

Schrodinger's Cat is neither alive nor dead

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In this paper, we have analyzed a movie recorded by a team from the Massachusetts Institute of Technology (MIT) to show that the quantum states are real, but not physical. We have then analyzed some natural phenomena to show that this observation applies to all the physical entities. Physical form is only a manifestation of a non-physical entity that has its own unique set of potential properties that it can manifest in physical form. The manifestation of the physical entities is observer dependent. An act of observation manifests a physical entity; it does not create it. We have also shown that we live in a non-physical world in which all the phenomena are mere manifestations.

We assume that the things exist on their own independently of an act of observation and events occur at a definite place and time.

Heisenberg explains, *“In classical physics, science started from the belief or should one say from the illusion, that we could describe the world or at least parts of the world without any reference to ourselves. This is actually possible to a large extent. We know that the city of London exists whether we see it or not. It may be said that classical physics is just that idealization in which we can speak about parts of the world without any reference to ourselves.”*^[1]

Greiner and Walter explain, *“In the everyday world, **it is natural and intuitive** to think of every object being in its own eigenstate. This is another way of saying that every object appears to have a definite position, a definite momentum, a definite measured value, and a definite time of occurrence.”*^[2]

On the other hand, quantum mechanics claims that things may exist at more than one place simultaneously.

The principle of superposition states that a particle *exists* in all its possible states at all the possible places until it is observed.

In fact, quantum mechanics suggests that a particle *exists* everywhere and nowhere simultaneously. However, if we observe it then, all possibilities except one collapse and the particle manifests at only one place in only one of its states.

Sheldon Goldstein et al explain *“It is a general principle of orthodox formulations of quantum theory that measurements of physical quantities do not simply reveal pre-existing or pre-determined values, the way they do in classical theories. Instead, the particular outcome of the measurement somehow **“emerges”** from the dynamical interaction of the system being measured with the measuring device....”*^[3]

However, quantum mechanics does not know that if a thing exists and at all possible places in all its possible states simultaneously then, why an act of observation manifests it only in one state at only one place.

Quantum mechanics has enough experimental evidence to back its claim about how things are in the quantum world, but it struggles to explain how things can be the way they appear to be. Therefore, there are several interpretations of quantum mechanics. The Copenhagen interpretation pioneered by Neils Bohr and Warner Heisenberg is the most popular interpretation of quantum mechanics.

The Copenhagen interpretation asserts that things do not have any preexisting values. An act of observation produces what is being observed.

Einstein assumes that things exist independently of an act of observation. Therefore, Einstein argues that things must have preexisting values. Einstein suggests that quantum mechanics is incomplete, if not wrong.

Now, we know that things do not exist in any particular state at any given time. Even the manifest form does not have preexisting values.

We are discussing the core issues related to the famous Bohr-Einstein debate on the nature of reality.^[4]

There is every chance that the interpretations of the quantum mechanics may be wrong, but there is a greater chance that the assumptions of classical physics may not be correct either. Therefore, quantum physics must move out of its world and examine the world of classical physics.

It is natural to think that no physical entity can exist in more than one state or at more than one place simultaneously, but quantum mechanics has experimental evidence to back its claim. The most famous of these experiments is the double-slit experiment.

It is one of the most beautiful experiments in physics, but it has baffled some of the most brilliant minds of physics. Thomas Young performed this experiment in 1801, but it turned into a mystery only later when other variants of the experiment were performed.^[5]

Imagine a wall with two slits in it. If we throw the balls at the wall then, some balls will bounce off the wall but some will pass through the slits and hit a screen placed behind the wall. If balls leave a mark on the screen then we can expect to see a shape similar to the slits.

If we shoot photons instead of the balls then, we see something unexpected. The photons do not form two distinguishable bright shapes similar to the shape of the slits. Instead, an interference pattern is formed on the screen with a series of alternating light and dark bands.

Thomas Young explained that the light is actually wave. The waves passing through the slit interfere with each other therefore, the interference pattern is formed on the screen.

Richard Feynman suggested that the interference will be formed even if we use one photon at a time.

