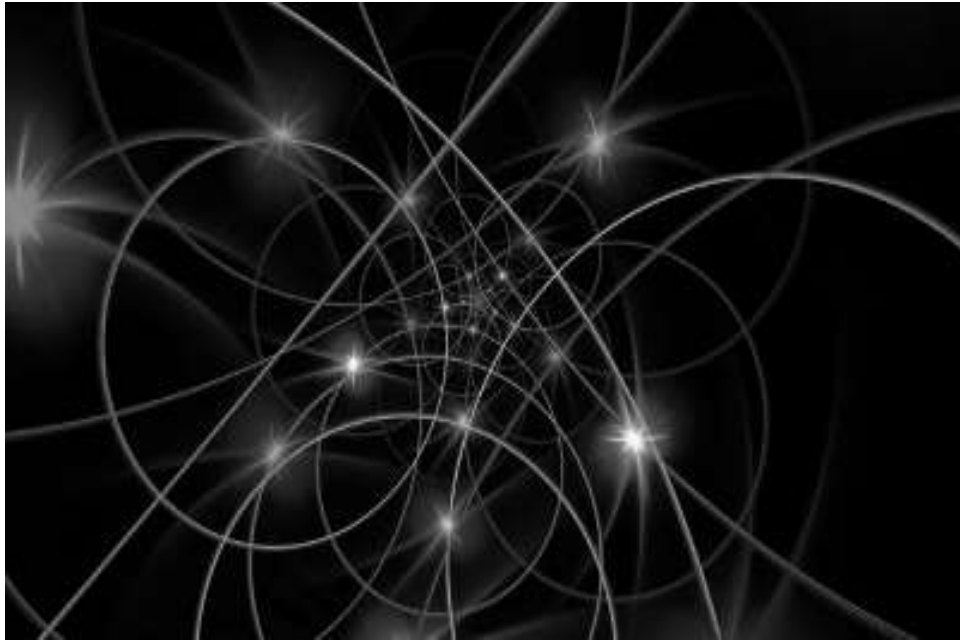




Quantum Physics and Sufism

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Quantum Physics examines the state of matter and light in atomic and subatomic dimensions. With this theory, it tries to understand the structure of molecules, atoms and the properties of particles such as electrons, protons, neutrons, quarks, gluons. The theory also discusses the interactions of the particles with one another and the reactions of these particles with electromagnetic radiation such as light, X-ray, Gamma ray.

The foundations of this theory were determined by physicists such as M. Planck, A. Einstein, N. Bohr, W. Heisenberg, E. Schrödinger, M. Born, J. Neel, P. Dirac,

W. Pauli in the 1900s. The emergence of quantum physics was in the late 1800s by trying to explain the phenomena of classical physics, such as black body radiation, spectral lines, photoelectric effect, which were not sufficient in the explanation.

While the classical physics was trying to explain the universe with continuous models, quantum physics tried to explain the universe with discontinuity. Many physical phenomena have been found to have a discontinuous structure. For example:

- The black body radiation can be explained by quantum energy masses. (1900, M. Planck).
- It is understood that light is composed of energy packages called photons. (1905, A. Einstein)
- It was found that there was a core in the center of the atom and the electrons were turning around. (1911-1913, E. Rutherford, N. Bohr)
- It was understood that light showed both wave and particle character, and this property was expanded to all materials. (1923, L. De Broglie)

While the data of classical physics was sufficient to explain the events at the macro level, it was insufficient to explain the events at the micro level. Quantum physics has been effective in explaining micro-level events. However, there is a principle of compatibility between the two theories, such that when the particles in quantum physics slightly change their level of energy, their behavior becomes explanatory by classical physics.

