The Nature of Physical Reality

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In this paradigm shifting paper, we show that the physical world is manifestation of a non-physical objective reality that exists absolutely, manifests relatively, and behaves relationally. We show that all the phenomena observed in the quantum world manifest themselves more eloquently even in the macro world. Things do not have any pre-existing values even in the macro world, but things do have predictable values even in the quantum world.

In his monumental work, *'The Road to Reality'* Richard Penrose observes, *"Indeed, we may well ask:* ***what is physical reality?*** *This is a question that has been posed for thousands of years, and philosophers throughout the ages have attempted various kinds of answers. Today we look back, from the vantage point of modern science, and claim to take a more sober position. Rather than attempting to answer the 'what' question, most modern scientists would try to evade it. They would argue that the question has been wrongly posed: we should not try to ask what reality is; merely, how does it behave."*

"To know how the contents of the universe behave does not seem to tell us very much about what it is that is doing the behaving. This 'what?' question is ultimately connected with another deep and ancient question, namely, 'why?' ***why do things in our universe behave in the particular ways that they do?*** *But without knowing what things are, it is hard to see why they should do one thing rather than another."[1]*

In this paper, we will answer both the 'what' and 'why' questions.

This paper shows that the physical world is manifestation of a non-physical objective reality that exists absolutely, manifests relatively, and behaves relationally.

Physics assumes that we perceive the things as they really are, but at the same time, it also assumes that the depth perception is a subjective phenomenon.

Depth perception is our ability to perceive the world in three-dimensions and determine the distance between the objects. Apparent physical properties of the objects depend on their distance from the observer; therefore, if depth perception is a subjective phenomenon then, we will have a chaotic physical world. We can only have speculative and at best intuitive theories on the nature of reality.

We just need to have a glance at the mechanism of perception to realize that it is based on one simple event – absorption of energy by the sense organs. Therefore, it is important to examine the process of absorption and emission of energy and its role in communication mechanism of the nature.

Communication mechanism of the nature can be examined in three parts – generation of information, effect of the nature of path between the source of information and observer on the nature of information, and process of perception.

Max Planck's observation that the energy is absorbed and emitted only in discreet packets (called quanta) laid the foundation of quantum (plural of quanta) mechanics, and is one of the most important features of the process of absorption and emission of energy.

This process plays an important role in many phenomena, but is not supposed to play any role in the mechanism of perception. However, if process of absorption and emission of energy plays any role in the communication mechanism of the nature then, this feature of the process of absorption and emission of energy must manifest not just in the quantum world but also in the macro world; not surprisingly, it does.

Atomic electron transition (also known as quantum jump or quantum leap) is a mysterious phenomenon because it appears that electron jump from one shell to another. However, this jump is not like the jump of a kangaroo whose motion is continuous; therefore, we can know the state of kangaroo at any stage of its motion. A change of quantum state of an electron appears to be a discontinuous process because electrons manifest in one shell and then, manifest in another shell after a few nanoseconds. Therefore, it is not possible to know what happens to electrons in the intervening period even if we observer it continuously.

This strange phenomenon manifests itself even in the macro world..

Galaxies also appear to move in jumps of multiples of 2.68 meters per second. This peculiar feature of the motion of galaxies manifests itself if we examine the absorption/emission lines of the galaxies.

There is nothing mysterious about the discontinuous motion of electrons and galaxies because energy is absorbed and emitted in discreet quanta; therefore, properties of a wave can change only in steps. Therefore, change in the position of the electrons and galaxies can only be a discontinuous process.

A galaxy having an expanse of millions of light years and comprising of billions of stars separated by huge spatial distances cannot jump physically from one location to another.

The motion of galaxies and even electrons is not real. However, if we conclude that the motion of galaxies is not real then, we also have to conclude that all galaxies still exist at one place. Since farthest galaxies in all directions are located at a distance of about 14.7 billion light years; therefore, if the apparent motion is only an illusion then, all galaxies must still exist at the geometric center of the universe. However, we find no evidence of existence of any singularity that comes even close to the kind of singularity envisaged by the theory of relativity.

Some physicists believe that the dark energy is fuelling the expansion of universe. If dark energy is fueling the expansion of the universe for last 14.7 billion years then, a source of dark energy that generates huge amount of dark energy continuously must exist in the universe. No such source of dark energy exists in the observable universe.

On the other hand, effects of expansion of universe can be explained only if we assume that the apparent position of a galaxy is its actual position. Expansion of the universe shall result in reduction in the energy density of the empty space, but energy density of the empty space is stable despite the addition of huge volume. Expansion of galaxies is being fueled by the energy emitted by the galaxies; therefore, there will be no change in the energy density of apparently empty space.

For all practical purposes, we must treat apparent position of galaxies as their actual position. However, even if apparent position of the galaxies is not their actual position even then, the actual position is inconsequential because it does not cause any observable effects. Nothing physical can exist at the original position of galaxies.

Above process only redistributes energy; therefore, volume of the universe shall not increase, but strangely, redistribution of contents of the universe causes a change in its volume.

Reader can understand the mechanism of expansion through what appears to be a very simple process – conversion of water into ice.

Proper understanding of this process is critical to understanding the nature of physical reality.

In chemistry, behavior of water is considered peculiar but predictable because cooling of water brings the water molecules closer to each other; therefore, water contracts. However, water contracts only until its temperature reach 4^0 Celsius, but after it expands. Therefore, volume of the water (ice) increases by a little over 9% at freezing point. Expansion creates so pressure that pipes crack if water inside the pipes freezes.

Chemistry suggests that all the water molecules stay close to each other and move even closer until the temperature reaches 4^0 Celsius. Further cooling of the water causes water molecules to form small groups. Chemistry suggests that space between molecules within a group reduces but the space between the groups increases; therefore, ice is more compact than water, but its density is less than the density of the water.

Interestingly, weight of the water does not change; therefore, we can say that nothing is added or subtracted from the water.

Analysis of the motion of galaxies and electrons shows that redistribution of matter may create volume. Space created by the expansion cannot be empty because such empty regions would increase the velocity of light substantially in ice, if not make its transmission an impossibility.

Ether is one of the biggest mysteries of the theoretical physics. Ether is some kind of media that exists without manifesting its existence. Therefore, it may be one of the candidates to fill the space between water molecules.

Current model of atomic structure suggests that an electron cloud surrounds the nucleus of an atom, but this space also behaves like empty space.

Even general relativity suggests that emptiness may be curved, and special relativity suggests that the matter can be created from non-material forms of energy. Quantum theory suggests that the virtual particles emerge from nothingness.

It is assumed that 99.9999996% of the volume of an atom is empty. What we need to find out is, *'does anything exist physically in the remaining 0.0000004% volume of an atom?'*

Let us first resolve the issues related to formation of ice.

Individual water molecules move closer to each other until the temperature of the water reaches to 4 degree Celsius. Volume of the water also reduces proportionally. Wavelength contracts until the temperature of water reaches 4^0 degrees Celsius.

At this stage, six water molecules form a bond. Molecules in the bonds cease to function as individual entities and constitute a composite whole. Therefore, randomness in the system reduces and symmetry increases.

