, we have surveyed modern thinking about the scientific method, the role of diversity in science, the unique features of Bahá'í consultation, the Bahá'í learning in action process, and the similarities of that process to science. We have concluded that learning in action is quite flexible in how it can be used and that it can be like science in many ways. Further, when validation methods—or similar mechanisms—are incorporated into learning in action, it and science can overlap.

Our larger question is whether we can show that Bahá'u'lláh's Revelation is scientific in its method. We address this question in these closing paragraphs.

To better understand the scientific method, we have looked at some of the ways that prominent scientists and philosophers of science think about that method. Some aspects of science—systematicity, modeling, theory development, empirical studies, experiments, reviewing, and community discussion—are features widely shared. However, we find that there is no one specific scientific method that applies overall. Rather, there is a diversity of ways of doing science. We conclude that there is no fixed method—be it adapted from the hard sciences, the social sciences, or otherwise – that is meant by the statement that Bahá'u'lláh's Revelation is scientific in its method. Rather, consistent with modern science, we can expect a wide variety of ways for Revelation to be scientific.

Because it is done by people, science is intrinsically social. History makes it clear that the embrace of differing worldviews and the effects of biases influence how science is done and sometimes sway its conclusions. These effects can be reduced, or sometimes even eliminated, by the celebrated self-correcting aspects of science: repeated experiments, analyses, reviews, and rethinking. Recently, it has become widely apparent that a diversity of worldviews, lived experiences, and even a diversity of biases can be used to make corrections and move closer to objectivity, one of the most important aspects of scientific understanding.

The growing emphasis on diversity in science is closely consistent with the emphasis on the great importance of diversity in the Bahá'í teachings.

Bahá'í consultation, practiced widely around the world, has characteristics that make it similar in some ways to scientific practice. A major part of its purpose, summarized in brief, is the investigation of truth and the promotion of unity. Like science, there is no one method by which it proceeds.

Bahá'í consultation, in a seeming departure from science, honors spiritual principles and fosters a spirit of fellowship, unity, and loving-kindness. But science too thrives on spiritual values and friendship. Devotion to truth, respect for others, cooperation, and the unifying power of understanding are as much a part of science as they are of spiritual endeavors. Both science and Bahá'í consultation agree on the leading role of the investigation of truth.

Bahá'í consultation does not duplicate the methodologies of science, although it can play a significant role in their implementation. For a fuller accounting of how Bahá'u'lláh's revelation is scientific in its method, we must search further than Bahá'í consultation.

According to 'Abdu'l-Bahá, the promotion of knowledge is "an inescapable duty imposed on every one of the friends of God" (*Selections* 97). As one way of addressing this, Bahá'í communities across the globe have adopted the process of learning in action.

Learning in action can have all of the features found in the sciences, including the empirical (actions, observations, conclusions from experiments, empirical studies), the theoretical (reflection, consultation, and theoretical studies), engagement with others, consultation, the "development of a shared language that enables diverse participants to communicate effectively and reach shared understandings on a global scale," "systems for distilling and disseminating new knowledge across [a] global community", and "structures of material and institutional support that enable sophisticated forms of cooperation and coordination on a global scale" (Karlberg and Smith 467).

Learning in action is different from science, but it is scientific in its method in many ways and can be made to act like any given science. Methods of validation and verification are not part of the formal structure, but review by supporting communities and institutions, or by other means, can be used to provide the group validation

that is necessarily part of the scientific process.

We conclude that there is ample support for the view that Bahá'u'lláh's revelation is scientific in its method. One support for this conclusion is that the learning in action process—in wide use throughout the Bahá'í world—in many ways operates as science does. The processes of action, reflection, consultation, and study that make up learning in action correspond to the empiricism and idea generation methods of science, to the analyses and evaluations of experimental data, to the consequent discussion of the implications of those analyses, to the follow-up strategies generated, and to the study of ideas and concepts that help create new knowledge.

Given the considerable overlap of learning in action with the sciences, and given the similar overlap of methods, we can say that one very concrete way the Revelation of Bahá'u'lláh is scientific in its method is through the widespread adoption of learning in action modes of activity in Bahá'í communities and institutions.

Bahá'u'lláh's Revelation is scientific in its method in other ways as well. For example, to achieve the goals of Bahá'u'lláh's Revelation, scientific progress is needed. Shoghi Effendi tells us about some of what will take place in the unfolding of the Bahá'í Revelation in the future: "The unity of the human race, as envisaged by Bahá'u'lláh," he writes, "implies the establishment of a world commonwealth" including "a mechanism of world inter-communication . . . embracing the whole planet, freed from national hindrances and restrictions, and functioning with marvelous swiftness and perfect regularity" (*World Order* 204). The goal of world intercommunication has been nearly achieved, brought about by scientific investigation and technical development. The other goals outlined by Shoghi Effendi also depend on science. Two of those—"the extension of scientific research" and the expansion of "the range of human inventions and technical development"—are directly scientific. Given that achieving the goals of Bahá'u'lláh's Revelation requires science, it follows that Bahá'u'lláh's Revelation includes the scientific method in the means to achieve its goals.[13]

Systematization and systematic action are also needed to achieve the goals of Revelation:

> Systematization ensures consistency of lines of action based on well-conceived plans. In a general sense, it implies an orderliness of approach in all that pertains to Bahá'í service, whether in teaching or administration, in individual or collective endeavor. While

13 We note that "scientific in its method" does not only mean adhering to scientific methods as ways of planning or understanding things. It can also mean the use of science to achieve ends. Drug development, for example, often directly depends on scientific investigation, so that we must describe it as scientific in its methods.

> allowing for individual initiative and spontaneity, it suggests the need to be clearheaded, methodical, efficient, constant, balanced and harmonious. (Universal House of Justice, Riḍván 1998)

According to the House of Justice, systemization is something that every "community must learn" if it is "to arrive at a unified vision of growth based on a realistic assessment of possibilities and resources" (27 Dec. 2005).

Systematization is a core component of the scientific method, according to many modern thinkers (Hepburn and Andersen, Haack, Hatcher, Hoyningen-Huene). Its use is another way that the implementation of the goals of Bahá'u'lláh's Revelation makes it scientific in its method.

Yet another way that the Bahá'í Revelation is scientific in its method is that it uses science to protect religion against superstition (Mehanian and Friberg). According to 'Abdu'l-Bahá, "religion must stand the analysis of reason. It must agree with scientific fact and proof" (*Promulgation* 62:9). Furthermore, "every religion which is not in accordance with established science is superstition. Religion must be reasonable. If it does not square with reason, it is superstition and without foundation" (*Promulgation* 44:8). The use of the scientific method in understanding religion protects against error.

The implications of taking learning in action to be scientific in its method are significant. One is that we can see learning in action as a generalization of the scientific method, that is, as an expansion of the scope of the scientific method to wider ways of doing things. The methods used in learning in action, combined with the widespread access to knowledge available via the internet and the spread of libraries, make learning in action a democratization of science. Any individual, group, institution, age group, or community can use learning in action, and there are no requirements for formal qualifications. New modes of community interaction, social and economic development, and resource generation are some of the doors being opened.

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