While the classical physics modeled the universe with continuous models, it examined the particles with 6 parameters (3 positions, 3 momentum). However, these models are not sufficient in the energy fields because they are defined with a large number of parameters. In quantum physics it is defined by a wave function instead of defining the particles with 6 parameters. This wave function contains all the information of the particle. However, this information is expressed by a probability function. That is, wave function is considered as a measure of probabilities. Accordingly, quantum physics is basically a probability theory. There are all possible states of the system within the wave function. However, there is an uncertainty here. The wave function can give you different answers in each asking of the same question. So you may have more than one

possible solution to the situation you want to learn about the particle. This is an important issue where classical physics and quantum physics are differentiated. When you want to know the two physical variables that are related to the particle, if you want to know the one variable precisely, you have less of a knowledge of the other physical variable. This is called the Heisenberg Uncertainty Principle. Since this principle was formulated in 1927, it has undergone no change in the foundations of quantum physics. However, quantum physics has been criticized by well-known physicists such as Einstein. The most important deficiency of quantum physics is that the law of gravity does not exist in it. For this reason, it was not possible to be compatible with the theory of relativity.

There are some phenomena in quantum physics, which are very striking for people who are accustomed to thinking classically. The physical causes of these events are not known exactly. For this reason, on quantum physics, the very comfortable philosophy can be done. People have produced some philosophies through the mind and endeavored to simulate them with quantum physics. However, most of these philosophies do not agree with real quantum theory on some issues. In addition, mystical interpretations are added to these philosophies, which has nothing to do with Sufism. People cost everything they want to think about both quantum theory and Sufism. The great masses of people, who are unaware of real quantum theory and true sufism, admire these views. In order to prevent this, people need to try to understand quantum theory with scientific definitions and concepts. In the same way, Sufism must also be learned from the works of real Sufis. Only then can they avoid cheering a lot of wrong things.

We want to approach the quantum theory and the interesting determinations of this theory in terms of Sufism. Our aim is to interpret the similarities and shortcomings between the theory and mysticism. In these comments, the data of the science of secrets will be used. Therefore, what we say is not a philosophy. Because the data of science of secrets are not obtained through the mind. These are revelation and discovery information.

- Together with quantum physics, two major changes in the way of understanding and interpreting the fundamental laws of nature came up. The

first is that, instead of the straight linear continuity of the large-scale world, the subatomic world is replaced by collision events involving extinction and existence. The other is that probability is replaced by certainty. How these different views can be compatible. Both views are conceivable in their own dimensions.

A typical law of classical physics is the law of necessity. Accordingly, once the initial conditions are determined, it is stated that the outcome of the event is necessarily uniform determined. For example, if you know the location and velocity of a matter at a particular point in time, you can calculate the place and the velocity of the particle at what time you want it to be, under Newton's laws of motion.

However, quantum laws are closer to telling you what cannot be than what has to happen. In this sense, these are considered as prohibition laws. For example, when a proton and another proton collide at a certain energy, there are many possible consequences. Each result will be at its own likelihood. In addition, the number of results that will not be realized is unlimited. What determine them, are the conservation laws. The conservation laws are which set the prohibitions and enforce them. Preserve of the electric charge is the most obvious. Since the electric charges must be preserved in the collision of two protons, the total electric charge after the collision must be +2, since the electric charge of each proton is +1.

Could all of the possible consequences in accordance with conservation laws actually occur? Although it is not clear that the answer should be yes, physicists think that the answer is yes. The fact that all of the allowed possibilities seem feasible brings some physicists back into the question of necessity: Everything which is to be possible has to be occurred.

If we consider the fundamental difference between classical physics and quantum physics we have explained above in terms of Sufism, we can say the following:

Allah Almighty connected the events in the world to a relationship between cause and effect and has set some rules on this issue. These rules will remain the same until doomsday. This scheme works in the realm is a software program. The author and carrier of this software program is Allah Almighty. But how much it is possible for people to see and understand the essence (truth) of the software

program, that is, the truths of rules and cause-effect relationships in the realm. All the claims of both classical and quantum physics are partly correct. But all this is wrong in another respect. We can see that without any mystical explanation. There are events that both theories can explain correctly and wrong. These are partly exemplified above. So why this situation arises. The answer to this in Sufism is as follows: Each matter and event in the universe has two aspects (face). One is the face (hidden face) that looks at Allah, the Creator, and the other is the face (apparent face) that looks at the universe, the material world. The apparent face of these can be seen by physics. But the hidden face looking at the Creator cannot be seen. Because it is not possible to see this face with the mind and five senses. To see this face you need the information of secrets. This information is also revelation and discovery information. However, the entire face of the hidden cannot be recognized by revelation and discovery. Because in the event of creation there are divine elements that belong to the essence of Allah. They are impossible to see and understand.