Temperature of ice is lower than water, but increase in the volume is similar to the effect caused by the increase in temperature because six water molecules (in normal ice) form a bond and function as one particle and space between particles increases in the ice.

Symmetry causes an increase in the volume; therefore, perceptibility of the matter reduces. Once bonds are formed, the volume increases; therefore, amplitude reduces and wavelength expands. In normal ice, expanded space behaves like vacuum; therefore, refractive index reduces proportionally.

All systems including atoms and galaxies achieve greater symmetry in their structure through the process of absorption and emission of energy. Therefore, absorption spectra and emission spectra of all entities are always complementary.

Therefore, usable energy (mass) of the system reduces. There is no gain/loss of mass, but greater symmetry in the structure reduces the amount of usable energy. Conversion of ice into water reduces the usable energy, but this process is reversible. However, a fraction of the mass is lost forever in every thermodynamic process in the form of unusable energy (because of greater symmetry) from the observable universe (not from the universe).

We will discuss this process in detail later when we discuss the concept of time.

Evidently, ordinary matter may exist in imperceptible form. Therefore, there is no obvious relationship between perceptible mass (matter) and volume. Since ether does not manifest physically, but for the reasons explained above, ether affects the transmission of light; therefore, we need the concept of optical density.

Expanded space behaves like vacuum; therefore, amplitude reduces and wavelength expands in ice. Period and frequency of the wave do not change, but wave covers greater linear distance in the same period; therefore, transit time of light does not increase. Light travels farther in the same period; therefore, velocity of light increases. Refractive index of ice is 1.31, about 9% lower than the refractive index of water.

Interplay between the amplitude and wavelength is responsible for acceleration/deceleration of light due to change in the medium of its propagation.

Behavior of water molecules in ice shows that the physical symmetry does not ensure behavioral absoluteness.

Scientists have been able to develop 15 different types of ice. Ice XV does not hold charge because all water molecules function as one particle, and function as a system. A system does not manifest any charge; for example, an atom does not manifest any charge. Symmetrical space does not manifest any observable properties.

The difference between the ether and vacuum is that ether behaves like vacuum, but it can be converted back into ordinary matter.

Unobservable space in ice not only behaves like water but also manifests in the form of water when ice melts. Therefore, it is ice and water are different states of the same entity, not different mediums. Apparent empty space in the atom not only behaves like electron but also manifests in the form of electron.

Light travels through the imperceptible matter at its velocity in vacuum; therefore, increase in the volume due to higher symmetry increases the linear distance traveled by the light.

Ratio of matter in perceptible matter and imperceptible matter in a system determines the optical density of the system. Density is perceptible mass per unit volume, and determines emission amplitude of electromagnetic waves.

Evidently, imperceptible matter is an important component of all physical systems. Imperceptible matter may not manifest physically, but it still behaves relationally, and manifests relatively because it is not in the state of perfect symmetry. In the state of perfect symmetry, universe behaves like a single particle; therefore, it is imperceptible.

The Nature ensures that the received frequency is always equal to the emitted frequency. Color of the light depends on the amount of energy received by the observer; therefore, color of the light depends on the amplitude, not on the frequency or wavelength of the wave. Therefore, we can know the precise distance of objects from us by comparing the frequency (energy of the wave at the time of emission of the wave) and amplitude (energy received by the observer).

A photon may either gain energy or lose energy after its emission and before it is absorbed by another physical entity. However, amount of energy delivered to a frame of reference is always the same as it will be if there was no loss or gain of energy during the course of its journey to the observer, and if all frames

were inertial frames for the observer. However, it does not mean that all frames in the universe are inertial frames.

Nature achieves these objectives through the mechanism of length contraction and time dilation.

The energy of the photon reduces as it propagates in the space-time; however, loss of energy is not proportional to the spatial distance, but depends on the amount of matter photon passes through as it propagates in the space-time. Vacuum is the region in which a system has achieved symmetry in its structure. Therefore, length can only contract if the amount of a matter (perceptible mass) increases in a region. However, length may expand if wave moves from an optically denser medium to an optically rarer medium.

Difference in the mediums is created because of the change in the ratio of matter (perceptible mass) and imperceptible mass in a region. Length contracts/expands due to a change in the ratio of matter (perceptible mass) and imperceptible mass in a region. Wave loses more energy in optically denser mediums.

Amplitude of the wave increases in optically denser mediums and wavelength contracts; therefore, period and frequency of the wave does not change, but linear distance traveled by the wave reduces in optically denser mediums. Therefore, waves decelerate in optically denser mediums. Received frequency must reduce due to deceleration of the wave, but as we know, frequency of the wave does not change due to change in the medium of its propagation.

This is possible only if change in the apparent position of object is real.

Position of the source changes proportionally to the change in the wavelength; therefore, there is no change in the received frequency and transit time of light despite the deceleration of the wave. Objects located in optically denser mediums move closer to the observer located in relatively rarer medium. These effects are reversed if observer is located in optically denser medium and source is located in the optically rarer medium.

Suppose we mark points on two different coils of a fully stretched spring. If we compress the spring then, the distance between the points reduces without any change in the spatial coordinates of the points.

Length contraction is about the contraction of spatial distance between the source and observer.

Suppose we have a box of glass divided into two equal compartments that has a light source and camera installed on either side of the box. Both the sources emit a signal simultaneously. Photons traveling in

opposite directions lose equal amount of energy as they move towards the camera, and will reach the observer (camera) located at the other end of the box simultaneously.

Now, 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 at the same time; therefore, they are expected to reach the observers located at the other end simultaneously, but observer located in optically rarer medium (air) will receive the signals earlier than the observer located in optically rarer medium (water) will.

Let us see what happens if wave gains energy.

Light travels rectilinearly in vacuum; therefore, it takes shortest possible time to travel between two points. Therefore, time interval cannot contract; it can only dilate. Light *does not* travel curvilinearly in vacuum.

Character of vacuum in a system does not change because of the perceptible matter in a system. For example, character of the vacuum in the solar system does not change because of the presence of the Sun and other heavenly bodies in the solar system.

Character of all other mediums changes due to change in the temperature, pressure, and other such physical factors, but these changes do not affect the transit time of light unless these factors results in the formation of bonds between matter particles.

Perceptible mass in a system is matter even if it is in gaseous form. Imperceptible mass in a system appears as empty space. Ratio between amplitude and wavelength at any point of space depends on the density of that point. Therefore, emission frequency of a wave indicates density of the source of that wave.

Time dilates if a wave gains energy.

As we know, if a wave gains energy then, its amplitude increases, but wavelength does not change. Period of the wave must increase and frequency must reduce as a consequence of increase in the amplitude without any change in its wavelength. However, wave accelerates due to increase in its energy; therefore, the effect of change in the period of the wave is negated.

In this case, the nature simply moves the object away from the observer so that observer still receives the same amount of energy, as he will in the absence of wave gaining energy after its emission from the source.

This is the cause of deflection of starlight.

In fact, gravity is nothing, but time dilation effect, but we will discuss gravity a little later.

