

---

# Ether, Quantum Physics and the Bahá'í Writings

*Robin Mahrshahi*

## **Abstract**

This paper deals with the use of the term “ether” in the writings and recorded utterances of ‘Abdu’l-Bahá, and tries to correlate His definition of this term as a medium not only for the propagation of electromagnetic radiation, but also for the communication of spiritual impulses to the physical world with modern scientific concepts, especially those of quantum physics. In doing so it demonstrates that many statements about the origin and nature of energy and matter, the creation and evolution of our universe and other scientific topics that can be found in the Bahá'í Writings, while they contradicted the concepts current amongst contemporary scientists at the time they were made, actually alluded to and anticipated more accurate theories that were to emerge many years later.

## **The ether concept**

One of the oldest and most puzzling questions of physics deals with the nature of light, and it was two of the most outstanding thinkers of their time who, on account of this question, split scientists into two parties in the seventeenth century: Sir Isaac Newton, famous for his discovery of the law of gravity and arguably the most influential physicist of all times, and Christiaan Huygens, discoverer of the Saturn moon, and inventor of the pendulum clock and numerous optical instruments. “Light consists of particles”, Newton had postulated, whereas Huygens was fully convinced of having found in his wave theory the correct explanation for all light phenomena. Contrary to Newton’s particle theory, which needed many different kinds of light particles—so-called corpuscles—to explain the different colours of the light spectrum, Huygen’s wave theory was easily able to explain this phenomenon by differing wave lengths. Nevertheless, it had a different and definitely no less important weak point.

Experience had shown that waves always need a medium in which they can spread. Hence it is the air for example that transmits sound and the water that transports ripples. However, what could be the medium responsible for

the propagation of light waves? Since sunlight is obviously able to travel to the earth through the vacuum of space, it could not possibly be air. Scientists accepting Huygen's wave theory therefore simply made use of a substance that had already been used as a substitute for the unimaginable and frightening nothingness at the times of the ancient Greeks—the ether.

Ether, which, after the heyday of ancient Greek philosophy, had only been thought of as a spiritual and immaterial substance, was thus brought to physical life again after more than two thousand years. In order to fulfil its task of transmitting light waves, however, it had to have some extremely unusual qualities: to transport light even from the most distant stars and galaxies, it had to uniformly fill the entire universe. It had to be dense enough to allow for elastic collisions between its atoms to make a forward movement of light waves possible, while at the same time refraining from exerting any braking action on the celestial bodies. Furthermore, it had to be weightless and transparent and, in many other ways, totally different from any other known substance.

In spite of all these unusual and hardly imaginable qualities demanded of the ether, the theory of its existence established itself as an important component of the mechanical worldview, and by the beginning of the nineteenth century, was even regarded as proven following the result of experiments that had clearly demonstrated the wave-like nature of light.

When James Clerk Maxwell, with his famous equations, finally managed to show that not only optical, but also electric and magnetic effects were wavy in nature and could thus be described with a single common term as electromagnetic waves, ether gained, in addition to being the transporter of light, a number of additional tasks. It was no longer solely the medium in which visible light spread, but was also responsible for transmitting gamma, X- and ultraviolet rays, heat or infrared radiation, micro- and radio waves, and thus for all types of electric and magnetic powers.

### **'Abdu'l-Bahá's definition of ether**

It seems to have been this theory of the spreading of electromagnetic radiation through the ether that 'Abdu'l-Bahá had referred to when using ethereal matter as an example for an "intellectual", that means not physically perceptible, reality:

*[E]thereal matter, the forces of which are said in physics to be heat, light, electricity and magnetism, is an intellectual reality, and is not sensible (Some Answered Questions 84).*

In a letter to the Swiss scientist Dr August Forel, He also confirmed the existence of the ether in the following words:

*[T]he existence of the Deity is intangible, yet conclusive spiritual proofs assert the existence of that unseen Reality. ... For instance, the nature of*

*ether is unknown, but that it existeth is certain by the effects it produceth, heat, light and electricity being the waves thereof. By these waves the existence of ether is thus proven (Tablet to August Forel 16).*

Here a scientifically well-versed reader might start wondering because, while the first statement was made at a time when the ether theory was still widely used and accepted, the second was written about one and a half decades later, when the scientific world, due to several new discoveries, had already discarded this hypothesis. Already in the years 1881 and 1887, the two American physicists Albert Abraham Michelson and Edward William Morley had discovered that a ray of light pointed in the direction of the earth's movement around the sun is not, as initially expected, "slowed down" by the ether but, relative to the earth's surface, moves exactly as fast as one pointed in any other direction. These experiments, which, instead of proving the existence of ether as had been intended, clearly challenged the theory of its existence, went down in the history of physics as the Michelson-Morley experiments. In spite of their results, which were devastating for the ether hypothesis, however, it needed a figure like Albert Einstein and his famous theories of relativity to finally banish this hypothesis from the models of physics and the minds of scientists the world over. These theories formulated in 1905 (special theory of relativity) and 1915 (general theory of relativity), though not taken very seriously by a majority of the scientific world for the first few years, did finally achieve general acceptance after 1919, when some of their predictions were experimentally verified.