This prediction was confirmed in an experiment conducted by Pier Giorgio Merli, Gian Franco Missiroli, and Giulio Pozzi. In this experiment, single electrons and biprism (instead of slits) were used. The result of the experiment was in line with the predictions of the quantum theory.^[6]

The experiment was repeated with electrons and real slits by Stefano Frabboni and his team in 2012. An interference pattern was formed even in this experiment.^[7]

This variant of the experiment suggests that electrons an electron can interfere with itself because it exists in the state of superposition.

Let us assume we can place a detector in the slits to find out the path taken by individual photons. We find that the interference pattern disappears if we place a detector in the slits. Neils Bohr argues that this experiment illustrates the complementarity principle. According to the complementarity principle photons can behave as either particles or waves, but cannot be observed as both at the same time.

J. A. Wheeler proposed another variant of the experiment in his article, *'The Past and the 'Delayed-Choice' Double-Slit Experiment'*." These experiments show that the photons can somehow know the experimental setup and adjust their behavior accordingly. The results of these experiments are also used to suggest that the future can affect the past.^[8]

We will resolve all the issues related to different variants of the double-slit experiment, but before that we will examine another phenomenon that manifests unpredictability in the behavior of the particles.

A mysterious feature of the radioactive element is that it is not possible to predict the time of the decay of radioactive nuclei. If we have a heap of say a hundred atoms of a radioactive element then we can be sure that at the end of the half-life of the element only half the atoms will be left, but we cannot be sure which atoms will survive and which will not.

It is also not possible to identify any internal or external factor that triggers the decay of radioactive nuclei.

Apparently, the nuclei of radioactive elements behave arbitrarily.

Quantum mechanics focuses only on the uncertainty, duality, and unpredictability; therefore, it cannot see the significance of the certainty in the behavior of either the radioactive elements or particles in the double-slit experiment.

The radioactive elements have a predictable half-life. Similarly, it may not be possible to predict the place where individual particles may strike the screen, but it is possible to predict the overall pattern to a reasonable degree of accuracy.

In both these cases, the behavior of the whole is predictable. The whole cannot behave predictably if the behavior of the parts is arbitrary.

Let us resolve the wave-particle duality.

Sense organs receive almost all the information about the external world through the electromagnetic waves and sound waves but physics knows next to nothing about the nature of either the light or the sound nor does it know anything about the neural activities in the brain after neurons receive signals from the sense organs in the form of nerve impulses.

Einstein says, *“All these fifty years of conscious brooding have brought me no nearer to answer to the question, 'What are light quanta?' Nowadays every Tom, Dick, and Harry thinks he knows it, but he is mistaken.”* ^[9]

Heisenberg explains, *“Light could either be interpreted as consisting of electromagnetic waves, according to Maxwell's theory, or as consisting of light quanta, energy packets (documentaries) traveling through space with high velocity. But could it be both? Einstein knew, of course, that the well-known phenomena of diffraction and interference can be explained only on the basis of the wave picture. He was not able to dispute the complete contradiction between this wave picture and the idea of the light quanta; nor did he even attempt to remove the inconsistency of this interpretation. He simply took the contradiction as something which would probably be understood only much later.”* ^[10]

In June 1883, *“The Chautauqua”*, a science journal, asked, *“If a tree were to fall on an island where there were no human beings would there be any sound?”* ^[11]

Scientific American's answer is, *“Sound is vibration, transmitted to our senses through the mechanism of the ear, and recognized as sound only at our nerve centers. (Therefore,) if there be no ears to hear, there will be no sound.”* ^[12]

This definition is self-contradictory and circular.

If the sound is vibration then it will be produced even if it is not recognized as sound, which means it is an observer-independent phenomenon. However, if the sound is not produced in the absence of a hearer then, it has to be an observer-dependent phenomenon.

We know that the answer is that the sound may or may not be produced even if a fully conscious human being capable of manifesting the sound were to be present in the jungle.

Obviously, the sound is not just vibrations. The sound may not even be just a nerve impulse created in the brain.

Let us analyze a movie recorded by a team of scientists from MIT to understand the nature of light and the role it plays in the communication of information.