Relationship between energy and amplitude is such that the angle of deflection will be in line with the deflection predicted by Newtonian gravity.

Higher the emission frequency of the wave, smaller is the angle of deflection because higher-energy waves pickup less amount of energy. Any factor that causes a change in the energy of the wave causes deflection of wave. For example, a change in the temperature of the medium will also cause time dilation.

The simplest way of observing these effects is to use a zoom lens, telescope, microscope, or even a zoom microphone. If we use any of these instruments then, objects actually moves closer to us because transit time of the waves reduces.

If we focus on something then, the invisible becomes visible.

Angle of deflection is highest at the surface of the heavenly body, not at the core of the body because if we move towards the core then, wavelength contracts, but amplitude does not change; therefore, period of the wave must reduce, but wave decelerates; therefore, frequency does not change.

If we keep on moving away from the core of the heavenly body then, amplitude disappears completely and light travels rectilinearly. Great voids come closest to the state of maximum disorder. On the other hand, if we keep on moving towards the core then, wavelength disappears completely and light travels vertically. Black holes of the supermassive galaxies formed by the merger of several galaxies come closest to the state of maximum order.

However, these extreme states cannot be reached in any individual pocket of the universe; therefore, matter starts to emerge in the voids and black hole explodes into a quasar just before these states are reached.

If density increases beyond a critical limit then, the core expands in cylindrical shape. Black holes are cylindrical objects, and sit at the center of a ring of stars in the same manner as Saturn has a ring around it. Even the nucleus of atoms is cylindrical, not a spherical entity.

Black holes are our saviors because they hold massive amount of thermal energy in a very small volume. The universe will reduce to ashes in no time at all if all the heat stored in the form of thermal energy is released in a flash. Most of the mass of the universe is lost through quasar. This is also the reason for the loss of the mass after the collapse of Bose-Einstein Condensate.

It is obvious from the analysis so far that the wavelength is the natural measuring rod for measuring space interval and frequency (number of ticks received from an event in a specific period) is the natural clock for measuring time interval. Depth perception depends on the wavelength.

If we use wavelength as the measuring rod and frequency as the clock then, velocity of light remains absolute (it is always equal to c) in all frames for all observers in all mediums; however, space-time interval may change due to time dilation effect.

Assumption that a single wave travels physically from the source of the wave to observer is incorrect. Properties of the wave are observer dependent. We will discuss implications of this important observation later.

Suppose two events occur simultaneously at location P and Q. An observer moving towards the event P happens to be at equidistance from both the events at the time of occurrence of the events.

In this case, the wavelength contracts and amplitude of the wave increases in the direction of motion of observer; therefore, period of the wave does not change, but linear distance traveled by light reduces. Reverse effect is observed in the signals coming from opposite direction. Therefore, observer will perceive the events simultaneously irrespective of the direction of his motion.

A change in the spatial distance between the source and observer due to motion of either the source or observer does not cause any change in the received frequency. Therefore, all consequential events related to a cause are projected in the same sequence as they occur.

Even in this case, light from both the events travel at the same velocity.

The interplay between the amplitude and wavelength also ensures that if two events occur simultaneously at different distances from an observer then, observer perceives the events simultaneously.

We hear the sound of speakers connected to an audio device simultaneously even if there is huge difference in our distance from speakers.

Wavelength expands and amplitude reduces with the distance traveled by the light; therefore, at any point on the path of the wave, value of the wavelength and amplitude is fixed.

We have noted that the light traveling the same path at the same time, but in opposite direction may take different durations to travel the same distance. Following movie recorded by Dr Ramesh Raskar and his team at Media Lab, Massachusetts Institute of Technology (MIT) shows that the photons may take different durations to travel the same path in identical conditions even if they move in the same direction.

Dr Ramesh Raskar and his team have developed a camera that captures a trillion frames per second. MIT team has captured the motion of light in the movie titled *'multiple_scenes.mp4'* to demonstrate the ultra high speed of the camera.[2]

The camera developed by the MIT team captures only one pixel vertical image. Therefore, to create the entire scene, team rotates a mirror to scan the line across the field of view. Every frame is composed of many pulses, one for each vertical line of the image, which are stitched together to make the movie. However, we can analyze the movie assuming it is a normal video film.

In a part of this movie, a light source ***emits a laser pulse for two picoseconds***. A fruit is kept between the light source and camera. The team has captured the motion of the light pulse as it leaves the light source and illuminates the fruit on its way to the camera.

To visualize the scene, reader can think of a fruit kept between a light source (for example, a torch) and a camera. Light emitted by the torch moves towards the fruit and illuminates it. A camera records these events.

The camera will record the same sequence of events in the same order irrespective of its distance from the light source. Therefore, we can take the liberty of analyzing the movie assuming that the fruit and camera are located at different distances from the light source.

Let us assume that the distance between the light source and fruit is 5 feet; therefore, the sequence of events starting from the emission of the first set of photons by the light source to the illumination of fruit must last for about five nanoseconds (light takes about five nanoseconds to travel a distance of five feet).

Suppose the light source emits first set of photons at 00.00 hrs. The first set of photons reach the fruit 5 nanoseconds past 00.00 hrs. Photons reflected by the fruit may not take the straight path between the fruit and camera; therefore, the first set of photons take a little over 10 nanoseconds to reach the camera located at a distance of 10 feet from their source.

The camera placed at a distance of 10 feet from the light source duly records these events between 10 nanoseconds past 00.00 hrs and 15 nanoseconds past 00.00 hrs. The camera located at a distance of 20 feet records the same sequence of events between 20 nanoseconds past 00.00 hrs and 25 nanoseconds past 00.00 hrs, and the camera placed at a distance of 30 feet records the events between 35 nanoseconds past 00.00 hrs and 35 nanoseconds past 00.00 hrs.

This is surprising because *the light source illuminates for 2 picoseconds; therefore, time interval between arrival of the first set of photons and last set of photons in any frame has to be 2 picoseconds.*

Therefore, total length of the movie cannot be more than 2 picoseconds, but the fact is that the first set of photons take just 10 nanoseconds to reach the camera located at a distance of 10 feet. However, the last set of photons emitted just 2 picoseconds after the emission of first set of photons take 15 nanoseconds to travel the same distance in identical conditions.

If the distance between the light source and fruit is 9 seconds then also the first set of photons would reach the camera 10 nanoseconds after they are emitted, but the last set of photons would have arrived 9 nanoseconds after the arrival of the first set of photons!

The first set of photons travel at a constant rate irrespective of the distance they travel, but transit time of the last set of photons is not fixed.

Other parts of the above-referred movie and some other movies recorded by the MIT team show that *all the consequential events occurring simultaneously at different distances (because light emitted by the light source traveling in different directions) are always recorded by the camera in the same sequence as they occur.*

If a source emits sound and electromagnetic waves simultaneously then, the observer receives the signals simultaneously, but velocity of light will still be higher than the velocity of the sound.