Why is it, one might therefore wonder, that 'Abdu'l-Bahá repeatedly used such an outdated and disproved theory even at a time when it had already been discarded?

Considering the context in which these statements were made, one will find that in most cases He used the ether as an example to demonstrate that there are things which are not sensible to human beings but still evidently exist (another example of such an "intellectual reality" would be "the Deity" i.e. God) to refute empirical world views held by some of His contemporaries. If such an example is used to deal with a question that is essentially different in nature (for example the question of the existence of God) this does necessarily mean, one might now argue, a confirmation of the whole concept associated with this example. One can use the phrase, "the sun is rising", for example, without necessarily affirming the incorrect Ptolemaic system that assumes the sun revolves around the earth. As an answer to the question why 'Abdu'l-Bahá used this specific example to support His argument, one could thus state that He chose it because it was easily understood by His addressee rather than because He wanted to make a scientific statement about physics.

Nevertheless, since a scientist like Forel in the year 1921 was most probably

aware of the incorrectness of the ether hypothesis, and considering the fact that 'Abdu'l-Bahá could have easily chosen a different example (e.g. radioactivity) to prove His point of the existence of non-sensible realities without exposing Himself to the criticism of being scientifically incorrect, this argument is not necessarily completely convincing.

Therefore, in order to find a different and hopefully more satisfying explanation for the usage of the ether concept in the writings and utterances of 'Abdu'l-Bahá, we should first take a closer look at the person who was primarily responsible for the abolishment of the hypothesis of its existence, Albert Einstein.

In his theories, the four-dimensional space-time continuum performs the tasks previously expected of ether by being the propagator of all types of electromagnetic radiation, which, as Einstein also proved, does not consist solely of waves or only of particles, but actually has a twin-nature combining these two characteristics. Hence, he had simply transferred the postulated qualities of ether to empty space, or rather the vacuum, in which electromagnetic fields are formed that can then, in a way not yet explainable, exert an influence on matter.

*Physical space and ether are just two different expressions for one and the same thing; fields are physical states of space.* (Trans. from: Einstein 143)

*It seems like the only option we have is to simply accept the fact that space does have the ability to transmit electromagnetic waves, without puzzling our heads too much about the details. We can even continue using the word "ether", but from now on we only want to understand by it a certain quality of space.* (156)

According to Einstein, it is thus quite correct to use the term "ether" to describe the ability of space to transmit electromagnetic radiation. What Einstein rejected in the ether hypothesis was solely the idea of the physical existence of the ether, or rather of its atomic structure. This, however, had also been the way in which 'Abdu'l-Bahá had always used this terminology. For Him the ether had never been a physical but always an "intellectual", that is an immaterial, reality. Nevertheless, He did not seem to confirm Einstein's concept of empty space, which, as the latter also had to admit, was not able to offer a satisfactory explanation for the propagation of electromagnetic radiation, as for 'Abdu'l-Bahá "a void is impossible and inconceivable" and the celestial bodies "fall within subtle, fluid, clear, liquid, undulating and vibrating bodies"

It took a few decades before quantum physicists were able to find an explanation for the spreading of electromagnetic waves in the vacuum, which

also, without any such intentions of course, confirmed 'Abdu'l-Bahá's rejection of the idea of an absolute void. What these scientists found out is that due to quantum fluctuations, even in a seemingly matter free vacuum, a constant formation of all kinds of elementary particles occurs, which, after they have been generated, immediately disappear again. For each particle formed in this manner, also the corresponding antiparticle appears, and after a fraction of a second these particles destroy each other again. The formation and destruction of these particles thus always occurs in pairs. These so-called virtual particles seem to borrow the energy needed for their creation from nothingness, solely to release it immediately again in their act of mutual destruction. In this manner, the overall energy level of the vacuum is maintained, despite this constant uptake and release of energy. Thus, in accordance with the above words of 'Abdu'l-Bahá, the vacuum is anything but a void. It is in fact filled with tiny particles, which, like in a ghostly dance, are constantly formed everywhere and immediately disappear again.

If a particle of matter is now added to this "living vacuum" or the latter is exposed to a force field, the result will be an increased formation of certain kinds of virtual particles in the immediate neighbourhood of this source of disturbance. Around a magnet, for example, an increased formation of virtual light particles, so-called photons, occurs. These virtual photons can then interact with other particles and in this way create and transmit the magnetic force of the magnet.