According to these explanations, it is quite normal that there are issues that every physical theory can and cannot explain, see or not see. Because it is impossible to understand the truth (essence) of the goods and events. In fact, this makes sense. Because otherwise, it wouldn't make sense that the world would be a test place. However, according to our belief in Islam, people are only created for worship and test for faith. If we could see everything exactly, everyone would have faith and there would be no trial. In this respect, Muslims should examine natural events in the light of the Qur'anic verses and authentic hadiths. They must believe that Allah Almighty is the creator of the order established in the universe and fulfill their obligatory duties against Him. This is the only way to attain happiness in the Hereafter.

Quantum physics is closer to sufistic interpretations than classical physics. Because it states that there is a possibility of events in quantum physics and that it is not possible to use an expression that will be certain. However, as some physicists' claims that every possible outcome will surely take place, is not suitable for mysticism. As Sufi, we believe that which possibilities will be realized is only under the knowledge of Allah. Here, if God wills, that result will be revealed.

"But you cannot will it unless God wills. God is indeed all knowing and wise." (Al-insan, 76/30)

We can never reach the full knowledge of Allah. Therefore, we cannot say that all possibilities will be realized.

"And they ask you questions about the spirit. Say: "Spirit is something my Lord will know. You have been given little knowledge." (Al-Isra, 17/85)

Some famous physicists who have seen this truth have voiced aloud whether they are trying to no avail in the face of this incomprehensible fact of nature.

- The most obvious proof of the above explanations is the Uncertainty Principle. When W. Heisenberg put forward this principle in 1927, he stated: The more precisely the position of a particle is defined at a given moment, its momentum may be known less precisely, vice versa. The principle is applicable not only to position and momentum, but also to other quantity pairs, such as time and energy. It means if you know something for sure, then you know less the another thing. In another approach, if you know a quantity in full completeness, there is another quantity you can't know anything about.

The principle of uncertainty has no any correspondence in classical physics, but it is the basis of quantum physics. This principle confirms the discovery information described above. However, the uncertainty expressed by Sufism is more advanced. In the principle of Heisenberg, two quantities are compared. However, uncertainty in Sufism applies to a single quantity. For example, it is never possible to detect an electron's position absolute. Because these determinations are always expressed as an approximate value. This is about nanometer. So there is a lower limit of the measurement. Every point of the universe is full of structures that are infinitely intertwined. When you reach the nucleus of an atom, the world of particles is reached. The interior of this world is always a realm of collisions, disappearances and new creations. There is no limitation here. No matter how much you go inside the core, you can't come to an end. This is just like there is a real number between two real numbers in mathematics. In other words, the points on the line cannot be physically exhausted. The same is true for the 3D realm within the nucleus. This realm can

never be exhausted physically. Therefore, you cannot specify the exact position of a particle with 3 parameters. This implies a mystical ambiguity.

The reason for all this is that it is not possible to know anything absolutely in the universe. Although some connect this to the inadequacy of measurement technology, it is really because of the hidden and the external sides of this universe. The measurement technology is in the external side of the universe. It also gives an accurate result. If we cannot make the measure of something exactly and absolutely correct, it is because of the hidden and external sides of the universe are out of each other. We can see the apparent side of the universe by measurement, but we can not see the hidden side.

If people could have fully recognized everything with reason and five senses, there would be no need for God to send prophets and holy books containing revelations to people. The truth is not what many scholars think. Only a part of the absolute truth can be recognized by the positive sciences such as physics, chemistry, etc.