A team of scientists from the Massachusetts Institute of Technology (MIT) has developed a camera that captures a trillion frames/second. The team has recorded several movies to demonstrate the speed of the camera. We will analyze a clip from a movie titled, 'multiple_scenes.mp4'.^[13]

In this clip, a light source emits a pulse for 2 picoseconds. The light illuminates a fruit kept between the light source and the camera. The camera records these events in the sequence they occur. The camera developed by the MIT team captures only one-pixel vertical image. Therefore, the team rotates a mirror to scan the line across the field of view to create the entire scene.

Every frame is composed of many pulses, one for each vertical line of the image, which is stitched together to make the movie. However, we can analyze the movie assuming it is a normal video film. The team has recorded normal events to show the motion of light. The team has slowed down the movies considerably to allow the viewers to make the sense of the sequence of events.

The light source emits a pulse for only 2 picoseconds; therefore, the difference between the arrival time of the first set of photons and the last set of photons in any frame cannot be more than 2 picoseconds. Therefore, if the photons carry information then, the total length of the movie cannot be more than 2 picoseconds.

The distance between the light source, fruit, and the camera does not affect the nature of the analysis because the camera would record the events in the same sequence as they occur irrespective of its distance from the light source. Therefore, we can analyze the movie assuming

that the distance between the light source and fruit is 5 feet and the distance between the light source and the camera is 10 feet.

The sequence of events starting from the emission of the first set of photons by the light source to the illumination of fruit lasts for about five nanoseconds, but the difference in the arrival time of the first and last set of photons can only be 2 picoseconds.

Therefore, if the light carries information then, the camera cannot record the entire sequence of events lasting 5 nanoseconds. All the photons travel the same path in *the same setup in identical condition* within a span of just 2 picoseconds; therefore, if the first set of photons takes only 10 nanoseconds to reach the camera then, the last set of photons cannot take 15 nanoseconds to travel the same distance. However, the camera registers the last set of photons five nanoseconds after it registers the first set of photons. Therefore, the length of the movie is 5 nanoseconds, not 2 picoseconds.

Obviously, photons do not communicate information. This movie rules out the possibility that information is communicated physically.

If we assume that the photons carry information then, the velocity of each subsequent set of photons has to be less than the velocity of the previous set of photons.

The causal relationship between the illumination of the light source and consequent illumination of the fruit can be explained only if the communication of information does not involve any physical entity.

The atoms in the light source absorb energy and move to the excited state. This event is perceived by us as the illumination of the light source. The energy emitted by the light source is absorbed by the next particle. The atoms in this particle also move to the excited state.

We again perceive this event as the illumination of the documentary. This process continues and eventually, the atoms in the fruit also manifest in the illuminated state. The camera does not receive any photons from these entities. It simply senses these events and projects them in the sequence they occur.

The theory of relativity's observation that the velocity of light is independent of the velocity of its source is considered a brilliant but counterintuitive observation but only because of a lack of understanding of the nature of light. The light and sound waves emitted simultaneously by a single source reach the observer simultaneously even if the source moves away from the observer to any arbitrary distance. This is possible because waves do not travel physically between the source and observer.

This analysis clearly shows that nothing physical, not even energy, travels from the source to the cameras or from the source of the sound to the observer.

The brain understands only one language – the language of the nerve impulse. The properties of the nerve impulses determine the projected form of the physical entities. For a physicist, the only fundamental difference between our sense organs is that they entertain the energy in the different range of frequencies.

As Schrodinger suspected and John Bell predicted, the communication of information does not involve real, local documentaries.

More importantly, this analysis reveals the true nature of the light and sound.

All the recording devices and our sense organs are sensors, not receptors. The light and sound are the projections of information, not the carrier of information.

The manifestation of information is an observer-dependent phenomenon; therefore, the light and sound have to be observer-dependent phenomena.

Any factor that affects the nature of information causes a change in the apparent form of the entities.

Physicists may have accepted the wave-particle duality as an unavoidable pain, but no physical entity can be both a wave as well as a particle, but it may manifest as both a wave as well as a particle. The light is neither a wave nor a particle; therefore, depending on the properties of the observer it may manifest either as a wave or as a particle. Thus, there is no wave-particle duality.