Quantum physicists now hope to be able to explain in the near future all types of force fields with the help of these virtual particles. At the present stage they have managed to explain three of the four existing fundamental forces of physics in this way. According to these field theories (or more correctly "unified field theories"), the carriers of electromagnetic forces are, as already mentioned, virtual photons. The strong nuclear force, which binds quarks together, is transmitted by gluons and the carriers of the weak nuclear force, which plays a role in the atomic disintegration of radioactive elements, are W and Z bosons. So-called gravitons are thought to transmit the force of gravity, but no one has so far been able to prove their existence. The movement of a photon in a vacuum, or in other words the spreading of an electromagnetic wave in space, according to these theories, can be described as "the reaction of the vacuum to its [i.e. the photon's] presence, which is transported from place to place" (Trans. from: Treumann 254).

In this way the vacuum, with all its qualities and effects, after years and decades of research, has proven to be exactly what 'Abdu'l-Bahá had referred to when using the term "ether". In the words of a modern-day physicist this is described as follows:

*Ether ... does not seem absent to us: It can, on the contrary, be understood as the vacuum itself with all its reactions.*

The ability of empty space to create virtual particles, which are the transmitters of the signals, exactly corresponds with the qualities of ether.

*Physics got into the habit of not using the disapproved of and defamed term 'ether' for this distance effect in the vacuum; it has put in its place the term 'field' (254 f).*

In this vacuum or field, matter and energy are interchangeable and basically the same. An area of high field strength manifests itself in a matter particle, which, in its turn, has an effect on the surrounding space or as 'Abdu'l-Bahá explains it: "... the substance and primary matter of contingent beings is ethereal power".

Nevertheless, the creation of force fields is, according to 'Abdu'l-Bahá, only one aspect of the twofold nature of ether. In a commentary on a passage in Bahá'u'lláh's Lawh-i-Hikmat, which states that "the world of existence came into being through the heat (al-harárat) generated from the interaction between the active force and that which is its recipient." (*Tablets of Bahá'u'lláh* 140 f.) 'Abdu'l-Bahá explains thus: "... ethereal substance is itself both the active force and the recipient: in other words, it is the sign of the Primal Will in the phenomenal world ... The ethereal substance is, therefore, the cause since light, heat and electricity appear from it. It is also the effect, for as vibrations take place in it, they become visible. For instance, light is a vibration occurring in the ethereal substance."

Following this explanation, the term ether in 'Abdu'l-Bahá's usage therefore refers to a manifestation ("sign") of the creative word of God (the "Primal Will") in the world of matter, that is the expression of God's will in the "phenomenal world" and thus a medium between the spiritual realm and our material universe. It acts as an active agent because force fields are created in it that give form and shape to matter. Additionally, ether is at the same time the recipient of these forces, because this matter, as explained above, is in its turn nothing but an expression of strong fields of "ethereal power" or energy.

In another passage, 'Abdu'l-Bahá further elaborates on this twofold nature of ether that is omnipresent in nature, this time using the terms "Fashioner" and "Fashioned", which appear to be identical in meaning to the "active force and that which is its recipient":

*Similarly they have said that the potentialities (qábiliyyát) and the recipients of the potentialities (maqbulát) came into being and were created simultaneously. For example it has been stated that all things are composed of two elements: the 'Fashioner' (gábil) and the 'Fashioned' (magbúl). By 'Fashioned' is meant substance (mádda) and primary matter (huyúlá) and by 'Fashioner' is meant the form and shape which confines and limits the primary matter from its state of indefiniteness and freedom to the courtyard of limitation and definite form. For example,*

*letters and words are composed of two things: The first is the substance which is ink and pencil-lead and is the 'Fashioned' while the second is the forms and features of the letters and words which are the 'Fashioner'. Now this specific substance and this specific form were created simultaneously although the general substance was created before the specific form. It is clear that, before the existence of this specific form and shape, the ink had an external existence which had no specific form or shape and had the ability and potential to assume the shape of any letter or word and was not restricted or specified to a particular shape or form. Similarly, the general shape and form had an existence before substance specified them since before being specified by substance (which is ink or pencil-lead) the general shape and form of letters and words had a mental existence in the mind of the writer. Moreover, general form and general substance were also created simultaneously. For it is not possible for a thing to have an external existence and not to be formed into a shape because substance and primal matter in order to exist need shape and form; while shape and form in order to appear need substance.*

In the same way that the letters in the above example given by 'Abdu'l-Bahá pre-exist in a non-material form in the mind of the writer, also every being in this physical world has a spiritual counterpart in the Logos, or Primal Will that is gradually imprinted upon matter to give it its desired form and shape. It is these archetypes or blueprints that 'Abdu'l-Bahá refers to when He speaks for example of the eternal existence of man. He is therefore not saying in these cases that human beings have always physically lived and existed on earth, but that God had always planned to create them and therefore an eternal archetype of human beings had always been (pre-) existent in the Logos.

