

Harmony of Science and Religion

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Introduction

Throughout the ages there has been widespread opinion that science and religion are in conflict. The belief in a basic contradiction between science and religion forced one to choose between being a believer in God, a follower of a religion, or a scientist, a follower of reason and logic. One of the basic teachings in the Bahá'í Faith, which partly inspired this essay, is that science and religion must always be in harmony. Both science and religion express truth — one from a material, the other from a spiritual point of view. The truth is one. It is not possible for something to be scientifically false and religiously true. Whenever conflict appears between science and religion, it is due, not to truth, but to error. When we look closely at the conflicts that have arisen between the two in the light of fuller truth, we can trace these conflicts, time after time, to ignorance, prejudice, vanity, greed and narrow-mindedness. Such a view is implicit in the statement given by Abdu'l-Bahá, the son of the prophet founder of the Bahá'í Faith.

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 onto the quagmire of superstition, whilst on the other hand, with the wing of science alone he would make no progress, but fall into the despairing slough of materialism When religion, shorn of its superstitions, traditions, and unintelligent dogmas, shows its conformity with science, then there will be a great unifying, cleansing force in the world which will sweep before it all wars, disagreements, discords and struggles — and then will mankind be united in the power of love of God.¹

The result of the practice of the unity of science and religion will be the strengthening of both science and religion. During the twentieth century we have seen the triumphs of science in many different fields — physics, chemistry and biology. These achievements, along with advancements in mathematics, have given rise to the development of electronics, communication and computers which have turned our various worlds into “one world”. This dramatic progress in technology suggests that the present time is a turning point for humanity. Yet we see that there are wars going on in every corner of the planet and the spiritual values are declining in our societies. Our global survival is in danger. It seems that mankind is refusing to grow up and does not wish to keep its cultural maturation in pace with its technological maturation. It is, however, possible to bring about the renewal of religion through inner transformation of the individual, by changing prejudice and greed into a spirit of universal love and dedication to service. It is religion that can connect humanity and God, and produce this inner change. It has not always been the case that science has had the upper hand. Three and a half centuries ago, Galileo, a teacher of physics at the University of Padua and a devout Catholic, was accused by the authorities in the Church of betraying the Church when he persisted in

claiming that the empirical evidence showed that the Copernican theory of the solar system was true and that the earth was not created first and was not the center of the universe with everything circling around it. He was, of course, forced to recant his theory and was, at first, condemned to prison and later forced to live in closely monitored solitude. Galileo's conscientious commitment to the pursuit of scientific truth was a good example of a scientist's criticism of fanaticism but not criticism of religion. His faith in scientific observation and his religious faith went hand in hand. He was critical only of abject submission to tradition and excessively literal interpretations of the Bible.²

Scientific Progress The Ancient Greek Heritage

The forces driving the ancient Greeks and medieval abstract thinkers to develop valuable tools, especially in mathematics, were religion, and a quest to better understand the behavior of physical objects such as the heavenly bodies. The Greeks thought they were observing something immaterial, something closer to God when they gazed at the skies, and the existence of motion, in this case the sun, the moon and the planets circling the earth, was taken as a proof of the existence of a god or gods. Without the contributions that the Greeks made in science and mathematics, the scientific revolution would have been much slower. The Greek learning was mainly philosophical, and was not able to develop and deepen its scientific side, because technology in the ancient world was never sufficiently advanced to provide the precise instruments of measurement that are the practical foundations of experimental methods. Perhaps an even more significant reason for not advancing in science more rapidly was that mankind was not yet ready to ask the type of questions that could be answered using measurements, such as "What is the rate of acceleration of falling bodies?" It was necessary for mankind to first discover and practice the use of "reason" and then progress to questions dealing with measurements. As part of the practice of "reason", the Greeks discussed many different paradoxes. An example is the one developed by the mathematician Zeno of Elea (490 BC) and referred to as "the geometric series". It states that you cannot complete the course round a stadium, because first you must run half-way, but before you can do that you must run half of half-way, and so on — an infinite series of tasks. Pythagoras (582–507 BC) was the best known of the ancient Greek mathematicians. He was the inventor of the deductive method in mathematics and believed that numbers were the essence of reality. This insight was crucial to the development of science. Again, the world was not yet ready to apply mathematics to the investigation of matter. Mankind was not ready for the geometric rigor which he introduced. One other problem with his geometry was the fact that geometrical figures could be constructed abstractly in precise mathematical terms and one could have infinitely many copies of a figure drawn in the sand or cut out of material substances. This was taking away from the beauty that existed in "One" unique geometric figure. Now there were infinitely many Ones. Pythagoras himself was so attached to his religious and mystical beliefs that when he discovered that the Pythagorean theorem for right triangles led to the irrational numbers like $\sqrt{2}$, he did not want to accept the theorem, since it did not agree with his belief that the natural numbers were divine and that there could not have existed any other form of numbers. However, he saw that his naive religious faith had to evolve to accommodate a wider truth that would allow irrational numbers to exist. Without irrational numbers and the contributions

