

NATURE OF TIME

(According to 'MATTER (Re-examined)')

By

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Abstract: Time is a functional entity, derived from the fundamental property of basic 3D matter-particles (photons) to move at a constant linear speed. 3D matter has no ability to act or move. It is the all-encompassing the universal medium around the 3D matter-particle, which moves them at the highest possible speed. A unit of time is related to the interval required by a photon to traverse a definite extent of the universal medium in space. Relating other activities about 3D material bodies, to time helps us to rationalise in terms of cause-and-effect relations. Due to its lack of physical form, time can neither expand nor contract nor flow in any direction.

Keywords: Time, disturbance, photon, 3D matter, quantum of matter, 2D energy-field.

Introduction:

The book 'MATTER (Re-examined)' presents an alternative concept based on only one type of postulated matter-particles, the quanta of matter. Quanta of matter are 1D matter-particles, and they form 2D lattice structures, called 2D energy-field, in all possible planes in space and create the universal medium. Quanta of matter fill the entire space. 2D energy-fields, inherently tend to maintain their homogeneity and serenity. A local breakdown of 2D energy-fields produces a gap in their latticework structures. The 2D energy-fields surrounding the gap move to fill the gap and restore their serenity. If an entity is present in the gap, actions by the 2D energy-fields apply an inward pressure on it. This inward pressure by the 2D energy-fields is gravitation. Local breakdown of the 2D energy-fields may release many quanta of matter from their latticework structures, free in space. Gravitational actions, by the surrounding 2D energy-fields, gather these free quanta of matter to produce 'disturbances' in the universal medium. Depending on the size of a disturbance, gravitational action may compress quanta of matter in the disturbance into their 3D status to create 3D matter. Due to their tendency to attain serenity, the 2D energy-fields expel the 3D matter-particle created in them. Since 2D energy-fields are everywhere, this expulsion continues as long as the 3D matter-particle is in existence. Linear speed of the 3D matter-particle, due to the expulsion from the 2D energy-field, is the highest possible speed that can be achieved without further damaging the 2D energy-fields. 2D energy-fields around the ejected 3D matter-particle maintain sufficient structural distortions in them to sustain the particle's linear speed by inertial actions. Ejected 3D matter-particle and the structural distortions in the surrounding 2D energy-fields, together, constitute a photon (corpuscle of light). Direct actions by the 2D energy-fields on the 3D matter-core of the photons (in this concept) get rid of the illogical assumption of action at a distance.

Depending on the nature of the 2D energy-fields in any region of space, the highest possible linear speed of a photon is constant, and makes the linear speed of light a critical constant. 3D matter-cores of all photons are disc-shaped (spherical-segmented) and of the same radial sizes. Each photon spins about one of its diameters at an angular speed proportional to its 3D matter-content. An attempt to reduce the photon's linear speed reduces its 3D matter-content (frequency) instead of reducing its linear speed. An attempt to increase a photon's linear speed increases its 3D matter-content (frequency), rather than increasing its linear speed. This keeps the linear speed of a photon constant with respect to the surrounding 2D energy-fields.

Compatible photons join as binary unions to form elementary particles. The elementary particles, in turn, form fundamental particles, atoms, and other macro bodies found in nature. All conclusions expressed in this article are taken from the book 'MATTER (Re-examined)' [1]. For details, kindly refer to the same.

Fundamental measurements:

Matter and its (apparent) interactions dominate our world. Matter provides a sense of reality to nature and our existence. In order to understand material bodies and their (apparent) interactions, rational beings

need to relate one material body to others and relate a material body in one state to the same body in a different state. This can only be done by comparison between different bodies or the same body in different states. For this reason, the dimensional measurements are formulated. To define a dimensional measurement, we need to have a reference. The nearer to an absolute measurement a reference is, better is the accuracy of the defined dimensional measurement system.

A 3D matter-particle (or a material body) has only two types of basic dimensional measurements. One type of measurement is of its matter (substance) content. Since we have no reference for this (to compare with), we are unable to formulate a dimensional measurement system for the direct measurement of the matter content of a body. Instead, we are compelled to represent the 3D matter content of a body, using indirect means, related to known or derived references from other dimensional measurement systems. Thus, we do not have fundamental measurements to directly describe the 3D matter content of a body.