Whereas it is the writer who, in 'Abdu'l-Bahá's example, brings the letters from a potential and archetypal existence to material reality, it is the love of God or the Holy Spirit which imprints the archetypes that exist for all created things upon matter and thus, through evolutionary processes, "creates" all contingent beings:

*...while God does not create, the first principle of God, Love, is the creative principle. Love is an outpour[ing] from God, and is pure spirit. It is one aspect of the Logos, the Holy Spirit. It is the immediate cause of the laws which govern nature, the endless verities of nature which science has uncovered. In brief, it is Divine Law and a Manifestation of God. This Manifestation of God is active, creative, spiritual. It reflects the positive aspect of God.*

There is another Manifestation of God which is characterized by passivity, quiescence, inactivity. In itself it is without creative power. It reflects the

negative aspect of God. This Manifestation is matter.

*Matter, reflecting the negative aspect of God, is self-existent, eternal, and fills all space. Spirit, flowing out from God, permeates all matter. This spirit, Love, reflecting the positive and active aspect of God, impresses its nature upon the atoms and elements. By its power they are attracted to each other under certain ordered relations, and thus, uniting and continuing to unite, give birth to worlds and systems of worlds. The same laws working under developed conditions bring into existence living beings. Spirit is the life of the form, and the form is shaped by the spirit. The evolution of life and form proceeds hand in hand. The powers of spirit are evolved by the experiences of the form, and the plasticity of the matter of the form is developed by the activity of the spirit. Working up through the mineral and vegetable kingdoms, sense-perception is reached in the animal, and the perfection of form is attained in man (Bahá'í Scriptures 301).*

*The forms or bodies of component parts, infinite in variety, which in the course of evolution spirit builds as the vehicles of its expression, are, because of the instability of matter, subject to dissolution. As they disappear, others are built following the same patterns, carrying on the characteristics of each.*

*When in the course of evolution the stage of thought and reason has been reached, the human mind acts as a mirror reflecting the glory of God (302).*

### **The importance of ether in creation and evolution**

The previous quotation thus states that evolution is not an arbitrary process, but the gradual expression of spirit in matter. The vehicles for this creative principle or spirit appear to be the fundamental forces known to physicists, which are, as 'Abdu'l-Bahá explains, manifestations of the love of God, that is the Holy Spirit.

It is interesting to note in this context that Bahá'u'lláh, when referring to the act of creation, talked about a single mathematical structure (a line) that was turned into a fourfold one (a cross) by God: "Know then, that God, praised and glorified be He, took a line, split it lengthwise into two, rotated the one about the other, and so made from them the universe." This account of creation might relate to the one force described by the unifying field theory, that was the only one at the time when our universe had just been "born" (and was still extremely hot), and which then, after the cosmos had cooled down a little, manifested itself in the four fundamental forces that we know today.

The heat that prevailed in this early period of time is also mentioned in many of the statements on creation found in the Bahá'í Writings. This early heat was a result of the extremely high quantities of electromagnetic radiation



that existed at this time and which influenced sub-atomic particles to move around enormously fast. It was thus in the truest sense a result of “the interaction between the active force and that which is its recipient” and the cause of motion in the early universe:

*... the cause of motion [harakah] hath ever been heat, and the cause of heat is the Word of God.*

When the early universe later cooled down and further expanded, this heat gradually decreased. This made it possible for sub-atomic particles, that had only existed individually before, to create the first hydrogen and helium atoms, which then, billions of years later, formed clouds of gas that, due to the force of gravity, gradually become denser and denser, thus reaching the state of fluids and finally becoming solid matter. It might have been this development Bahá'u'lláh had, many years before scientists formulated such a theory, alluded to in the following terms:

*Know that the first tokens that emanated from the pre-existent Cause in the worlds of creation are the four elements: fire, air, water and earth... Then the natures (ustuqusát) of the four appeared: heat, moisture, cold and dryness—those same qualities that you both know. When the elements interacted and joined with one another, two pillars became evident for each one: for fire, heat and dryness, and likewise for the remaining three in accordance with these rules, as ye are aware.*

The four classical Greek elements of fire, air, water and earth mentioned here might thus correspond to the four physical states of matter: radiant (or plasma), gaseous, liquid and solid which, as we can see, are given by Bahá'u'lláh in the correct order of their appearance in our universe.

The two natures in them (temperature and moisture) could have a number of different meanings: Temperature (together with density, pressure and some other factors) distinguishes the physical state matter is in. If solid matter is gradually heated up, it first melts to become a liquid, then evaporates to form a gas and in the end is transformed into a radiant plasma in which no complete atoms, but only ions and free electrons, can exist. Therefore, temperature is definitely a “pillar”, that is a distinguishing factor for the physical state of matter.

Moisture, on the other hand, is extremely important for biological processes and is therefore a “pillar” for organic matter.