of Pythagoras, western music would not have come to develop the way it has and perhaps would have followed a different course.³ Plato's student Aristotle (384–322 BC) prepared the way for a scientific revolution. He initiated the study of statics and dynamics, along with the theory of pressure and equilibrium in liquids, which eventually proved to be useful in starting the scientific revolution of the seventeenth century. He was also among the first to engage in the collection of data and the use of experiments. Many elements of what we call "the scientific method" today were present in his studies. However, when empirical results of his experiments conflicted with theory he attributed this to the complicated matter and form that existed in the experimental bodies. He accepted an incompatibility between theory and experience on the grounds that the experiments and observations were inferior to the true reality of the forms.

The Impact of Christianity and Islam

During early Christianity there were many philosophers who made great contributions to the philosophy of science. Among them was St. Augustine, who saw the Christian Church as embodying the City of God in the last phase of human history and saw priests in the role of the philosopher kings, the interpreters of all truth. Later St. Thomas Aquinas (1225–74) did more than any other scholar to reinforce the understanding that Catholic teaching was rational in every one of its details. It was during the eighth century that the dark clouds of ignorance covered all of Europe. However, at this time the Islamic Civilization reached its peak. The Arabs, though not barbarians, lacked the cultural sophistication and refinement of the Romans and Persians — but they established centers of learning in Baghdad. The city soon developed into the greatest center of learning the world had ever witnessed, attracting scholars from all over the world. Greek works on philosophy, medicine and science were translated into Arabic. It was through the efforts of the Muslim scholars that the Greek heritage was saved as these works would have been lost. The Muslim scholars, many of whom were Persians but did their scientific work in Arabic, led in the fields of mathematics, geography, and medicine. The Muslim scientists improved astronomy and made excellent planetary tables. They imported into Europe the Indian system of numerals and invented the symbol zero, the sine function, and the algebraic methods. They made great contributions to the field of optics. The medical books of the Persian philosopher Avicenna remained the standard medical text book in the Western world until the seventeenth century. Islam provided its followers with the inspiration and incentive to investigate all the fields of knowledge. During this time there was no conflict between science and religion. Ali, the son-in-law of Mohammed, had said: "That which is in conformity with science is also in conformity with religion." Islam brought social progress to its people and initiated dramatic development in science which helped pave the way for the European Renaissance. The first European universities were modeled on the Islamic centers.

From the Renaissance to the Modern Times

It was during the Renaissance that the spirit of rediscovery made its mark. There was renewed interest in collecting data and making observations. New ideas had started to creep into the world and were not to be dislodged. One of these new ideas was the

