

NATURE OF LIGHT

According to 'MATTER (Re-examined)'

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Abstract: Light is sensed by living beings. Only real entities can produce sensory perception. Matter alone provides the substance needed for objective reality in space. Hence, light or its components are essentially made of matter. A universal medium (formed by matter), under suitable conditions, creates components of light from itself. For existence, it is essential for the components of light to move at the highest possible linear speed, at which the universal medium can move them and spin at a frequency proportional to their matter contents. The flow of these components constitutes the radiation of light or similar radiation. This essay very briefly describes the mechanism of creation and development of the components of light as envisaged in an alternative concept, presented in the book 'MATTER (Re-examined)'. For details, kindly refer to [1].

Keywords: Universal medium, light, photon, corpuscles of light, speed of light.

Introduction:

Light is a real entity with physical attributes. It exists and moves in space. Only real objects can exist and move in space. To have objective reality and a positive existence in space, light has to be a physical entity. Substance provides objective reality to all physical entities. Hence, light should have substance as its content.

In our material world, the existence of matter is closest to absolute truth. Hence, it is logical to assume that matter alone provides substance to all real entities, including light. Therefore, light or its components have to be made of matter. As light can be simultaneously observed in more than one plane, it has to be constituted by three-dimensional matter. Light, being constituted by 3D matter, has to have all associated physical attributes (mass, inertia, quantity, size, etc.) of 3D matter, like any other 3D material body.

Light, being a physical object made of 3D matter, has to have a certain structure and a definite process and mechanism of creation and sustenance. Nothing can be made out of nothing. 3D matter, for the creation of light, has to be provided from pre-existing matter in space. There has to be an agency that provides matter for the creation of components of light. The same agency, through natural processes, should create and regulate various parameters of the created light. This agency should exist outside of the components of light, and as light can be created and exist anywhere in space, the agency should fill

the entire space. An entity that fills the entire space outside of the components of light is a universal medium. The universal medium, which fills the entire space, cannot provide matter from an external source but from itself. Hence, the universal medium should be made of matter. Under suitable conditions, the universal medium should provide a sufficient quantity of matter for the creation of components of light from itself and provide a logical mechanism for their creation and sustenance.

Since the universal medium fills the entire space outside the corpuscles of light (or similar radiations), there can be only two types of real entities in nature: the universal medium and the corpuscles of light, made from and by the universal medium. All other material bodies larger than the corpuscles of light have to be constituted by the corpuscles of light. Mechanisms for their development have to be provided by the universal medium. Corpuscles of light are the smallest and only stable (basic) 3D matter-particles in nature. Under suitable conditions, the corpuscles of light (with appropriate parameters) should be able to constitute larger composite 3D matter bodies, under natural processes, to form all other fundamental matter-particles and macrobodies. The same mechanism should account for the diverse properties of macrobodies and various physical phenomena related to them.

Light is observed to have linear motion in space at a constant speed. 3D matter is inert. It has no ability to move or act on its own. Therefore, the light, being a composite 3D matter body, has to have an external moving agency. Since light is independent of all other known agencies and moves anywhere in space, the moving agency of light has to exist in and fill the entire space. Only the universal medium is such an agency. To act on light and produce its motion, the universal medium has to be a real entity. To be real, the universal medium has to be made of matter.

Since an observer or source body of light may move at any speed in any direction, the constancy of light's linear speed cannot be related to them. The other entity that is present everywhere in space (and acts on light to move it) is the universal medium. Therefore, the universal medium should be the agency that moves light, and the motion of the light should always be in relation to and through the universal medium. The universal medium should not only move light, but it should also stabilise any variation and maintain its linear speed at constant magnitude, irrespective of any influence that may tend to vary the linear speed of light. The universal medium should provide mechanisms for all other properties of light as well.

Light is observed to have many similarities with electromagnetic waves. In fact, according to most theories, light is currently considered a pure electromagnetic wave. Light is also understood to exhibit certain properties of corpuscles under certain conditions. In order to satisfy these diverse properties, particles of light should exhibit both of these properties simultaneously. These two characters, together, provide light (or similar radiation) with their dual nature.

Alternative concept:

An alternative concept, presented in the book 'MATTER (Re-examined)' is based on the single assumption that 'Substance is fundamental, and matter alone provides substance to all real entities'. Matter, in its unstructured state, exists in the form of minute particles, called quanta of matter. Unstructured matter in a quantum of matter tends to reduce its spatial dimensions to a minimum. Free quanta of matter tend to form quanta-chains in straight lines. Quanta-chains in perpendicular directions in a plane form two-dimensional latticework structures, called 2D energy-fields. Each 2D energy-field extends infinitely in its plane, in all directions.

2D energy-fields in all possible planes in space, together, form a universal medium. 2D energy-fields are able to co-exist at their intersections and thus fill the entire space outside of 3D matter-particles. Due to its latticework structures, the universal medium has all the properties of an ideal fluid. Structural distortions in the universal medium constitute 'work', and the stress due to work (structural distortions) is energy. Frequent local breakdowns of universal medium ensure the availability of free quanta of matter and ample opportunities for them to migrate into the latticework structures of universal medium. This keeps quanta-chains of the universal medium under compression, even without a definite container.

Local breakdown, in any part of the universal medium, releases quanta of matter from its latticework structures and forms a gap. Free quanta of matter within this gap form a 'disturbance' in the 2D energy-fields. The universal medium from all around (being under compression) moves towards the centre of the gap to re-establish continuity. Due to the inward radial movement, the universal medium presses on any disturbance (or a 3D matter-particle) present in the gap and compresses it. The presence of a disturbance in the latticework structure of a 2D energy-field breaks its continuity. As far as the 2D energy-field is concerned, the space occupied by a disturbance remains a gap in it. 2D energy-fields from all around the disturbance continue to thrust themselves into this space and keep the disturbance under compression. The application of pressure by the universal medium onto a disturbance is called gravitation. Latticework structures of the universal medium impose certain restrictions on gravitational actions. Gravitation is unable to act on flat surfaces or the straight perimeters of disturbances. The magnitude of gravitational action on a disturbance is proportional to the extent of the 2D energy field in the direction, away from the disturbance and the magnitude of the convex curvature of its perimeter.