Similar accounts about the evolution of our universe, which are in complete conformity with modern scientific theories, are also given by 'Abdu'l-Bahá, who states that:

*there is no doubt that in the beginning the origin was one: the origin of all numbers is one and not two. Then it is evident that in the beginning matter was one, and that one matter appeared in different aspects in each*

*element. Thus various forms were produced, and these various aspects as they were produced became permanent, and each element was specialized. But this permanence was not definite, and did not attain realization and perfect existence until after a very long time. Then these elements became composed, and organized and combined in infinite forms; or rather from the composition and combination of these elements innumerable beings appeared (Some Answered Questions 181).*

And furthermore:

*Then it is clear that original matter, which is in the embryonic state, and the mingled and composed elements which were its earliest forms, gradually grew and developed during many ages and cycles, passing from one shape and form to another, until they appeared in this perfection, this system, this organization and this establishment, through the supreme wisdom of God (183).*

### **The Heisenberg uncertainty principle and its implications for the interaction between mind and matter**

‘Abdu’l-Bahá’s mention of the “original matter” here brings us back to our initial topic, the ether, which, according to His words, is both its originator and its shaper.

The idea that this ether is in fact the medium through which spirit can exert an influence on matter completely contradicted scientific theories at the time it was formulated, because in the deterministic worldview of contemporary physicists the movement and development of all things, from the largest celestial bodies down to single atoms and even subatomic particles, was completely and fully determined by the laws of physics (i.e. Newton’s laws of mechanics). These laws seemed to dominate nature so completely and inescapably, that the idea of any kind of spirit that can influence matter or in other words anything like a free will, which might have enabled human beings to escape from the all encompassing law of cause and effect, would have been absurd.

This worldview was, however, soon to experience its almost complete extinction.

According to quantum mechanics, it is, as physicists found out in the 1920s, not only electromagnetic radiation that has a dual nature consisting of both particles and waves, but this dualism is in fact a quality that can be found everywhere in nature. Every single particle, every atom, molecule, complex atomic structure and biological organism and also every virtual particle and force field has such a twofold nature.

However, the wave function that is associated with a particle is fundamentally different to any other known types of waves (e.g. sound waves). It is a function that displays the information we can have about a certain

particle by describing the probability of this particle having certain qualities such as velocity, position or spin. It can therefore tell us for example that the probability that a particle can be found at a certain position  $x$  is five times higher than the probability of it being at position  $y$ . In a similar way it can also tell us something about the probability of the particle having a certain velocity. It cannot, however, give us any exact and unambiguous information about any of these qualities. If this uncertainty is not exact enough for us, we can of course make a measurement to find out the exact position of the particle for example, but in doing so, we inevitably cause the wave function of this particle to collapse (because there is no probability of the particle being anywhere else any longer), and the result of this collapse will be that it will henceforth not be possible anymore to find out what the exact velocity of that particle was at the time its position was measured. If on the other hand we want to measure the exact velocity of the particle, we will unavoidably lose the possibility of attaining any exact data about its current position.

One might now want to argue that this difficulty in obtaining accurate data can only be due to a lack of more precise methods of measurement. Such an opinion was in fact held by many physicists, including Albert Einstein, in the early years of quantum physics, but it soon proved to be incorrect. Many different experiments that have since been carried out clearly and unambiguously demonstrated that this indeterminist randomness is in fact an intrinsic part of nature. Regardless of how strange that might sound, a particle cannot have simultaneously both an exact position and an exact velocity (Gell-Mann 139). The more exactly the one is determined, the fuzzier the other one becomes.

Quantum physicists nowadays believe that a particle in fact does not have any exact and determined features, but rather exists in a hybrid state of many different, more or less probable qualities as long as no measurement is made. Some even go so far as to suggest that a wave function can only collapse if it is a conscious mind that observes or measures a quantum phenomenon and that therefore even the macroscopic apparatus used to make the measurement goes into some sort of quantum limbo until a human being actually looks at it. Whatever interpretation might turn out to be more accurate, it is clear that by making the decision to determine a particle's position for example, we take away the possibility of the particle having had a definite velocity at the time the measurement was made. We will still be able to make a statement about its most probable velocity, but there will no longer be a way of determining if this guess is correct. It is this principle, called the Heisenberg uncertainty principle after its discoverer Werner Heisenberg, that Paul Davies, professor of theoretical physics, is referring to when saying:

*The fact that you can decide to create either an atom-at-a-place or an atom-with-a-speed confirms that, whatever its nature, your mind does, in a sense, reach into the physical world (Davies 141).*

By demonstrating the possibility of the existence of a mind over matter phenomenon in quantum physics, the Heisenberg uncertainty principle has thus, after centuries of deterministic thinking, made it scientifically justifiable again to speculate about ways in which spirit might be able to influence matter on a quite fundamental level. It should be noted, however, that such phenomena have only very recently come under the scrutiny of reputable researchers and that the existing hypotheses about these matters are thus still of a rather speculative nature. The ideas and hypotheses summarized in the following sections are therefore not necessarily representative of the current thinking of a majority of scientists.