introduction of a three-dimensional perspective into drawing and painting, as artists pursued more convincing naturalism. Another rising class of inventors were the engineers who applied mathematics and physics to improve machinery. The new scientific approaches to art and engineering were brilliantly combined in Leonardo da Vinci (1452–1519). The Renaissance engineers, unlike the ancient Greeks, no longer blamed the metaphysical inferiority of matter for the malfunction of their machines. If the machines did not work, the fault lay with their own understanding of mathematics and physics. Once again we can turn our attention to Galileo, who is considered the founder of modern science. As one of his achievements, Galileo demonstrated that a falling body's velocity is proportional not to its weight but to the time spent falling. This led to the study of velocity and acceleration which was an inspiring point for Newton, the founder of calculus, who built his foundations on Galileo's mechanics. Another contributor to the new science during this time was Descartes, who is remembered as a philosopher and a mathematician (the inventor of coordinate systems). He was also a devout Catholic. Unlike Galileo, who expressed that his faith in God did not require him to deny reason, Descartes deliberately withheld from publishing his treatise *Le Monde*. This work accepted the Copernican view and offered a complete theory of the origins and workings of the solar system in terms of mathematical laws, a theory which was in contradiction with the dogmas of the Church at that time. Lasting progress towards understanding the details of material reality was achieved during the seventeenth century by great mathematicians such as Kepler whose first and second laws of planetary motions are still being studied by calculus students today. However, it was Sir Isaac Newton (1642–1727) whose mathematical principles revolutionized the course of mathematics. Although Newton was a very religious person he decided to separate his religious beliefs from his scientific beliefs and was one of the first scientists to be unencumbered by religious interference with his work. Newton's universe was easy to picture as a vast machine created by a God who then stood back and watched, in the same way that a clock maker stands back and watches his finished product. Unlike previous scientists, Newton did not make the relationship of God to his creation one of his subjects of inquiry. The seventeenth century gave humanity a more accurate picture of the universe, a picture that established itself despite opposition from religious institutions. The main effect of the scientific revolution was something much more important than just a few new theories. A method of inquiry was established which brought about unimaginable wealth of knowledge and benefit, together with frightening new responsibilities. Field after field in science started building theories. Nature was placed under human control. After the seventeenth century, laboratories and equipment enabled mankind to continue the rapid progress in the sciences. The study of atomic structure, thermodynamics, hydrodynamics, elastic bodies, magnetism, electricity and electromagnetic waves were among these achievements. Through mathematical deduction and experimental techniques, physicists of the late nineteenth and early twentieth centuries began to penetrate the subatomic structure of matter. Albert Einstein (1879–1955) propounded his general theory of relativity, superseding Newton's theory of gravitation.

Conflict of Science and Religion in the 20th Century

During the 20th century the conflict between science and religion started to grow larger. While it may be true that the conflict between them was largely caused by representatives of religion in the past, part of the blame lay with the followers of science. It is true that the Christian Church opposed the progress of science for centuries, not because it is in the general nature of religion to do so, but rather because the Church at times was represented by religious leaders some of whom had incorporated the Greek philosophical ideas, the literal interpretation of the Bible, and the pursuit of power and self glorification. However, the actions taken by these leaders were not representative of true Christianity, let alone any other religions. It became fashionable for scientists and philosophers to object to religion. Bertrand Russell wrote:

The harm that is done by religion is of two sorts, the one depending on the kind of belief which it is thought ought to be given it and the other upon the particular tenets believed.⁴

Another reason why the scientists were turning away from religion was that they felt that science was superior to religion as it was governed by a scientific method and religion, it seemed, had none. Science was thought to command a flawless logical rigor in its methods of verification, involving no trace of faith. This belief in lack of faith was not universal among the scientists. The famous philosopher Huxley wrote:

The great deeds of philosophers have been less the fruit of their intellect than the direction of that intellect by an eminently religious frame of mind. The English mathematician George Boole assured us that:

Geometric induction is essentially a process of prayer — an appeal from the finite mind to the Infinite for light on finite concerns.

Albert Einstein said:

You will hardly find one among the profounder sort of scientific minds without a religious feeling of his own. ... His religious feeling takes the form of rapturous amazement at the harmony of natural law, which reveals an intelligence of such superiority that, compared with it, all the systematic thinking and acting of human beings is an utterly insignificant reflection. This feeling is the guiding principle of his life and work ... It is beyond question closely akin to that which has possessed the religious geniuses of all ages. ... Religion without science is blind. Science without religion is lame.⁵

It is this element of faith, an empirically developed confidence in a model, which appears to be as much part of science as it is part of religion. There is a difference between science and religion as they deal with different questions: science seeking a description of the phenomenal world through striving for a descriptive model and religion dealing with the purpose of life and how to best fulfill this purpose through striving for a value system. The process of formulating and refining a value system, however, is analogous to the scientific method of collecting and examining all relevant data, formulating a model to explain the data, and testing the model by repeated experiments. The spiritual reality and

human values, which are acquired by revelation from a prophet of God, is interpreted, and then this model is applied to further advancement of social and spiritual development of humanity.