The second type of dimensional measurement of 3D material bodies is the relation between different 3D material bodies or between different parts of the same 3D material body in space, represented by the distance or the separation between them. To formulate a dimensional measurement system for this relation, we presume to have a reference. It is generally understood that the displacement (speed) of light in space keeps (almost) a constant speed. To use this as a reference to define distance, a functional entity – time – is introduced to represent equal intervals of changes in physical properties of certain 3D material bodies. We can measure the distance traveled by light in a unit interval of certain physical changes (unit time). This distance, which is believed to be constant, is used to define or relate our measurements of distance in space. Any other reference that can provide similar or better convenience may also be used to define the distance. Distance is the relation between the locations of 3D material bodies (or one part of a 3D material body and another) in space.

Motion:

One of the most fundamental properties of a photon is its motion at constant linear velocity (since the spin speed or the frequency of a photon is directly related to its 3D matter content, the photon's spin motion is not considered in this article). In fact, a photon's 3D material body exists in its stable state only because of its motion at a constant linear velocity. By its inherent property, a stable photon maintains its velocity at a critical constant value. The velocity of a photon is with respect to the 2D energy-fields (the universal medium) around it. The inertial property of 2D energy-fields in the region where the photon is present at the instant moves the photon at its critical constant velocity. It is a necessity of the 2D energy-fields to maintain the velocity of a photon at the critical level. Hence, the 2D energy-fields apply continuous effort to sustain the linear velocity of the photon at a constant level. Although here the motions are directly assigned to the photon, a photon (being a 3D matter-particle) is incapable of any actions or movements on its own. It is the inertial actions of the 2D energy-fields about a photon that move the photon.

Interactions between a photon's 3D matter-core, in its unstable condition, and the 2D energy-fields around it produce the photon's linear motion. Once a photon has attained stability, this interaction is not present at the same scale anymore. Photon's 3D matter-core is carried forward only by the inertial actions of the 2D energy-fields, which are limited to the immediate surroundings of the photon's 3D matter-core. Interactions between the 3D matter-core of a photon, in its unstable condition, and the 2D energy-fields are the result of the inherent tendency of the 2D energy-fields to remain homogeneous and isotropic. The 2D energy-fields cause the ejection of the disturbance out of themselves. They mould the disturbance into a 3D material body of appropriate shape and move it at constant linear velocity to transform it into a photon. By doing so, the 2D energy-fields on a larger scale regain their serenity.

No 3D material body (photon) has continuous existence in any one 2D energy-field. It will be continuously ejected out of the 2D energy-fields of its existence at any instant. Since the 2D energy-fields are everywhere, 3D matter-cores of the photons can never escape this ejection force. In nature (in our 3D world), all real matter is in the form of photons. There are no basic 3D matter-particles larger or smaller than photons. Photons vary in their 3D matter-contents, as indicated by their frequency. The radial sizes of all photons are similar. Photons, in various combinations, make up all other 3D matter-particles and superior material bodies in nature.

Motion of a material body is necessarily accompanied by its displacement in space. In the 3D spatial system, the magnitude of displacement is measured with respect to three mutually perpendicular coordinate planes through a point. To comprehend the displacement of a material body, it is necessary to compare its location at any instant with an outside reference. Since the same 3D material body cannot exist simultaneously in two places, there should be an interval between the existence of the 3D material body in one place and its

presence in another place, after its displacement. The material body can be in the second location only after being at the first location. When other changes in a 3D material body are considered, the interval is between two states of the body. A material body cannot be in two identical states simultaneously. One state has to precede, and another state has to follow. Likewise, all actions have their causes preceding them. The interval between two states of a material body produces the rationality in its continuous existence. The cause-and-effect relation of all physical phenomena necessitates sequential operations. Hence, there is an interval (however small it may be) between two states or two phenomena of 3D material bodies. This interval is required for the cause to produce the effect or for the first phenomenon to produce the second phenomenon, which depends on the result of the first phenomenon. Unless the first phenomenon produces a certain result, the second phenomenon cannot take place.

These phenomena are real. There is nothing else between them. The interval between the phenomena is only a functional entity. It has no real existence. The gap between the phenomena is understood by rational beings as an interval. If the first phenomenon culminates in a particular result, the second phenomenon has to follow the first. The interval between them does not affect the nature of the first or the second phenomenon. On the contrary, it is the interval that depends on the development of the second phenomenon after the completion of the first phenomenon. That is, unless the second phenomenon has developed (however late or far it may be), the interval is not recognized. The interval comes into existence only when the second phenomenon has developed after the first phenomenon. Hence, the interval has absolutely no control over either of the phenomena or their results.