### **God and quantum physics**

We have seen above that the writings and utterances of the Central Figures of the Faith describe material forms (e.g. the physical bodies of living organisms) as something that “in the course of evolution spirit builds as the vehicles of its expression” (*Bahá'í Scriptures* 302) and that these forms are said to pre-exist in the divine plan or the Logos before they are realised through an evolutionary process in the material world. Having furthermore found out that ‘Abdu’l-Bahá’s ether, which can be related to modern concepts of force fields, appears to be the medium through which spirit is stated to influence and shape matter, we can now go on to examine how quantum physics, and especially the Heisenberg uncertainty principle described above, might be able to help us understand on what level such an interaction between spirit and matter might take place.

On a microscopic (i.e. atomic or sub-atomic) level, the uncertainty principle is of vital importance as it allows, for example, for virtual particles to be created from nothingness without any obvious cause and makes it possible for others to have qualities that no one would have expected them to have. According to this principle, a single particle can even go through two slits in a barrier at the same time or simultaneously be at two totally different places as long as no measurement is made that forces it to adopt one of the two (or more) possibilities.

On a macroscopic level, the uncertainty becomes less and less important, the greater the quantity of particles that are involved. This is due to the fact that the probability of a large group of atoms collectively behaving in a way that is already very improbable for any single one of them is extremely low. Nevertheless, quantum physics states, for example, that it is not absolutely impossible for an object of visible size to be found at a totally different place the next time someone looks at it, without anyone or anything having moved this object to its new position. This is also the reason why quantum physicists cannot deny the possibility of the existence of a God that can cause things to happen that were not foreseeable and might even appear miraculous

to us. The way in which such divine interference in the material world might take place is described thus by the physicist and mathematician Euan Squires.

*Quantum theory offers at least two possible roles for a 'God' ...*

*The first role is to make the 'choices' that are required whenever a measurement is made that selects from a quantum system one of the possible outcomes. Such a God would remove the indeterminacy from the world by taking upon himself those decisions that are not forced by the rules of physics. ... He would be very active in all aspects of the world, and would be totally omnipotent within the prescribed limits. It is interesting to note that this role might even permit 'miracles', if we were to regard these as events so highly unlikely that they would be effectively impossible without very specific, and unusual, 'divine' choice. For example, according to quantum theory, there must be a small, but non-zero, probability that if I run into a wall, then I will pass right through it. The second possible role for a God to play in quantum theory is more relevant to our principal topic. God might be the conscious observer who is responsible for the reduction of wavefunctions. Whether, in addition, he also decides the outcome of his observations, as in the above paragraph, or whether this is left to chance is not important here. What is important is the fact that God must be selective—he must not reduce all wavefunctions automatically (Squires 66 f).*

The elegance of such an interpretation lies in the fact that it allows God to influence the material world without having to break the natural laws by which this world is governed. It appears logical that an all-knowing and omnipotent God as portrayed in the Bahá'í Writings would rather create a universe controlled by laws that allow him to influence its development than one whose laws He would have to supersede to allow for such an act of divine interference.

### **The relationship between body and soul**

One area where, as the Bahá'í Writings clearly state, spirit influences matter is in the interaction between the human body and soul:

*As outer circumstances are communicated to the soul by the eyes, ears, and brain of a man, so does the soul communicate its desires and purposes through the brain to the hands and tongue of the physical body, thereby expressing itself (Paris Talks 86).*

The soul, according to 'Abdu'l-Bahá, is completely immaterial and therefore free from all physical limitations and independent of time and space. It interacts with the brain through a medium called "common faculty" (*Some Answered Questions* 210). This faculty, which seems to be identical with or

at least related to the human mind, is a partly spiritual (“pre-existent”) and partly physical (“contingent”) entity that “is connected with the brain” (242) and controls the functioning of the human body:

*The mind force—whether we call it pre-existent or contingent—doth direct and co-ordinate all the members of the human body, seeing to it that each part or member duly performeth its own special function (Selections 48).*

The faculties of the human soul are described by ‘Abdu’l-Bahá as the powers of imagination, thought, comprehension, memory and the common faculty described above (*Some Answered Questions* 210). These powers of the soul are called inner perception (*Promulgation* 325) in contrast to outer or sense perception, the main faculty of the human body. Other aspects of this inner perception are the ability to dream, (*Promulgation* 416) self-consciousness (*Promulgation* 258) and free will. The human soul has therefore “two means of perception: One [sense perception] is effected through instrumentality; the other [inner perception], independently” (*Promulgation* 416).