If were to replace fruit with a light source, and the second light source were to emit a signal 5 nanoseconds after the emission of signal by the first light source then, the signals emitted by both the sources must reach the camera simultaneously, but the signals arrive at the interval at which they are emitted. However, if both the light sources were to emit a signal simultaneously then, the signal from the first light source should reach later than the signal source located at a distance of five feet from the observer, but signals from both the sources will reach the camera simultaneously.

Similarly, if a source of a wave and observer happens to be in one frame, but either of them moves subsequently then, the observer will continue to receive the signal without any time delay. On the other hand, if a source and observer are spatially separated, but subsequently move to the same frame then also the observer will receive the signals at the same interval at which signals are emitted. As already explained, we continue to receive the sound of the siren at the same frequency at which they are emitted even if spatial distance between the source and observer changes continuously.

Very complicated experiments are performed in the quantum mechanics to show that the quantum systems can exchange information instantly. However, entanglement can be observed routinely in the macro world. The important point to note here is that the entangled entities must be in the same frame of

reference at the start of the communication. Entanglement is lost if communication between the entangled entities breaks.

Telepathy is a more complex phenomenon because telepathic communication may occur even if entities involved in such communication may not have been in the same frame of reference.

Position of an entity can be changed by changing the frequency of the waves emitted by that entity. If we change the frequency then, the transit time of the light also changes. If frequency of the wave reduces then. The transit time of the light also reduces. (Things may move closer to us because of the length contraction effect, but transit time of light does not change).

If reader has studied physics even at the school level then, he will be able to recall a very interesting problem.

Suppose you are moving in a car and a fly is also moving in the same car but in opposite direction.

How do we determine the direction and velocity of the fly?

This simple problem is unnecessary complicated by the theory of relativity. In the theory of relativity, motion is a relative phenomenon. This proposal of the theory of relativity creates several paradoxes. The reality is that motion is not a relative phenomenon; perception of motion is relative.

The theory of relativity wrongly interprets these rules of the communication mechanism of the nature to conclude that motion is a relative phenomenon.

It is true that for every observer, all other frames are inertial frames, but it does not mean that all frames are inertial frames.

The motion of an entity causes changes in the properties of an entity; perceived motion of that does not affect properties of any entity.

However, the most important question pertaining to motion of fly has not even been asked so far – *'How is the motion of the car transmitted to the fly?'*

Position of fly always maintained in relation to its reference frame (car) irrespective of the direction and velocity of the car.

For each observer, his frame of reference is always at rest and velocity and direction of motion of other entities has to be determined in relation to the reference frame of the observer. However, irrespective of

whether the observer is aware of the motion of his reference frame or not, his frame is always in the state of absolute rest. For the fly, car is always in the state of the absolute rest even if it is actually moving.

As we have already pointed out, received frequency of the signals is always equal to the emission frequency. Therefore, in the twin paradoxes, if both observers were to send signals to each other at a regular frequency then, for both the observers, received frequency will be equal to the emission frequency; therefore, the observer in the spaceship will receive the signals at higher frequency than the observer located at the Earth. Twin who has gone on a voyage in a spaceship will return younger, and his clock will also be behind the clock of the twin on the Earth.

Similarly, in the pole barn paradox, shutting of the doors is an observer independent activity. Two or 'n' number of doors can shut simultaneously, and all observers will perceive the events simultaneously irrespective of state of their motion.

In the pole-paradox, pole contracts; therefore, superman will not be able to escape the barn if front and rear door close simultaneously. Of course, sheer velocity of the superman will reduce everything involved in the crash to pieces.

Therefore, no paradoxical situation is created because of the perceived motion.

Velocity of a wave may not change due to change in the nature of the medium or change in the medium, but the phrase 'velocity of wave' does not provide any meaningful information unless we specify either the length of the measuring rod or length of the interval between the two ticks of the clock. However, behavior of wave can be understood only if we assume that waves travel physically from the source to observer. Therefore, we can continue to use the terms that indicate real motion of waves.

It is also obvious from the above analysis that the projection of events is such that the space-time reduces to a flat surface for every observer. Therefore, we can use Euclidean geometry and Euclidean coordinate system. Of course, as we have mentioned, every observer must specify the length of the measuring rod while plotting the events on a graph paper.

Waves are not the carriers of information; waves are manifestation of the information. Waves, disturbance created on a recording media, nerve impulse formed on the surface of the brain are all manifestations of the information.

Let us now examine the mechanism of perception.

Our sense organs sense the information and forward it to the brain in the form of nerve impulses. Our sense organs function like a convex lens. Convex lens refracts the waves coming from different regions at different angles so that all waves reach a single point simultaneously.

Information from all sensory systems except olfaction system is routed through the thalamus to the concerned regions of the brain.

Absorption of the energy received through the sensory nerves by the cells in the regions related to a particular system can only make the cells behave like excited atoms. Therefore, it is not difficult to predict what happens when cells absorb energy.

Energy is transmitted to the sensory lobes in the form of nerve impulses. Period of the nerve impulse (wave) determines the period of the expansion of the cells. Shorter period causes faster expansion. Higher amplitude causes greater vertical expansion and longer wavelength causes greater horizontal expansion. In other words, this process inflates the cell like a balloon.

Brain cell returns to its ground state on the completion of absorption/emission of energy. It is also obvious that atoms in a cell functions as a composite whole because energy is not emitted absorbed by individual atoms in the cells.

One can see that the process of perception itself does not allow us to remove the uncertainty even if uncertainty is not a fundamental feature of the nature.

In the absence of mental awareness, the events simply create a disturbance as they do in any atom. On a recording media, the absorption/emission of energy changes the structure of the media; therefore, information is recorded. The event is projected in three-dimensions by the mind of only conscious entities, but only in the state of mental awareness.

We confuse consciousness with mental awareness. We are mentally aware when our mind is where our body is, but we are conscious even if our body and mind are not at one place. Even unconscious state is actually a state of mind, not of consciousness because we are still conscious of all the information brain receives; however, mind does not project the information in the unconscious state.

In the absence of mental awareness, events are not even felt by the observer; for example, we do not feel pain if we are not mentally aware. Physical processes involved in the process of perception do not cease to stop even if we are not in the state of mental awareness.

We will discuss the consciousness later.

All the information we receive from the sense organs is duly processed by the brain even if information is not projected in the space-time. We may focus on information coming from only one source, and close our mind to the information coming from other sources. Sometimes, we fail to see an object lying right in front of our eyes because our mind does not project the object if our mind is not at the place where our eyes are. However, if information is intense then, we are forced to notice it.

Perception is a mental process, not a mechanical process. Seeing is not the function of eyes or even brain. Absentmindedness may result in failure of brain manifesting the information. This observation applies to the information we receive from other sense organs as well.

In coma patients, connection between mind and brain is broken.

Blindness is not caused only by the malfunction of eyes; more often than not, blindness is caused by the malfunction of the mental eye. Such blindness is self-inflicted. We fail to notice the obvious because we wear the veil of the knowledge, pre-conceived notions, and at times, of misplaced trust or faith.

Sense organs work as a filter to prevent most of the information generated in the universe. Thalamus and olfaction systems reduce the energy of the nerve impulses generated by the information we are interested in and increases the energy of nerve impulses generated by the information we wish to perceive. This is as good as receiving more information about the entity we wish to observe.