Evidently the particles in both these cases enjoy some degree of freedom within the whole. However, this freedom is not absolute. There has to be some rule that determines the path that

individual particle can take in the double-slit experiment. Similarly, there has to be some rule that governs the behavior of radioactive nuclei. We may not know these rules because of our observational limitations but we can be sure that nothing happens arbitrarily in nature.

Schrödinger uses the unpredictability in the behavior of individual radioactive element to show through the famous cat paradox to show that if certain proposals of the quantum mechanics are correct then a cat may exist in alive and dead states simultaneously.

Schrödinger argues that since this is a physical impossibility; therefore, the proposals of quantum mechanics cannot be correct.

It will be interesting to see if the cat can exist in alive and dead states simultaneously.

Schrödinger observes, “.....an indeterminacy originally restricted to the atomic domain becomes transformed into macroscopic indeterminacy, which can then be resolved by direct observation. That prevents us from so naively accepting as valid a "blurred model" for representing reality. In itself, it would not embody anything unclear or contradictory. There is a difference between a shaky or out-of-focus photograph and a snapshot of clouds and fog banks.”^[14]

Let us open the box sealed by Schrödinger and see if the cat can exist in the alive and dead states simultaneously.

We had analyzed a movie recorded by the MIT team in the documentary on the physics of perception. We will carry this analysis forward to see if the movie can tell us anything about how things really are.

Let us assume that the same sequence of events has been recorded by three different cameras located at a distance of 10 feet, 20 feet, and 30 feet from the light source respectively.

The camera located at a distance of 10 feet catches the fruit in the illuminated state at 15 nanoseconds past 00.00 hrs.

The same sequence of events is recorded at 25 nanoseconds past 00.00 hrs. by the camera located at a distance of 20 feet, and the camera located at a distance of 30 feet records these events at 35 nanoseconds past 00.00 hrs.

We must assume that for each of these cameras, the events actually occurred at the time the cameras recorded these events or else we will not be able to establish the causal relationship between the illumination of the light source and the illumination of the fruit unless we assume that the photons emitted in a span of 2 picoseconds by the light source take different durations to travel the same path in identical conditions.

We have already clarified in our article on the nature of light and sound that if we assume that the photons carry the information to the camera then we cannot explain how camera can record a sequence of events lasting five nanoseconds when the time interval between the arrival of the first set of photons and the second set of photons is only two picoseconds.

We have shown that the camera senses the events it records. Three cameras located at different distances from the light source cannot find it in the illuminated state if the light source illuminates only for two picoseconds between 00.00 hrs. and two seconds past 00.00 hrs.

In other words, the illuminated state of the fruit at 25 nanoseconds past 00 hrs. is as real for the camera located at a distance of 20 feet as is the unilluminated state of the fruit at the same moment for the cameras located at a distance of 10 feet and 30 feet.

Thus, the present in the frame of the second camera is the past in the frame of the first camera and the future in the frame of the third camera.

Two events may occur simultaneously, but two or more observers may still perceive them at different points of time and for each of them the time at which they see the events is the actual time of occurrence of the events.

However, if the observers use scientific methods to determine the place and time of events then, they will agree that the events occurred simultaneously. They will also agree that the events occurred between hrs.

In other words, the events do occur at definite time and place, but may manifest at different times and at different places to different observers. As we have already mentioned, for each of these observers, the time and place at which they perceive the events is the actual time and place of occurrence of these events.

We have already shown that the camera senses the information; it does not receive the information. Therefore, if we use the language of the quantum mechanics then the light source fruit must *exist* in mutually exclusive states of illuminated and unilluminated states simultaneously for different cameras to catch it in these mutually exclusive states simultaneously.

This sounds very interesting, but we can assure the viewer that a physical entity cannot exist in two different states simultaneously.

The light source does not illuminate at 00.00 hrs. nor does the fruit illuminate at 5 nanoseconds past 00.00 hrs. The fruit and the light source only acquire the potentiality to manifest in the illuminated state. The actual state of their apparent form is observer dependent. The light source and the fruit do not exist in either the illuminated or unilluminated state nor does the cat exist in the alive and dead states simultaneously; however, they can manifest in any of their previous states simultaneously. Similarly, light is neither a particle nor a wave.