The interval between two phenomena depends on (or is controlled by) the relation between these two phenomena. That is, if the interval is larger for the first phenomenon to produce a particular result to commence the second phenomenon, the first phenomenon can be considered to operate for a longer interval (or if the second phenomenon takes place, a long time after the first phenomenon, the interval between them may be considered longer). Physical phenomena develop and control the interval between them. Physical phenomena are the apparent interactions between 3D material bodies in all their related forms. Real interactions take place between each of the 3D material bodies and the 2D energy-fields, separately. The interval between two phenomena has no control over either of the phenomena.

Time:

To represent the interval between two phenomena, a functional entity called 'time' is used. Time has no real existence. Time is a functional entity and hence has neither tangible existence nor direction. It is purely a scalar measurement. It is created by rational beings to understand the cause-and-effect relations between different states of a material body. To have a reference for a (macro) body's motions, they are related to the linear motions of a stable photon (in free space). What is being considered is the (rate of) number of 2D energy-fields traversed by a stable photon at its critical state of linear motion during equal intervals. Therefore, the time is the interval elapsed for the displacement of a stable photon in the 2D energy-fields from one reference point to another reference point, with a definite number of 2D energy-field latticework squares in between them.

Because of its functional property, time cannot be considered as a fundamental dimension in any spatial dimensional system. It comes into existence only when there is motion and because of the motion. It qualifies an action or a change of state. It does not describe (distance in) space or matter content. As soon as the first 3D matter-particle was created, due to its inherent nature of motion, a functional property of time also came into existence for rational beings like us. Time has no tangible existence. Scale and measurement of time are always related to motion or change of state of 3D material bodies. Hence, time should be considered as a character of matter rather than a dimension of space. In some mathematical (analytical) solutions, time is also used with other fundamental spatial dimensions to describe (history of) events in space. This has led to an erroneous belief that time is a fundamental dimension. Thus, time came to be regarded by many as the fourth dimension (of space).

Whichever method we use to estimate time and its units of measurement, we are basically comparing the motion of a photon in the 2D energy-fields and the motion of another (macro) body in 3D space. Second, the unit of time is presently defined as *"duration of (certain) number of periods of the radiation corresponding to the transition between the two hyperfine energy levels in the ground state of caesium-133 atom"*. This refers to the frequency of photons radiated under the defined conditions. In order to produce photons of this particular frequency, constituent photons of the atom have to discard quanta of matter at a certain rate, into

the 2D energy-fields. This, in turn, depends on the speed variations of constituent photons of the atom. In other words, the frequency of the photons radiated by a cesium-133 atom under the defined conditions depends directly on the movement and the variations in the speed of constituent photons of the atom. A steady frequency of radiated photons indicates steady speed variations of the atom's constituent photons.

Stable photons, in space, move in linear directions. However, when they (in their unstable state) are forming elementary particles and higher forms of 3D material bodies, they move at a constant critical linear speed in circular paths within the particles formed by them. Normally, larger 3D matter-particles or macro bodies (made up of unstable photons) may move as required by external efforts, without affecting the independent motions of their constituent photons. It is this motion of a macro body, as a whole body, which is compared with the linear motion of a stable photon in free space.

Human beings (and to an extent, many other living beings) have the ability to think and deduce rationally. To develop this rationality, they are trained throughout their life to think in terms of cause and effect. Every effect has to have a preceding cause, or an action follows a cause. This sequential rationalization creates a sense of past, present, and future in all our thinking. This has created an apparent direction and an arrow of time for us. Our training is so thorough that we refuse to consider anything else that does not exhibit this sequential relation (e.g., instincts) as reasonable or rational. In our rational thinking, time appears to be very real, that we have no hesitation in calling time a real entity and a fundamental dimension.

Variation in the scale of time:

Time is a convenience created for us and by us to rationally understand interactions between 3D material bodies or states of 3D material bodies. In our sense, the functional dimension of time came into being when the first photon was created (if there was such an action) in nature. Time will continue to be in existence as long as there are 3D matter (photons) and rational-thinking beings like us exist in nature. Time will cease to exist when there is a lack of either of these two. Since the time depends on the existence of photons and the existence of rational beings, either of them can control the scale of measurement of the time. Variation in the velocity of a photon in relation to the reference points in the 3D world or the thinking of rational beings can control or regulate the flow of time. Therefore, it is up to us, the rational beings, to assign meanings to the 'time'. Time will fulfill the functions assigned to it. Time, being only a functional entity, has no physical form. An entity without physical form cannot contract, expand, flow, or deform in any other way.

We may say that a photon – radiation of 3D matter – always maintains its linear velocity (this can be in linear or curved paths) at a constant critical value with respect to the 2D energy-fields. Actually, it is the 2D energy-fields that are forcing a photon to move at the maximum possible velocity with respect to itself. Just because this velocity is the maximum that the 2D energy-fields can produce, it happens to be a critical constant under steady conditions. If conditions of the 2D energy-fields in a region vary, the criticality of the maximum velocity also will vary. For a different state of the 2D energy-fields, in another region of space, the magnitude of the constant velocity of a photon (the light) with respect to other 3D material bodies will be different.