In the absence of thalamus, it will be impossible for us to focus our mind on any one entity.

Brain is only a passive entity in the process of perception. Thalamus and olfaction system connect mind to the brain. However, we can control our mind; Therefore, mind too is not the agency that determines where it ought to be at any particular time because we can control our mind.

Therefore, there has to be some other agency that actually perceives the events, analyzes the information, and takes decisions.

We will unveil this entity later in this paper.

Light, sound, touch, taste, and smell are abstract projected forms created by the mind in its conscious state based on the information received by the brain. Three-dimensional projection is also a projection of the mind in its conscious state. Waves in a specific range of frequency manifest as light, and the same electromagnetic waves in a different range of frequency manifest as heat; therefore, it is not correct to define light as the electromagnetic radiation of any wavelength.

As already mentioned, our sense organs respond to very limited range of energy. In case, of light, the mind projects the energy of individual photons in different colors, but if energy level goes below a particular level then, mind projects it in black color. If energy crosses a threshold limit then, mind projects it in white color.

Black color indicates relative absence of light, not absolute absence of light. For example, in the double-slit experiment, light bands are formed in the regions that receive light from both the slits and dark bands are formed in the regions that receive light from neither of the two slits or from just one of the two slits. The space between the two slits that creates the pattern of alternate light and dark bands.

Therefore, alternate light and dark bands are formed even if one photon is emitted at a time.

One can see that nothing mysterious happens in the double-slit experiment.

We will now examine another important effect caused by the change in the behavior of the waves.

In Newtonian physics, gravity is a force whereas in the theory of relativity gravity is an effect caused by the warping of the space-time, but even gravity is only an effect caused by the change in the properties of the wave.

None of the theories on gravitational force identifies the factor that determines the distance and velocity of orbiting entities. Distance and velocity of celestial bodies is determined by the time dilation effect.

We have almost a perfect inverse square relationship between velocity and distance in the solar system; therefore, it is very easy to calculate the velocity at the center of gravity. If we use a standard meter rod and a standard clock then, the velocity at the center of gravity will be 364460.9914 km/second (1.2152139346 times the velocity of light). However, minor variations exist if we calculate velocity at the core of the Sun individually for each planet. In case of the velocity is 364311.97 km/second whereas for the Mercury, velocity is 364301.47 km/second. This actually means that the planets are moving slower in their orbits than they should at the distance they are located. There is almost a uniform deceleration of 0.822900373 (1/1.2152139346). Deceleration negates the effect of increase in the frequency.

Therefore, we can say that planets are deflected away from the Sun to a distance 1.477348958 (square of 1.2152139346) times their original distance from the Sun to negate the effect of higher frequency.

The reason for higher velocity (if use a standard measuring rod and clock) is that the core of the Sun is nowhere close to a state in which light will travel only vertically. Therefore, center of the mass of the Sun is a circle, not a point. As we have mentioned, if core reduces to a point then, it explodes into a quasar.

In a space-time that expands uniformly, the Earth will be located at a distance of 149720279.3 km from the Sun and the Mercury will be located at a distance of 57960201.77 from the Sun. Therefore, there will be perfect inverse-square relationship between velocity and distance of the Earth and Mercury.

Orbital velocity of the Mercury is 1.607220155 times the orbital velocity of the Earth. Orbital length of the Earth is 2.583156628 (slightly lower than the square of 1.607220155) times the orbital length of the Mercury. Therefore, orbital period of the Earth is 4.151940728 times the orbital period of the Mercury.

These calculations assume uniformity in the behavior of measuring rods and clocks, but this assumption is incorrect. The theory of relativity assumes that the time dilation effect is the same for all frequencies, but as already mentioned, time dilation effect increases in the lower frequency waves.

Measured orbital period of the Earth will be 2.583156628 times the orbital period of the Earth.

Precession is observed if center of mass of a body is not located at its geometric center.

If we study the motion of hands of a clock, we find that the velocity increases as we move towards the top of the hand, but wavelength increases as we move away from the center of the clock; therefore, all points of the clock of a hand travel at the same velocity.

If we calculate the velocity at the core of the Milky way galaxy using normal inverse square relationship then, the velocity will be 1.13608E+11 km/second (Estimated distance of the Sun from the core of Milky way galaxy is about 8 kpc). This is 378953.8678 times the velocity of light. However, because we know that the velocity at the core of the Sun is 364460.9914 km/second; therefore, we can calculate precise distance of the Sun from the core of the Milky way galaxy. If expanse of the milky way galaxy is 30 kpc then, the distance of the Sun from the core of the Milky way galaxy has to be about 7.69 kpc.

It is obvious that gravity is neither a force nor an effect of the warping of space-time. These effects will be observed in any medium if nature of medium varies sufficiently to cause changes in the properties of a wave. This is the universal principle of gravity.

We do not perceive an object; we perceive the information generated by the objects. Any factor that causes a change in the properties of the wave including the properties of the observer causes a change in the apparent form of an object. Change in the method of observation only causes a change in the properties of the observer; therefore, a change in the method of observation also causes a change in the properties of the apparent form.

These observations show that objects do not exist at any particular place even in the macro world. These observations also show that for all observers, all frames are inertial frames. We have noted that every observer must assume that events occur at the time he perceives them, but we cannot ignore the time delay in the communication of information; therefore, we cannot know how things really are at the time of observation. Even in the MIT movie, we cannot ignore the time delay in communication even if we have no option but to ignore it.

However, evidences show that even this assumption is incorrect.

If we analyze the Cosmic Microwave Background Radiation (CMBR) then, we realize that we cannot make sense of the information provided by the CMBR unless we assume that we perceive the events in real time. For example, if we assume that there is time delay in communication of information then, we will also have to conclude that the temperature of the universe has not changed in 14 billion years. In fact, it will not be possible to make any statement about the current state of the universe.

Cosmologists ascertain the age of the galaxies by calculating the distance traveled by the galaxies. Age of the galaxies can also be determined by radioactive dating.

If we assume that there is time delay in communication of information then, the results obtained by using these two methods cannot match, but there is no disagreement in the results obtained through these two methods.

If we assume that there is a time delay in communication of information then, it will not be possible for us to make any statement about the current state of affairs in the universe.

However, things are projected in real time to us.

Properties of the projected form of an object depends on the properties of the wave. Amount of energy lost by a wave depends on the measured distance traveled by the light, and is always proportional to the amount of energy lost by the source in the same period. Of course, we may switch off a light source once it emits a signal, but events are projected based on the assumption that source continues to emit energy.

Properties of the waves/nerve impulse formed on a recording media have the same properties that the source will have at the time observer perceives the events.

This is why the nature ensures that the gain/loss of energy by a wave during the course of its journey does not affect the net amount of energy delivered to the observer.

This is how space is directly related to the time. In the relative universe, it is possible to examine space and time individually because we can compare the results of two different acts of observation. However, if we compare the results of two different acts of observation without realizing how things really are then, we end up having the kind of theoretical chaos we have in modern physics.