- The most important means of controlling the probabilities in quantum physics is the wave function. Because in quantum theory, the state of a particle or a system is represented by a wave function. According to classical physics, all quantities in physical terms - mass, velocity, electric charge, magnetic field and others - are measurable. All such quantities can be observed at the same time. This is not the case in quantum theory. The wave function in quantum theory is the number with real and imaginary parts. Therefore, the wave function itself is not a measurable quantity. But the absolute value of the square of the wave function can be measured. The absolute value of the square is a real number and it is measurable. This observable number gives the possibility that the particle will be in a particular state or location. This subtle distinction between classical physics and quantum physics is important for understanding the behavior of some elementary particles, such as boson and fermion.

The wave function can also take negative values. What is the meaning of negative values in an electron's unobservable behavior? These mysterious results lead to the elaboration of electrons in order to better understand the distinctive behavior of the formation of elements. This points to the usual superiority of issue.

Probability uncertainty indicates a lack of knowledge. Indeed, uncertainty is the hallmark of quantum physics that is its distinctive characteristic. What is uncertain is the prediction information of where a certain particle can be found when an experiment is arranged to determine the exact location of the electron. We don't know for sure beforehand. If we make many identical experiments, the electron can be found in different places in each. This is similar to a pair of dice. You know exactly the probability of a result (if the dice are smooth). For example, the probability that the sum of the numbers is 7 is $1/6$; The probability of a 1: 1 is $1/36$. But you will never know the outcome of a dice roll in advance.

This result is also expected in terms of mysticism. Because fate, that is, the consequences of the events will be closed to people. Only Allah knows this. Sometimes some of the destiny can be shown by Allah to a special person.

- In 1924, De Broglie proposed the idea that all particles have wave characteristics. This idea acknowledges that the reason that particles are allowed to move only in certain orbits is the result of the constructive interference of a wave accompanying the particle in its orbit. When this justification was adapted to the circular orbits in the hydrogen atom, the results were in full agreement with the experiments.

Light is both wave and particle. The light is called a particle photon. The accuracy of this structure has been proven in many experiments, such as photo electricity.

Quantum physics tells us that. A particle acts only as a particle in its emergence and disappearance (in which it was born and died, radiated and absorbed), acting as a wave during the period between them. It means when we want to measure it, it acts as a particle. In predictions about what a measurement might be, the waves are used.

The remarks above remind us the hidden and exterior faces of the particle. In the moments of birth and dying of the particle, which we call them moments of creation and extinction, it shows the particle property because it is related to the external realm. Between the two of them, because they did not reach any warnings on the side of external seems to take the character of the wave. The wave is the covering and concealment of the external side of the particle. At the

moment of measurement at any time, the instantaneous side of the particle emerges. Because measurement is a matter of external world. The particle immediately fits it and for that moment it goes out of the wave feature. In the double-slit experiment, we will discuss this in the following paragraphs.

The above situation was raised 800 years ago by Ibn Arabi. Ibn Arabi (ks) in his work "Füsusu --I – Hikem":

When external says "I am", the hidden says "No ". When the hidden says "I am" external says "No".

This truth, determined by discovery, has been tested with quantum physics and its accuracy is determined. This shows how important the power of discovery information is.

The principle of uncertainty is also closely related to the wave movement of the particle. Because the principle of uncertainty is a way of preserving the secrets of nature, the secrets of the hidden. In this sense, the wave motion that accompanies the particle is just a shell that protects the hidden side of the particle. What is important, is the truth in this shell, that is the truth of the hidden side.

As far as we know from Sufism, when a substance is created, it is created also a soul which accompanies it. According to this, all substances are alive with their souls. All particles such as electrons, protons have souls and are so living. Their souls indicate the hidden side. In this respect, the wave movement that accompanies the particle is the boundary between the soul of the particle and the outer world. With this wave movement, the hidden side of the particle is prevented from appearing in the external realm.

According to this understanding, the particles know their creators very well. Their knowledge of Allah is stronger than people knowing God. Because the real self of a person hinders him from knowing of Allah. There is no real self in the particles. But those who save themselves from being slave of their real self can be like the particles to be knowing Allah.