This description of the relationship between the human body and soul is remarkably similar to the picture drawn by the physiologist and Nobel Prize winner Sir John C. Eccles who distinguishes between the outer sense of perception and the inner senses of thoughts, feelings, memories dreams, imaginings and intentions, which he describes as properties of the immaterial mind (Eccles 184). Largely basing his argumentation on Margenau’s work *The Miracle of Existence*, in which the latter proposes a description of the mind as “a field in the accepted physical term” or more precisely a quantum mechanical “probability field” (97), Eccles suggests that some components of the human brain might act as quantum-based receptors that can communicate information from the mind to the brain and from there to the rest of the human body. The structures he suggests for this role are certain synapses (i.e. interfaces between individual nerve cells) of the pyramidal cells in the cerebral cortex of the brain (Eccles 187). The firing of a nerve cell can be induced at these synapses by the release of neurotransmitters, which travel across the synapse from one nerve cell to the other, from tiny vesicles that form a presynaptic vesicular grid at the surface of a synapse. As the vesicles at these synapses are already in apposition for exocytosis (release of transmitters) and all it takes to trigger such an event is the displacement of  $10^{-18}$  g of vesicular membrane, such an event would be “within the range of quantum mechanics and Heisenberg’s uncertainty principle” (189). A mental activity such as thinking would, according to this model, “do no more than select for exocytosis a vesicle already in apposition” (190), and the combination of a larger number of such quantum mechanical events could then lead to the firing of a nerve thus communicating an immaterial mental impulse to the

brain and nervous system.

Another scientist engaged in research of this kind is Sir Roger Penrose, one of the worlds leading physicists and mathematicians. His hypotheses are similar to those of Eccles in that he also describes a process in which quantum phenomena might induce the firing of nerve cells, but differ from the former ones in regards to the physiological configurations proposed to fulfil this role. The structures which he suggests to serve as such quantum-based receptors to the human consciousness, are the so-called microtubules, tiny tubes filled with vicinal (i.e. atomically ordered) water that are part of a neuron's cytoskeleton. In these structures, Penrose states, quantum-entangled or coherent phenomena (many particles being entangled in such a way that they behave like one single particle with only one collective quantum state) might occur that could cause nerve cells to fire as a result of purely spiritual activities of human consciousness, that is activities of the human soul:

*On the view that I am tentatively putting forward, consciousness would be some manifestation of this quantum-entangled internal cytoskeletal state and of its involvement in the interplay between quantum and classical levels of activity. The computer-like classically interconnected system of neurons would be continually influenced by this cytoskeletal activity, as the manifestation of whatever it is that we refer to as 'free will'. The role of neurons, in this picture, is perhaps more like a magnifying device in which the smaller-scale cytoskeletal action is transferred to something which can influence other organs of the body-such as muscles. Accordingly, the neuron level of description that provides the currently fashionable picture of the brain and mind is a mere shadow of the deeper level of cytoskeletal action-and it is this deeper level where we must seek the physical basis of mind! (Penrose 376)*

Both of these models therefore propose an interaction between immaterial mental activities and the human brain and nervous system based on the theories of quantum mechanics, especially that of Heisenberg's uncertainty principle. From a Bahá'í perspective, such an approach is supported by the fact that at least one aspect of this nervous system, the "sympathetic nerve", is described by 'Abdu'l-Bahá as "neither entirely physical nor spiritual, but ... between the two [systems]" (*Tablets of 'Abdu'l-Bahá Vol. 2* 309). Much more solid scientific research is probably necessary to develop more complete theories and for some kind of consensus to form among scientists regarding these phenomena. The fact that preliminary models such as the two described above have already been formulated by reputable and world-renowned scientists, however, demonstrates that a fundamental shift of consciousness in regards to such topics is already starting to take place within the scientific world.

## Conclusion

The above paragraphs have shown that striking similarities seem to exist between some scientific concepts as described in the Bahá'í Writings and the theories of modern physics—especially those of quantum physics—which, for the most part, only emerged long after the passing of the Central Figures of the Bahá'í Faith.

In these concepts, the ether as defined by 'Abdu'l-Bahá seems to play the significant role of a medium for the expression of spiritual impulses in the physical world and is thus of importance for the understanding of various Bahá'í ideas such as those of divine creation, a process of evolution that is at least partially guided by spiritual impulses, the relationship between the human body and soul, God's influence on the material world, etc.

By comparing this Bahá'í concept of ether to the models of quantum mechanics, it can be demonstrated that all these ideas appear to have counterparts in modern scientific literature and that the understanding of “the essence of existence” being “a spiritual reality because invisible forces of the spirit are the origin of matter and the foundation thereof” (Shoghi Effendi) can therefore not simply be dismissed as unscientific anymore. Quantum mechanics has in this way made a big step towards the reconciliation of science and religion, “the two wings upon which man's intelligence can soar into the heights, with which the human soul can progress” (*Paris Talks* 143).