Events are placed in space to turn every frame into inertial frame for every observer and events are so placed in the time that the present of every observer is present of all frames; however, it does not mean that all frames are inertial frames nor does it mean that the time passes at the same rate in all frames.

The nature keeps the place and time of events floating to ensure that for every observer things really are the way they appear to him from his frame of reference at the time of observation.

Events do not occur at any particular place or at any particular time. This is possible because physical world is merely a projection.

Another interesting feature of the galaxies is that merger of galaxies and even black holes of galaxies is a very smooth process. Any collision of massive objects such as galaxies moving at a very high velocity will destroy both the systems and several other systems in the vicinity.

Smooth merger of galaxies is possible because galaxies and all other physical entities are only projections in space and time.

We will now confirm observations made so far in this paper by examining one of the most spectacular natural events – total solar eclipse.

Geometry and mechanism of the total solar eclipse is simple – total solar eclipse occurs when the Moon comes in between the Sun and Earth.

Total solar eclipse has a cause (the Moon blocking the path of the Sunlight) and an effect (darkness engulfing the area affected by the total solar eclipse).

We are supposed to see the Sun at the place it actually was about 8 minutes and Moon at the position where it was about 1 second ago. Refraction also causes a change in the apparent position of the Sun and Moon. However, the sunlight reaching the Moon is not subjected to refraction because the Moon exists outside the atmosphere of the Sun.

In fact, the present mechanism accounts for the refraction, but ignores the effect of time delay in communication of information while determining the position of the Sun and Moon.

Another important fact related to the total solar eclipse is that the Moon is orbiting the Earth at a velocity of about 1.02 kilometer/second and the Earth is orbiting the Sun at a velocity of about 29.77 kilometers/second. During total solar eclipse, sunlight takes about 8 minutes 44 seconds to reach the Moon and about 8 minutes 45 seconds to reach the Earth. During this period, the Moon moves about 525 kilometers and Earth moves about 15600 kilometers in its orbit. Therefore, the Sun and Moon cannot appear to be in a straight line when they appear to be in a straight line.

If all the above facts are correct, and we know that all the above facts are correct then, the total solar eclipse cannot occur when the Sun and Moon appear to be in a straight line with the Earth. However, total solar eclipse does occur precisely at the time the Moon comes in between the Sun and Earth.

More importantly, we cannot assume that the Sun and Moon exist at any other place than the place at which they appear because if assume that the Sun does not exist at its original position then, we must assume that the Sunlight must originate from the original position of the Sun.

At the same time, we cannot assume that objects exist at the place they manifest because we know that objects do not exist at the place they manifest to an observer. For example, to determine the effect of refraction, we must know the actual position of the object; therefore, nothing exists even at the apparent position.

Light from any source propagates outwardly in conical shape, not in V-shape unless direction of its propagation is controlled; therefore, if any object blocks the path of the light then, the darkness is caused in an area bigger than the size of the object blocking the path. However, geometric representation of the mechanism of total solar eclipse is based on the assumption that light propagates in V-shape. The reality is that our vision expands in conical shape.

We cannot establish the relationship between the cause (The Sun disappearing behind the Moon) and effect (Appearance of the darkness on the parts of the Earth affected by the total solar eclipse) unless we assume that for every observer the apparent positions of the Sun and Moon are their actual positions.

If an object is in motion then, for every observer, place of its manifestation is always be the same as its actual position at the time of observation.

Apparent position is observer-dependent, but instead of relying on perceptions, if all observers use scientific methods to determine the position of the objects then, all observers reach the same conclusion. Therefore, actual position of the objects is observer-independent. Moreover, we cannot predict the place where an object will be projected by the brain unless we know the actual position of the object.

Measurements always return the same value provided we use the right measures. Manifestation is relative, but underlying reality is absolute.

Nothing physical exists anywhere in the universe. We live in a non-physical universe.

Things do not exist anywhere, but have the potential to manifest everywhere. An act of observation manifests an entity; it does not create any entity. For every observer, the manifested form of every entity is the actual form for a particular act of observation.

Space-time is like a mirror. Nothing exists in the mirror, but mirror can manifest everything at all its points. A mirror can manifest different physical entities at the same point, but not to the same observer. Space-time remains unaffected by the properties of the entity it manifests.

For every observer things are the way they appear from his frame of reference at the time of observation.

The universe is inherently non-local. Non-locality has many dimensions; for example, non-local influence, instant communication, teleportation, and even quantum tunneling. Quantum tunneling is about disappearance of a physical entity at one place and its simultaneous manifestation at another place either in the same form or in any other form. Quantum tunneling and teleportation are different manifestations of the same phenomenon.

We live in a holographic field in which all the information becomes available at all the points instantly irrespective of the place where it has been generated. Thus, an object may exist at a particular position, but this position is neither special nor unique because the same information is available across the universe instantly, and properties of the object projected to a particular observer are the actual properties of the object for that observer. In any case, space-time is an absolute structure; therefore, nothing really exists anywhere even in any non-physical form.

Once information becomes available at all the places then, its manifestation is observer-dependent. Therefore, all the points of the field have the potentiality to manifest all the information. We have already explained that the properties of the manifested form are observer-dependent. However, it still does not mean that anything exists at the original position of the objects. Original position of objects is only an illusion.

Space interval and time interval manifests only in the projection of events. Space-time exists absolutely, but manifests relatively.

Mechanism of the collapse of wavefunction is no longer an issue, but the bigger question is, *'if space-time exists absolutely then, how is wavefunction created in the first place?'*

Why does space-time manifest relatively?

We have noted that process of generation of information is such that we cannot remove the uncertainty about the state of a system between two acts of observations. Another form of uncertainty manifests in the behavior of radioactive elements.

At present, unpredictability about the time of decay of nuclei is a mystery, but the bigger mystery is that radioactive elements have predictable half-life despite the apparent unpredictability in the behavior of individual atoms.

Predictability in the behavior of whole despite the unpredictability in the behavior of parts clearly indicates that the radioactive elements follow some law hitherto unknown to us.

All systems operate at a unique frequency at any given time, but slight variations exists in the operating frequency of the constituents of a system. Therefore, some atoms of even a normal atom may decay earlier than other atoms.

Some atoms of even normal atoms are more energetic than others; therefore, these hyperactive atoms have to be kicked out of the Bose-Einstein Condensate before it can be cooled down to desired temperature.

We cannot expect that any entity in the universe will exist forever irrespective of the material it is made up of. A dozen prototypes of one-kilogram are losing mass constantly, but at different rates because individual atoms emit/absorb energy in a narrow range even in identical conditions.

Atoms of radioactive elements enjoy greater freedom than the atoms of normal elements.

In a heap of radioactive elements, behavior of individual atoms may vary because heaps of normal elements are not connected functionally. For example, in the Bose-Einstein Condensate, some atoms are hyperactive. These atoms radiate at relatively higher rate.

Radioactive elements function as a system. Quantum world also acts like a system; therefore, behavior of individual constituents cannot be examined in isolation.