The fruit illuminates at different times for different cameras; however, if the observers located in the frame of each of these cameras determine the time the fruit acquires the potentiality to manifest in the illuminated state then, they will reach the same conclusion. However, they must realize that the fruit only acquires the potentiality to manifest in the illuminated state at 5 nanoseconds past 00.00 hrs.

Once it acquires the potentiality to manifest in the illuminated state then, it can manifest in both the illuminated as well unilluminated states simultaneously. Similarly, the cat cannot even manifest in both the alive and dead states simultaneously until it dies. Once it dies, it can manifest in both the states simultaneously.

Please note that each of these observers can determine the actual time of occurrence of these events (illumination of the light source and fruit), but if the observers assume that the events occurred at 00.00 hrs. and 5 nanoseconds past 00.00 hrs. then they will not be able to establish the causal relationship between the illumination of the light source and consequent illumination of the fruit.

Now, let us examine some other interesting phenomena.

Schrödinger analyzes projection of another form of information – emotions and feelings. Schrödinger observes, *“I wonder has it ever been noted that the eye is the only sense organs whose purely receptive character we fail to recognize in naïve thought. Reversing the actual state of affairs, we are much more inclined to think of „rays of vision“, issuing from the eye, than of the „rays of light“ that hit the eyes from outside. You quite frequently find such a ‘ray of vision’ represented in a drawing in a comic paper, or even in some older schematic sketch intended to illustrate an optic instrument or law, a dotted line emerging from the eye and pointing to the object, the direction being indicated by an arrowhead at the far end.*

Dear reader, or better still, dear lady reader, recall the bright, joyful eyes with which your child beams upon you when you bring him a new toy, and then let the physicist tell you that in reality, nothing emerges from these eyes; in reality, their only objective detectable function is, continually to be hit by and to receive light quanta.

In reality! A strange reality! Something seems to be missing in it.” ^[13]

The fact is that a lot is missing in it. Schrödinger assumes that the sense organs are receptors, not sensors. Schrödinger suggests that the only objective detectable function of the eyes is to receive light quanta.

Schrödinger does not realize that the *‘rays of vision’ represented in a drawing in a comic paper, or even in some older schematic sketch intended to illustrate an optic instrument or law, a dotted line emerging from the eye and pointing to the object, the direction being indicated by an arrowhead at the far end* are still being used in the science books to illustrate the mechanism of sense of sight and even the mechanism of total solar eclipse.

We know that the information is not communicated physically from the source to the observer, but we also know that the communication of information involves time delay. Therefore, we are supposed to see the Moon at the position it was about 1 second ago and the Sun at the place it was about 8 minutes 44 seconds ago.

Obviously, the Sun and Moon cannot be in a straight line with the Earth at the time they appear to be in a straight line with the Earth to an observer located on the Earth.

This fact in itself is enough to prove that something is seriously wrong with the present mechanism of the total solar eclipse because the Moon cannot block the photons of the Sun at the time it appears to be exactly in between the Sun and Earth.

Further analysis of the relevant facts confirms this observation.

In 8 minutes 44 seconds, the Moon moves about 500 KMs and the earth moves about 15,000 KMs in their respective orbits.

Therefore, the photons emitted by the Sun when it is in a straight line with the Moon and the Earth will miss the moon by a huge distance.

Refraction also causes a change in the apparent position of the Sun and Moon, but the sunlight refracts only if it enters the atmosphere of the Earth, which means the Sunlight reaching the Moon is not subjected to the refraction. The current mechanism ignores this important fact. It means that the diamond ring cannot appear behind the Moon!

These indisputable facts show that the actual position of the Moon and Sun cannot be in a straight line if their apparent position is in a straight line with the observer unless we assume that the apparent position of the Sun and Moon is their actual position.

The current mechanism of the total solar eclipse assumes that the apparent position of the Sun and Moon is their actual position, and not surprisingly, the total solar eclipse does occur in this position because this assumption of the current mechanism is correct.

We cannot establish the causal relationship between moon coming in between the Sun and Earth and the darkness engulfing the affected parts of the Earth unless we assume that the apparent position of the Sun and Moon is their actual position.