Progressive Revelation and Evolution of Science

Another similarity that exists between religion and science from the Bahá'í point of view lies in the “progressive revelation in religion” and “relativity in the evolution of science.” Progressive revelation states that there is one God, the Creator of the Universe. The religion of God is one as absolute truth is one and cannot change, but absolute truth is infinitely beyond human understanding and our conception of it must constantly change. Throughout history, God has revealed Himself to humanity through a series of divine Messengers — each of whom has founded a great religion. However, as the maturity of humanity has not always been the same, the divine messengers of God revealed their teachings according to the capacity of mankind at the time, giving the impression that religious truth is relative and not absolute. But the Founders of all past religions, though different in the social aspects of their teachings, abide in the same Tabernacle, and proclaimed the same Truth. Each revelation is a fulfillment of its predecessors. An analogy is provided by the process of schooling. Just as children start with simple ideas in the primary grades, and are given increasingly complex knowledge as they move on through secondary school and college, so humanity has been “educated” by a series of Manifestations. In each age, the teachings of the Messengers of God have conformed not to their knowledge but to the level of our collective maturity. Just as in religion we can never know the absolute truth, in science also we can never penetrate the mysteries of the universe completely. However as humanity and science both evolve, newer and more accurate models of scientific laws of the universe are revealed, each building on its predecessors, enabling us to understand more and more about the universe we live in. Therefore, we can say that the truth in science is “relative” and evolves with time — for example, Einstein’s theory of relativity unfolded a new understanding of the universality of physical law and the relative nature of certain observations made from different frames of reference. This was a new perspective, one that Newton was not aware of and did not discuss. Einstein showed that the Newtonian conception of space as being just an empty vessel existing for all time is an illusion and if the scientists want to describe nature in terms that are consistent for all systems in the universe, they must treat measurements of time and distance as relative to the systems in which the measurements are made. Nevertheless, Newton’s theory was not discarded after the discovery of relativity. In fact, most everyday physical phenomena are very accurately described by Newtonian mechanics and it is extensively and effectively used in physics, biology, engineering, etc.

The Limits of Science

Einstein was also instrumental in introducing “quantum theory”, stating that any form of radiant energy, including light, had a dual nature; it travels as an individual “particle” and also as a “wave”. This duality forms an essential but mysterious foundation of the modern theory of light. The idea was further developed in a highly abstract mathematical way by Erwin Schrödinger (1887–1961) who explained this quantum phenomena by

attributing specific wave functions to protons and electrons. This system, which is known as wave mechanics, has been experimentally confirmed. Similarly, the German physicist W.K. Heisenberg (1901–76) introduced the famous principle of uncertainty which states that there is a fundamental limit on the measurement of minute entities, because observation is a function not only of the object under observation but also of the observer. Therefore, the position and the momentum of a particle, for example, cannot both be measured with accuracy at the same time. If the position is measured, the momentum must be left uncertain. If the momentum is measured, the position must be left uncertain. An implication of Heisenberg's uncertainty principle is that we cannot determine whether light is made up of particles or waves. Another example of paradox or uncertainty comes from classical mechanics. The eighteenth century French mathematician, Laplace, showed that if the initial condition for a system of differential equations modeling the universe is known then one can predict the dynamics of the universe. However, Chaos Theory has shown that any slight error in initial condition could lead to profound changes in the dynamics of the system. Using Heisenberg's uncertainty principle, the initial condition for such a system cannot be determined, therefore making the universe a nondeterministic system. Chaos Theory began in the 1960s when, with the help of his primitive computer, Edward Lorenz, a meteorologist at MIT, realized that if the initial conditions in the computer simulation he was performing for forecasting the weather were slightly changed by accident, the end result, i.e. the output of the simulation, changed tremendously. At first he thought that the computer was malfunctioning but then he realized that the problem lay in the numbers he had typed. He had entered .506 instead of .506127 assuming that the difference was inconsequential. He was using a purely deterministic system of equations and expected that a slight change in the starting point would just cause a slight change in the end. This phenomenon, "sensitive dependence on initial condition", which is now known as the Butterfly Effect, basically implies that if today a butterfly flaps its wings in Brazil, this slight disturbance in the air might introduce a storm system next month in North America. Actually, the French mathematician Henri Poincaré had at the end of the last century observed such sensitive dependence in mathematical systems arising from celestial mechanics, but yet again, it wasn't until the rise of computers that humanity was ready to absorb the implications of Poincaré's theory. Chaos Theory shows that deterministic systems, including Newtonian and Relativistic models, can exhibit unpredictable (but not random) behavior, therefore eliminating any hope for predicting the behavior of the universe. These are examples that represent a fundamental limit to the ability of scientific knowledge. They show that finite methods of scientific experiment are not able to completely understand, validate, or disprove complex designs.