- An entanglement principle in quantum physics, which is in contradiction with the human sense. The basic idea of entanglement is simple. This is a special kind of overlap. This principle involves the quantum effects of the superimposed

states to be propagated to great distances beyond the normal distances. For example, let's think of a motionless and unloaded pion that turns into a double photon at a certain point. The first pion has zero charge, zero momentum and zero angular momentum (spin). Since they are preserved quantities, they are also zero in products after transformation. The charge of the two photons is again zero. Photons fly linearly to each other in the opposite direction. When flying, their momentums are equal with the opposite signs. But because of the momentum preservation, the total momentum is zero. Spin directions must be opposite, so that the sum is zero. However, it is a single system until the two photons separated by flying are observed. Let's say a photon is flying to the left and the other to the right. We can measure the spin of the left-hand photon when it is one meter, one km or a light-year away from where the photon was created. While the direction of spin of both photons is indeterminate and unknown until the measurement is made, a precise learning of the direction of the spin of a photon determines the spin direction of the other photon at the same time. This is because the two photons are not two separate quantum systems, but a single quantum system until the moment of measurement. This behavior of the particle was very disturbing for many famous physicists, especially Einstein, and so they tried to prove the opposite. However, in many experiments, expectations about the principle of entanglement have been correct. Therefore, when all the predictions of quantum physics are tested, it is seen that they are true regardless of whether they satisfy our right sense or violate our logic.

We can explain the principle of entanglement in terms of Sufism. In the worlds, the principle of unity is valid. This principle covers the entire universe and its contents. So when two photons are together, their spirits are in an unity. But since the principle of unity encompasses the whole world, the two photons continue to be united how they are separated from each other. Therefore, the results of the observation in one affects the other and so the other is observed.

The comprehension of the unity actually applies to all created systems. However, some of their initial data may appear to be in contradiction with their subsequent state because they are parameters we do not know. In fact, the reason for this is that we know only part of the parameters that determine the system.

The function of the name Al-Wahid (the Unique) of Allah is constantly fulfilled and the principle of unity in all the worlds are common and dominant.

It is possible to understand the laws of conservation in physics in this context. The conservation of momentum, angular momentum and energy is a result of the principle of unity. However, they appear to be not valid in some places because of the other parameters that we do not know at the moment. According to the Islamic belief, the uniqueness is valid in all created realms and entities. This is a result of the name of al-Wahid in the hidden. We are only able to perceive this result only partially in the external realm. Because there are many other factors that we do not know.

- One of the events that best describes the wave-particle duality is the double-slit experiment. In this experiment, a light with a single wavelength illuminates a display with two narrow slits positioned very close to each other. The light passing through the slits diffuses in different directions due to diffraction and makes interference and creates dark and light lines on a surface behind the screen. This is an excellent quantum experiment. Because the photon passing through the slits decides where to go on the surface. The possibility of a stroke in some places (luminous lines) is too much, the possibility of landing in some places is weak (dark lines).

Because of this experiment, Einstein said that it was ghostly for quantum physics. Feynman stated that the double slit experiment reflects the spirit of quantum physics. One way of interpreting the double-slit experiment is that each photon acts as a separate wave, which passes through both slits, completely independent of the previous photons, and moves with the possibility dependent only on this wave. .

What this experiment teaches us is that we have to give up the idea that a photon is a particle - apart from the moments of birth and death.

An important one of the double slit experiments was the experiment on electrons by C. Davisson and L. Germer in 1927. In the experiment, a single electron is passed through two quadrangular slits, which are reflected on the screen behind the slits. While the electron is expected to pass through one of the slits, it passes through both slits at the same time, and gives a wave pattern

of sequential luminous and dark stripes on the screen. In order to understand what such a miraculous thing might be, scientists put observation instruments in the slits in the next experiment. But the electron in this case acts as a normal particle and passes through the single slit. It means, when we look at the electron, it's as if he understands us and is in position to appear somewhere and somehow. This is called a crash event in quantum physics. In other words, only one of the infinite possibilities is realized by the observer's perception.