As a final observation it should be noted that because many of the scientific discoveries and theories referred to in the Bahá'í Writings were yet unknown to the contemporaries of Bahá'u'lláh and 'Abdu'l-Bahá, They obviously could not have used the technical terms applied for their description nowadays. Instead, They had to make use of and sometimes redefine already existing concepts and terms (e.g. the ether concept or the idea of the four elements of ancient Greek philosophy) in a way that they would accurately explain what They had in mind. On a superficial level, this might give the impression that the Central Figures of the Faith did not actually formulate any new ideas about physical reality. When we study Their Writings more closely, however, we come to realise that this is only the case because Their references to such topics were purposefully made in such a way that they would neither offend Their addressees who believed in certain (erroneous) contemporary scientific concepts, nor make use of a terminology that these people would not have been able to understand.



## Works Cited

- 'Abdu'l-Bahá: *Makatib-i 'Abdu'l-Bahá*. Vol. 1. Cairo: Kurdistán-i-'Ilmíyyih, 1910.
- : *Paris Talks, Addresses Given by 'Abdu'l-Bahá in Paris in 1911-1912*. 11<sup>th</sup> ed. London: Bahá'í Publishing Trust, 1982.
- : *Selections from the Writings of 'Abdu'l-Bahá*. Haifa: Bahá'í World Centre, 1982.
- : *Some Answered Questions*. Trans. Laura Clifford Barney. Wilmette: Bahá'í Publishing Trust, 1987.
- : *Tablets of 'Abdu'l-Bahá*. Vol. 2 New York: Bahá'í Publishing Committee, 1915.
- : *Tablets of 'Abdu'l-Bahá*. Vol. 3 New York: Bahá'í Publishing Committee, 1915.
- : *Tablet to August Forel*, Oxford: George Ronald, 1978.
- 'Abdu'l-Bahá and Bahá'u'lláh: *Bahá'í Scriptures, Selections from the Utterances of Bahá'u'lláh and 'Abdu'l-Bahá*. Edited by Horace Holley. 2<sup>nd</sup> ed. New York: Brentano's Publishers, 1923.
- Bahá'u'lláh: *Gleanings from the Writings of Bahá'u'lláh*. Trans. Shoghi Effendi. Wilmette: Bahá'í Publishing Trust, 1983.
- : *Tablets of Bahá'u'lláh revealed after the Kitáb-i-Aqdas*. Haifa: Bahá'í World Centre. Rev. ed. 1988.
- : *The Seven Valleys and the Four Valleys*. 3<sup>rd</sup> ed. Wilmette: Bahá'í Publishing Trust, 1986.
- Brown, Keven: "A Bahá'í Perspective on the Origin of Matter". *Journal of Bahá'í Studies*. Vol. 2 no. 3, 1990, pp. 15-42
- : "Hermes Trismegistus and Apollonius of Tyana in the Writings of Bahá'u'lláh". *Revisioning the Sacred*. Vol. 8. Los Angeles: Kalimát Press, 1991, pp. 153-187.
- Brown, Keven and von Kitzing, Eberhard: "Evolution and Bahá'í Belief: 'Abdu'l-Bahá's Response to Nineteenth-Century Darwinism". *Studies in the Bábí and Bahá'í Religions*. Vol 12. Los Angeles: Kalimát Press, 2001.
- Davies, Paul: *God and the New Physics*. New York: Simon and Schuster, 1984.
- Eccles, John C.: *The Evolution of the Brain: Creation of the Self*. London; New York: Routledge, 1989.
- Einstein, Albert and Infeld, Leopold: *Die Evolution der Physik*. Rowohlt Taschenbuch, 1995.
- Gell-Mann, Murray: *The Quark and the Jaguar: Adventures in the Simple and the Complex*. 2<sup>nd</sup> ed. London: Abacus, 1995.

- Margenau, Henry: *The Miracle of Existence*. Woodbridge, CT: OxBow Press, 1984.
- Momen, Moojan: “‘Abdu’l-Bahá’s Commentary on the Islámic Tradition: ‘I Was a Hidden Treasure’ (a Provisional Translation)”. *Bulletin of Bahá’í Studies*. Vol. 3, no. 4, 1985, pp. 4-64.
- Penrose, Roger: *Shadows of the Mind: A Search for the Missing Science of Consciousness*. New York: Oxford University Press, 1994.
- Savi, Julio: *The Eternal Quest for God: An Introduction to the Divine Philosophy of ‘Abdu’l-Bahá*. Oxford: George Ronald, 1989.
- Shoghi Effendi: letter to an individual believer dated 18 February 1930.
- Squires, Euan: *The Mystery of the Quantum World*. 2nd ed. Bristol: Institute of Physics Publishing Ltd, 1994.
- Treumann, Rudolf: *Die Elemente; Feuer, Erde, Luft und Wasser in Mythos und Hissenschaft*. Hanser, 1994.