Relative time:

Units of distance measurements in any spatial dimensional system are based on the motion or linear speed of photons. Therefore, a change in the linear speed of a photon changes the units of distance also, in that spatial dimensional system. In the same region of space, corresponding changes in the photon's linear speed and the scale of distance keep the unit of time constant. Based on this constancy of linear velocity of light (stable photon) in the region of space where we live, we can set our standard of time. Interval required for the photon to move through a definite quantity (space occupied by the functional thickness of 2D energy-fields) of quanta of matter in the 2D energy-fields is set as a standard unit of time. While doing so, we did not consider any of our aspects as the observers or the state of our surroundings. Instead, it is assumed that the observer and his surroundings are static with respect to the 2D energy-fields. 2D energy-fields are fluid in nature. Depending on the macrobodies present in the region, their structural density may vary from place to place, and the motion of a photon is related to these variable densities of 2D energy-fields. Therefore, to assess the absolute velocity of a photon – radiation of matter – the state of the observer and his surroundings with respect to the 2D energy-fields should also be taken into consideration. An estimate of the velocity of radiation (light), without considering these factors, is only of apparent or relative value. Observers, under different states of motion, each have their own estimate of relative time. To estimate the absolute time: motion of the photon, motion of

the observer, movements of the (structural distortions in the) surrounding 2D energy-fields, and the state of surrounding 2D energy-fields are to be taken into consideration.

To estimate the relative time, the linear motion of a stable photon is considered with respect to the observer. Depending on the motion of the observer and the state of the 2D energy-fields, the linear velocity of radiation appears to be faster or slower than the estimated relative velocity, but never faster than the absolute linear velocity of radiation. Since the velocity is a relation between displacement and time, we can take either the unit of displacement or the unit of time constant and let the other vary. In some cases (like transmission of light through a denser medium of a transparent macro body), we take the unit of time as constant and let the unit of displacement vary. Thus, we find that light travels slower in a denser medium of a transparent macro body. However, in some other cases (like when comparing very large velocities or passages of light near a very massive macro body), we take the unit of displacement as constant and let the unit of time as a variable. Thus, we see that time moves faster or slower for the observers in motion or near massive bodies. It appears that the general rule, followed at present, is that: if the observer is outside the transparent medium, the velocity of radiation is variable within the medium, and the unit of time is considered a constant. If the observer is inside the transparent medium, the velocity of radiation is a constant within the medium, and the unit of time is considered variable. This is not scientific thinking.

In everyday life, we consider the unit (or rate of flow) of time a constant so that the light appears to be traveling slower in a denser transparent medium and faster in a rarer transparent medium. Whatever the case, the velocity of light with respect to the 2D energy-fields never varies. If the 2D energy-fields in a region can be made very dense, the velocity of light in it will appear very slow to an outside observer, may be even few kilometres per second, thereby creating an illusion that time almost stands still. For another observer, witnessing the same action from another region of 2D energy-fields of a different structural density, time flows at a different rate.

Arrow of time:

Time is always estimated in relation to the displacement of some or the other material body or particle. Therefore, time itself is no real quantity but it is only a functional quantity to indicate a relation. It describes a function or a relation between certain actions with respect to an action of a reference body or particle. Hence, it is not correct to assign a direction to the time. However, due to sequential actions of cause and effect, we (rational beings) feel that time flows in one direction, from the past through the present to the future. This gives us the false impression of the direction of time and the corresponding arrow of time in the direction of the future. The arrow of time may be compared with the arrows of other emotions. When one person loves another, the arrow of love is directed from the first person to the second person.

Conclusion:

Time is a functional entity, conceived by us to help us to relate different phenomena. Since time does not describe space and it is not tangible, time should not be included with fundamental dimensions as one of them. When we are supposed to measure time, we are actually measuring a regular motion or some other similar physical activity of some material bodies and assigning certain meaning to such motions in terms of 'time'. Since time has no physical form, it cannot contract, expand, or flow in any direction. Time is included with the fundamental dimensions to define the character or history of certain events, in some theoretical approaches, only for the ease of analytical solutions of mathematical equations. This does not mean that time has become or is regarded as a fundamental dimension, as many happen to think.

Reference:

- [1] Nainan K. Varghese, *MATTER* (Re-examined). <https://www.matterdoc.in/>

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