Science and Religion are Complementary

There is only one creation, one ultimate reality, one world, with which both science and religion are concerned. They may take different methodology and different approaches. Science takes the physical approach and religion, the spiritual approach. Nevertheless they reflect different aspects of the same reality. The physical view of the world should not be in conflict with the spiritual views. These views are different facets of the same truth.

A Geometric Analogy

Let us imagine the world to be a large, complicated building that we want to know and understand so that we can better live with it. We need a good set of drawings for this world edifice to aid us in visualizing it, and they should be good architectural drawings in plan and elevation. We note a simple but important property of plan and elevation views. If one examines an architectural drawing of the facade of a building, one gains little, if any, idea of the layout of the rooms or of the contents in the rooms, i.e., the plan. However, if one looks only at the plan drawing, one learns almost nothing of the form of the building in elevation. Of course, the same architect was involved in both drawings, and on this basis one can do some guessing and form some theories about the other projection in each case, but there are few reliable clues. The two projections are orthogonal and irreducible one to the other, and each contributes essentially no information in the domain of the other. This is an easily understood demonstration of a situation in which two mutually exclusive views of something can exist side by side and not conflict in the slightest, and, moreover, both are essential for us to grasp a reality greater than either view alone can convey. We can identify the elevation view, the view that shows the whole integral form and beauty of the edifice from top to bottom, with spiritual reality, and identify the architectural sketch representing that view with religion. We can also identify the organization of the layout of the parts of the edifice in the plan with physical reality and the corresponding detailed and accurate plan drawing with science. The important point illustrated by this analogy is that the plan view of the world need not, indeed should not, conflict with the elevation views. There could be conflict only if someone too literally regards details of the elevation inferred from the plan.⁶ It is worth mentioning another point of view on the complementarity of science and religion. T. Blackburn writes: It is conceivable that the notion of complementarity offers a method of including both sensuous and intellectual knowledge of nature in a common frame of reference. The result, far more than a mere compromise or amalgamation of the two viewpoints, could be a richer science, in which esthetic and quantitative valuations, each retaining its own integrity, would contribute equally to the description of nature that science alone took for its province. Further, it may produce a scientific ethic that is less destructive toward nature.⁷

Conclusion

In this essay we have seen that the ancient scientists were seeking to understand nature using the spiritual dimension that is the underlying force in the material world. We have seen that in order for science to advance, it was necessary for science to fight religious fanaticism. Unfortunately, this led to seeking inspiration in a very materialistic way and only relying on a scientific method. This loyalty to materialism has continued in the twentieth century, but for many scientists there is nothing unscientific about believing that a divine and creative force is at work within the universe which helps them in finding a unified and coherent explanation for nature. We have learned that science is limited, and the limited is not able to unravel the unlimited, so there is a need for an element of faith. As human beings we have two natures, a physical nature which medical science can explain and a spiritual nature. We have two complementary natures, neither of which

alone can explain the reality of the human person. It is only through consideration of these two natures that the true reality of the person is identified. This dual nature of man enables him to take two complementary approaches in striving to understand the reality of the world, a physical and a spiritual approach. Finally, science does not seek a specifically scientific truth inconsistent with true religion, unless it is faulty science; and religion does not seek a specifically religious truth inconsistent with true science, unless it is faulty religion. I close with the following words of Abdu'l-Bahá:

Any religious belief which is not conformable with scientific proof and investigation is superstition, for true science is reason and reality, and religion is essentially reality and pure reason; therefore the two must correspond. Religious teaching which is at variance with science and reason is human invention and imagination unworthy of acceptance, for the antithesis and opposite of knowledge is superstition born of the ignorance of man. If we say religion is opposed to science we either lack knowledge of true science or true religion, for both are founded upon the premises and conclusions of reason and both must bear its test.⁸

Works Cited:

- 1 Abdu'l-Bahá, Paris Talks, 1912.
- 2 Gingerich, O. The Galileo Affair, Scientific American, August, 1982.
- 3 The Secret Power of Music by David Tame, 1984, Destiny Books.
- 4 Russell, Bertrand. Why I am not a Christian. George Allen &Unwin, 1957.
- 5 A. Einstein, Ideas and Opinions, London, Souvenir Press, 1973.
- 6 Science and Christian Belief, by C.A. Coulson.
- 7 T. Blackburn, Sensuous Intellectual Complementarity of Science., Science June 1971.
- 8 Abdu'l-Bahá, The Promulgation of Universal Peace, U.S.A.,1912.