If we look at the issue here in terms of Sufism, we can say the following. The reason for the issue here is that the observation of the electron. The observation causes the electron to be driven to its external face.

Therefore, the electron acts as a particle. However, if the electron is not observed, the electrons that are not related to the apparent side completely passes to the hidden side and shows the wave character. Thus, it causes interference.

The effect in this event is called the observer effects in quantum physics. According to the evidence, the observer (a human being) only observes the observations (external world). Observing in this sense reveals the apparent side of matter. When not observed, the substance is directed towards the hidden side.

Everything in the world is under the observation of each other. However, some Sufis are experiencing incidents that the right sense cannot accept if they tear the curtain of the real self, pass to the hidden side and feel the uniqueness in all their cells. The living of some Sufis in Vahdet-i Wucud (uniqueness and existence) is an example for it. When these people enter into this situation, we call this situation as extinction and continually, they have been seen in more than one place at the same time. There are some hadiths that some people will pass through the 7 gates of heaven at the same time. This event is in this context. Everything in existence has a spirit . With this spirit all beings are connected to God. We cannot see these spirits in the external realm. Because the spirits belong to the spiritual realm. As the world realm is a reflection of the realm of the truth, the imaginary side of the matter is emerging and its hidden side is concealed. Thus, the substance behaves with the properties that appear in the world.

The understanding of the whole universe in quantum physics as a whole is the reflection of the Vahdet-i Wujud concept on the world. Therefore, quantum physics is closer to sufism than classical physics.

- We learn from the following hadith that the universe contains waves:

“ One day our Prophet (pbuh) replied, when the Companions asked questions about the movement of the clouds in the heavens: Do you know what this heaven is? A rolled up wave and a protected ceiling.”

Rotational movements in the firmaments can cause wave movements in the sky. Because wave motion is actually some kind of rotational motion. The wave characters of the particles can be caused by their spin movements. There is nothing standing in the universe. Because stopping is to go to absence.

Mevlânâ says in a couplet:

, When hundreds of volcanic floods flow through the volcano that explodes in my soul, heaven makes me rotating. “

This is the depiction of wave movement through discovery. Wave movements take the source from the soul and spread like a flood. To be able to get into this state and to see the hidden side of the wave movement, you need to be saved from the captivity of the soul and the real self like Mevlânâ. Then we can understand the statement of Hz. Ebubekir:

“Whatever I looked at, I saw God before all else.”

When man is saved and freed from his real self, he observes wherever he looks, the hidden side of everything. In this observation, he sees Allah above all.

Result

The physical phenomena described above have led people to think about what nature is. Some people have tried to perceive nature with reason and 5 senses. These are positive scientists today. Some people have tried to understand the nature through discovery and revelation. The most important step that the scientists have reached is the quantum physics. We have tried to explain the secrets of secrets science related to these issues.

With the interpretation of Ibn Arabi's on the nature through Sufism, we can express:

“What is it called natural? And who is he who is guilty of nature? Nature is a place where God's divinity is revealed. Natural beings have emerged from a single truth and appear in various aspects. In other words, all of the beings in nature have emerged from truth in a single truth. But in appearance it is in multiplicity. This means that the natural world is the images that appear in a mirror. Perhaps it is a single surrogate that appears in various mirrors.

According to Sufism, it is clear that reason and 5 senses are not enough to understand nature. In order to be able to perceive the nature, discovery and revelation information is needed. When this information is included in the work, there may be some way out to the positive scientists. However, the discovery and revelation information may not be enough to fully understand the whole nature. Because, of course, there are divine elements in the truth of the events. They can't be seen by people.

How we are closer to understand the events in nature, our amazement grows more and we can approach God more. For this reason, learning is for the Muslims binding duty. On this website, many articles have been published about the relevance of Sufism to science. In order to better understand the view of Sufism in terms of positive sciences, it is useful to examine these articles.

Friends! May Allah bless us all to learn science.

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