If we assume that the Sun has an observer independent position then, the light must originate from this position. If the light originates from the actual position of the Sun then, the Moon cannot block the Sunlight because the actual position of the Moon and Sun cannot be in a straight line with the Earth if their apparent position is in a straight line with the Earth.

The total solar eclipse can occur only if the apparent position of the Sun and Moon is their actual position.

The apparent position of all the objects, which is also their actual position, is observer-dependent.

An examination of the phenomenon called refraction has already shown that the apparent position of the object is their actual position.

Interestingly, the apparent position of the objects may be observer dependent, but if all observer use scientific methods to determine the position of objects then, they will reach the same conclusion.

Therefore, objects appear to have a definite observer independent preexisting position, but all the effects can be explained only if we treat the apparent position of the Sun and Moon as their actual position.

These days, the debate on the flat Earth is gaining momentum despite the overwhelming indisputable evidence showing that the Earth is an oblate spheroid.

We may have enough evidence to conclude that the earth is an oblate spheroid but we also have equally strong if not equally obvious evidence to prove that the earth is flat.

Euclidean geometry is based on the assumption of a flat universe and cosmologists also assume that they are observing a flat universe. Cosmologists also have no option but to assume that they are observing a flat universe because any other assumption can only create theoretical chaos.

In case of the motion, we have seen that an object may move at a breakneck velocity and still behave as if it is perfectly still.

The reality is that physical entities do not have any inherent form or shape; the manifest form and shape depends on the properties of the observer and method of observation being used by the observer.

Suppose we have a box divided into two equal compartments that have a light source and a camera installed on either side of the box. Both the light sources emit a signal simultaneously and both the cameras receive the signals simultaneously.

Let us fill water in one of the compartments. Both sources emit a signal simultaneously once again. Signals travel the same distance in identical conditions simultaneously, but the signals do not reach the other end simultaneously.

The observer located in optically rarer medium (air) receives the signals earlier than the observer located in optically denser medium (water).

The projection of events is based on the conditions prevailing in the local frame of the observer because the energy of the wave does not change after it enters the frame of the observer.

This mechanism turns every frame into the inertial frame for all the observers. However, it does not mean that all the frames are inertial frames.

Thus, we can say that even the expanse of the universe is observer-dependent. More importantly, even the behavior of the space is observer-dependent. However, it is not correct to say that the existence of the physical entities is observer-dependent.

The observer must have the potentiality to manifest at least one property of the observed entity to be even aware of its existence. The manifest form of the observed entity depends as much on the properties of the observer as it does on its own properties. For example, our eyes respond to the electromagnetic waves in a very narrow range of frequency. The rest of the electromagnetic spectrum does not exist for our eyes.

At any given time, the objects exist only in one state at only one place but may manifest in different states at different places to different observers.

The method of observation may also change the properties of the manifest form because it sorts of changes the properties of the observer.

In a relative universe, a change in the properties of the source, properties of the observer, properties of the medium between the source and observer, and the method of observation selected by the observer may change the apparent form of the source.

All our observations apply even to the inert world. As we have mentioned, the observer does not have to be a conscious entity. Any entity that manifests information is an observer. For example, in the double-slit experiment, the screen and detectors are the observers.

One can see that not just the quantum world and the macro world but also the inert world and the conscious world follow the same set of laws.

Every entity in the universe is merely a sum of its potential properties. It exists independently of an act of observation in non-physical form, but manifest in the physical form only as a consequence of an act of observation.

One can see that not just the quantum world and the macro world but also the inert world and the conscious world follow the same set of laws. The wavefunction of all the entities is the sum of all the properties of an entity that it may manifest in the physical form.

The reader may be tempted to ask, '*What is the significance of death?*'

We have already mentioned that all the entities including human beings exist only in the non-physical form, but have the potentiality to manifest in the physical form. The death takes away the potential of an entity to manifest in the physical form. Therefore, the person cannot perform any activity nor can he be a direct cause of any event in the physical world. Obviously, no new potential properties can be added to his being.

However, he still retains the ability to manifest in any of his previous states.

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