A heap of a radioactive element always vibrates at the unique frequency of the element. If we observe a single atom then, it also operates at the unique frequency of the element. However, individual atoms

within a heap can operate in a bigger range than the atoms of normal elements. Therefore, they have observable half-life. Measured life-time of all the atoms of any element is always the same, but some atoms decay faster than others because they vibrate at relatively higher frequency.

Since the constituents of a radioactive element have greater freedom, but the system operates at a unique frequency; therefore, radioactive elements have predictable half-life despite the vagarious behavior of their constituents. Since systems lose only a fixed percentage of energy in a specific period; therefore, amount of energy lost by a system reduces with time. Therefore, radioactive elements have fixed half-life.

Universe would not have evolved into a diverse structure without the inert entities having some degree of functional freedom.

This analysis shows that the systems are not just group of their constituents. Constituents of a system are parts of a composite whole.

Aristotle suggests that the whole is greater than the sum of its parts, but Aristotle could not explain the scientific basis of this observation. Therefore, current interpretation is that if parts function as a team then, they produce more output than their individual effort will produce.

We will explain the scientific basis of this philosophical statement.

A system manifests more properties than the sum of the properties of its constituents.

Constituents of a system have a set of properties that do not change even if constituent moves from one system to another. These properties determine the physical form of the constituent. For example, oxygen atom manifests certain properties whether it is part of a tree or a human being (therefore, we can identify an oxygen atom).

However, constituent of a system have another set of properties that it acquires by virtue of being part of a particular system. For example, oxygen atom manifests the properties of a human being only until it is part of a human being. Oxygen atom has the potentiality to manifest the properties of a human being, but the potentiality actualizes only if it becomes part of a human being.

One cannot consume hydrogen and oxygen separately to quench one’s thirst because water is more than just a combination of hydrogen and oxygen. Like any other physical system, a human being is also just a bundle of atoms, but we can manifest properties like intelligence, consciousness, and several such special properties that no other system can manifest.

Examination of behavior of galaxies unveils several secrets; one of the most mysterious features of a galaxy is that a galaxy can generate their own spectra despite not being a source of the light. A Galaxy is a group of stars, but in itself, it is not a source of light. Light does not propagate in V-shape; therefore, we cannot assume that light from all the stars reaches us simultaneously.

A system loses only a fixed percentage of energy in a specific period. Therefore, every entity vibrates at its own unique frequency. Vibration is the language of the nature.

These observations show that galaxies and all other physical entities are only projections of a non-physical entity. Thus, galaxy cannot be described as a group of stars; a galaxy consists of stars. In a non-physical universe, physical connection is not an essential requirement for manifestation of any phenomenon.

Physical and non-physical properties (for example, consciousness, mind, intelligence, and other such special properties) of a human being are projection of the accumulated information of one entity that does not manifest itself physically.

Similarly, galaxies and all other physical entities are merely a projection of accumulated information of a non-physical entity.

As already explained, systems communicate as a composite whole. We can observe a system in parts, but system can communicate as a whole even if its constituents are not in direct or indirect physical contact with each other. When we observe the system in parts then, the whole disappears and when we observe the whole then, the parts disappear. Therefore, frequency of the parts does not interfere with the whole and frequency of the whole does not interfere with the parts.

Space-time is an infinite expanse of limitless potentialities.

Every system has potentiality to manifest a set of properties. However, it needs another system that can manifest at least one of its properties. Interaction between the potential properties of the observed and potential properties of the observer determines the manifested properties of the observed.

Potential properties of the observed and potential properties of the observer constitute a complete whole. Nature nullifies the effect of the nature of the medium; therefore, its affect on the properties of the wave can be ignored.

Only those properties of the observed manifest in material form that observer has the potentiality to manifest. Remaining properties of the observed appear in the form of imperceptible matter, but imperceptible properties do affect the behavior of the observed.

There is no collapse of wavefunction because potential properties of the observed do not disappear just because observer does not have the potentiality to manifest all the properties of the observed. Our properties do not disappear just because a mirror cannot project all our properties. Limitations of the observer do not affect the properties of the observed.

It is like taking a snap of an object from different angles simultaneously by using more than one camera. Different cameras observing the same system simultaneously will manifest different properties of the system under observation, but properties of the system remain unaffected.

A system must acquire the potentiality to manifest a property before it can manifest that property. For example, in the movie recorded by the MIT team, the fruit cannot manifest in illuminated state unless it acquires the potentiality to manifest the illuminated state. However, once the fruit illuminates then, it can manifest in both illuminated and non-illuminated states simultaneously even to a single observer, but only if observer uses two different methods of observation (for example, if we use an ordinary lens and a zoom lens simultaneously then, we can see the fruit in illuminated and non-illuminated state simultaneously). In the cat-paradox, the cat cannot manifest in the dead states unless it actually dies, but once it dies, it can manifest in both alive state and dead state simultaneously.

Since we can manifest only those properties of a system that we have the potentiality to manifest; therefore, we can know a system in its entirety only by being that system. Behavior of whole cannot be understood by examining properties of its parts, but behavior of even parts cannot be understood without understanding the whole. Therefore, only scientific way of understanding a system is to examine it as a whole.

This is possible because physical form is just a projection.

Every physical entity in this universe is losing mass constantly. Even universe is losing mass by way Cosmic Microwave Background Radiation (CMBR). By carefully measuring the rate of change in the wavelength of CMB photons, we can calculate the precise time when the expansion began and the precise time when this process will stop.

In the initial phase when there was more matter in the universe, expansion was inflationary, but if we use wavelength as the measure of the distance then, we can say that the universe is expanding at a constant rate. In relative terms, the rate of expansion is reducing.

We have not lost almost 96% of the matter in any matter-antimatter collision. Perceptible matter is converting irreversibly into imperceptible matter. Therefore, entropy of the universe is increasing constantly and irreversibly.

Since systems can lose only a fixed percentage of usable energy; therefore, there is an interval between beginning and end of a process.

Idea of time emerges from this interval between the beginning and end of a process. Since processes proceed at different rates in different frames; therefore, time is a relative phenomenon; however, time interval between the beginning of a process and end of that process is absolute.

However, it is important to mention here that though the total amount of energy that can be lost by a system is fixed, but systems can give off one form of energy in exchange of another form of energy. For example, water converts into ice by giving off thermal energy and absorbing light energy. This process is reversible.

Therefore, state of order/disorder can change temporarily; therefore, some process may appear to be reversible, but are not completely reversible because system loses a tiny amount of usable energy in every cycle of even reversible processes. Therefore, change in the entropy is irreversible.

State of order and state of disorder are not mutually exclusive states. The difference is only in the degree of order/disorder. Therefore, we need not use two different phrases to describe these states. Similarly, the hot and cold are not mutually exclusive states. A thing appears hot to an observer to whom it is transferring thermal energy but at the same time, it may appear cold to another entity from which it is receiving thermal energy.

Second law of thermodynamics suggests that the usable energy is converting irreversibly into unusable energy, but in view of the first law of thermodynamics, unusable energy must continue to exist in the universe in some imperceptible form.

On one hand, we have the existence of dark energy whose source is untraceable and on the other hand, we have evidence of generation of massive amount of unusable energy, but we have no idea where it disappears.

Dark energy/matter is ordinary energy and matter that exist in imperceptible form, and have potentiality to convert back into perceptible matter, but unusable energy is lost forever because it cannot be used in any manner whatsoever.

Passage of time for an entity is proportional to the frequency of the wave. It indicates the rate at which system is achieving symmetry in its structure. Greater the asymmetry in a system, higher is the frequency of the wave. Entropy is the measure of permanent symmetry achieved by a system. Systems achieve symmetry in their structure by constantly exchanging energy with other complementary systems. Therefore, absorption spectra and emission spectra are complementary to each other.

A photon is also like an atom, it has a very tiny amount of energy (not enough to manifest in the form of mass), and its own symmetrical space.

Entropy and state of order/disorder give us two concepts of relative time (clock time) – one concept of time is irreversible and other concept of time is reversible.

We need a third concept of time purely for practical reasons.

We will have a chaotic situation if we use clocks whose behavior changes with the change in the physical conditions. Therefore, we need a concept of time that has universality, continuity, irreversibility, measurability, and uniformity as its fundamental features.

However, for scientific reasons, we have to acknowledge the fact that processes move at different rates in different frames. Therefore, scientific concept of time can have all these features except uniformity.

Individual atom in a heap decays when it completes its life-cycle within a short span of time. Its measured age will be the same as the measured age of all other atoms of a radioactive element, but its relative age is shorter than the age of the rest of the atoms.

The phrase ‘without delay’ does not covey the same meaning as the phrase ‘with no time intervening’. Instantly means ‘without delay (at the same point of time on a uniform timescale)’ and instantaneously means ‘with no time intervening (at the same point of time on a relative timescale)’.

Nothing in this universe has any pre-determined or pre-existing value, but things do have predictable values even in the quantum world.

Galaxies and waves combine once again to produce almost an incredible feature of our universe.

Observations suggest that the farthest galaxies are located at a distance of about 14.7 billion light years from us; therefore, we can say is that we appear to be located at the geometric center of the universe.

Cosmologists suggest that we appear to be at the geometric center of the universe because universe is expanding uniformly in all directions. Analysis of the motion of galaxies shows that further a galaxy is from us, the faster it moves. Resins in the loaf of a raisin bread being baked expand and move away from each other. An observer located at any of the resins will find that all other resins are moving away from him at a rate proportional to his distance from the resin being observed. Farther a resin is from the observer, faster it moves.

Our position is supposed to be neither typical nor special.

This assumption does not address the core issue.

Physical examination of the universe leads to the conclusion that the expansion of the universe started from a singularity. Therefore, that point has to be the geometric center of the universe. Since farthest galaxies in all directions are located at equidistance from us; therefore, we can say that we are located at the geometric center of the universe.

Physical singularity does not exist at any particular point. It is also obvious that parts do not make up the whole; the whole divides itself into parts. Therefore, universe as a whole must have acquired the ability to manifest itself physically and then, it kept on dividing itself into sub-systems while retaining its physical and functional integrity as a whole. This feature of the physical universe is also just a manifestation of the same feature of consciousness. There is only one mind and one consciousness, but mind and consciousness can divide themselves into parts without losing their universal character.

However, it does not mean that our position is either special or typical because any observer located at any point of the universe will find that the farthest galaxies in all directions are located at a distance of about 14.7 billion light years from him. Actual measurements will show that for every observer, irrespective of his position in the universe, his frame is the geometric center of the universe!

How is that possible?

Holographic nature of the universe and mind's ability to project the universe puts every observer at the geometric center of the universe irrespective of his location in the infinite expanse called space-time.

We have noted that for every observer objects actually exist at the position he perceives them. Spatial expanse between the observed and observer is observer dependent phenomenon; therefore, even universe cannot have any fixed spatial expanse. However, measured expanse remains the same for all observers.

One can see that projection is from inside to the outside. Every point of the field has the potential to project the universe in any circle of an imaginary cone that expands outwardly from it.

The most important feature of the mechanism of perception is that *projection of events is based on the assumption that everything happens here and now, in the local frame of the observer.*

The nature does not acknowledge the existence of two. Only one entity exists in the physical world – the observer.

Space interval and time interval are just illusions created by the mind. Even in the macro world, constituents of a system can communicate with each other instantly without being part of the same physical system. Constituents of functional systems need not have physical connection with each other to exchange the information instantly.

Space interval and time interval manifest only if we use two different methods of observation or if we compare the results of two different acts of observation. The observed and observer enjoy a unique relationship. Observed and observer are always in entangled state. The particle that is being affected at one place because of a measurement made on some other particle existing at any other place need not be aware of the effect of the event that is affecting it.

Mind projects the universe in a conical shape; therefore, all our external sense organs also project the universe in conical shape.

Matter and energy are convertible into each other because matter and energy are physical manifestations of the consciousness. Physical form is nothing but manifestation of ripples on the surface of consciousness.

According to some philosophers, that which is not inert is conscious, but conscious entities have evolved from inert entities; therefore, consciousness must exist as an unexplored potentiality even in the inert entities.

Physics examines inertia at great length. In physics, inertia is defined as the tendency of a body to maintain its state of rest or uniform motion unless acted upon by an external force.

However, the most simplistic and broader definition of the inertia is, *'Inertia indicates a lack of functional freedom'*.

Consciousness provides functional freedom to physical entities; however, consciousness is not just about functional freedom.

Energy can be converted into matter, it can be used to perform work, and it can be used to communicate information. These are just a few applications of energy. We can say that in the physical world, whatever is, is energy, but energy itself is just a manifestation of consciousness.

Quantum world cannot said to be conscious because quantum world is a system in itself. Fundamental laws of the nature are obeyed only in systems, not in objects. Therefore, we have the illusion that the fundamental laws can be violated in the quantum world. Law of causality is one of the fundamental laws of the nature.

This is complete description of the nature of physical reality.

This paper raises a new set of questions that must be answered if wish to understand the nature of reality. In our next paper, we will explain the nature of reality.

Swami Vivekanand Ji says, *"Truth stands on its own evidences; it does not require any other testimony to attest it; it is self-effulgent. It penetrates into inmost recesses of our nature, and the whole universe stands up and says, 'This is truth'*."

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1. Penrose Richard, Road to Reality, Vintage Books, 2007, Softcover, ISBN 0679-77631-10
2. MIT Media Lab http://www.media.mit.edu/~raskar; http://cameraculture.media.mit.edu
3. Patanjali Yog Sutra

PS: We have tried to keep the discussion as simple as possible, and have not quoted purely imaginative interpretations and theories. However, great scientists like Max Planck, Neils Bohr, Warner Heisenberg, David Bohm, J.S. Bell and some other great scientists at least had a glimpse of the truth.

If reader wishes to have a better understanding of the background work related to the concepts discussed in this paper then, reader may read more about most of the issues discussed in this paper on Wikipedia and other websites. Reader can read Warner Heisenberg's book 'Physics and Philosophy' and J S Bell's,

‘Speakable and Unspeakable in Quantum Mechanics’, and ‘Wholeness and Implicate Order’ by David Bohm.