Gravitational action tends to reduce the disturbance(s) in the universal medium to a minimum. This is achieved either by combining the disturbances present or by ejecting them from the 2D energy-fields of their existence. The side of a disturbance with a larger convex curvature experiences greater gravitational effort compared to the side of the same disturbance with a lesser convex curvature. The result of these efforts tends to move the disturbance in the direction of greater gravitational effort.

Creation of 3D matter:

A stable disturbance in a plane has a critical radial size, determined by the gravitational capabilities of the 2D energy-field of its existence. If the number of quanta of matter in the disturbance is greater than what is required to create the critical radial size of a stable disturbance in any plane, gravitational compression compels its quanta of matter to grow into the third spatial dimension. This is the 'creation of 3D matter' (a real 3D matter-particle). A 3D matter-particle exists simultaneously in more than one 2D energy field, and it is a disturbance in the universal medium. Gravitational compression, in each plane, acts against the natural tendency of quanta of matter within the disturbance to expand.

The magnitude of gravitational action depends on the shape of a disturbance's perimeter. Variation in a 3D disturbance's shape, from a perfect circle in a plane, produces unevenness in gravitational compression on it. The major part of gravitational action on a 3D disturbance is limited to the circular periphery of its 3D matter-core. Its disc-faces receive only slight gravitational actions, appropriate to their very small curvatures and sufficient enough to sustain its inherent movements. The 3D matter-core, being a disturbance in the universal medium, is ejected out of each of the 2D energy-fields of its existence. Gravitational actions from the universal medium maintain the 3D matter-core's constant (highest possible) linear speed and spin speed proportional to its 3D matter content.

The 3D matter-core, created by gravitation, is stabilised and moved as required by mechanical interactions between it and the structurally distorted region in the surrounding universal medium. In its stable state, the 3D matter-core (created by gravitation) is disc-shaped, spins about one of its diameters, and moves at constant linear speed with respect to the steady universal medium. They have uniform radial sizes and thicknesses proportional to their 3D matter contents.

Photon:

The 3D matter-core of a 3D disturbance and associated structural distortions in the surrounding universal medium, together, form a basic 3D matter particle called a 'photon'. A photon is a corpuscle of light or similar radiation whose spin speed (frequency) is proportional to its 3D matter content. All aspects of a photon are regulated, stabilised, and sustained by gravitational efforts from the universal medium.

The most fundamental properties of a photon are its linear motion at constant linear velocity and spin motion at angular speed proportional to its 3D matter content. In fact, a photon exists in a stable

state only because of its linear and rotary motions with respect to the surrounding universal medium. It is a necessity of the universal medium to maintain the photon's movements at critical constant values. Moving photons are practically isolated from the universal medium so that the universal medium can maintain its serenity and stability. Variations in a photon's movements are stabilised by continuous gravitational actions from the universal medium. [Here, the movements are assigned directly to the photon for a clearer understanding. A photon, being a corpuscle of 3D matter, is incapable of any actions or movements on its own. In reality, it is the inertial actions by the universal medium about a photon that move a photon's 3D matter-core].

The 3D matter-core of a photon has a segmented spherical (disc) shape that spins about one of its diameters. Quanta of matter, constituting the 3D matter content of a photon, are held together to form an integrated 3D matter particle by all-around gravitational compression. Gravitation is effective only on convex, curved surfaces of a 3D disturbance. Gravitational actions around the circular periphery of a photon's 3D matter-core maintain the matter-core's radial size at constant magnitude. The difference between instantaneous convex curvatures at the front and rear surfaces of the 3D matter-core determines the resultant gravitational action that moves the photon in a linear path and spins its 3D matter-core.

Structural distortions in the universal medium all around the 3D matter-core of a photon are its 'inertial pocket' (distortion field). The inertial pocket of a photon contains enough structural distortions (work) in the universal medium to sustain integrity, instantaneous shape, and movements at constant speeds. The inertial pocket of a photon continuously moulds its (spinning) 3D matter-core, so the magnitude of the convex curvature of the forward-facing surface is always less than that of the rearward-facing surface. Gravitational actions on the spinning 3D matter-core of a photon regulate its instantaneous shape so that the latticework structures of 2D energy fields are not damaged and, at the same time, external and internal pressures on the 3D matter-core remain in balance. Under this condition, a photon moves at a critical constant (maximum) linear speed through the universal medium (space). The linear speed of a photon is a critical constant because that is the highest linear speed at which the universal medium can move a 3D matter particle without causing its own breakdown.

Electromagnetic waves are the transfer of periodically varying structural distortions through the universal medium. The spin motion of a photon's 3D matter-core creates cyclically varying structural distortions about it. Structural distortions in the inertial-pocket of a photon in any transverse (perpendicular to its spin axis and the direction of its linear motion) plane have many similarities with EM waves. Hence, they may be considered an electromagnetic wave-part of a photon. A single pulse of the corresponding electromagnetic wave and the spinning disc-shaped 3D matter-core, together, form a photon. The rotating distortion-field about a photon's 3D matter-core in the transverse plane appears as a wave motion in space, which is the same as an electromagnetic wave. The 3D matter-core provides the matter component, and the associated structural distortions in the universal medium provide the electromagnetic wave component of the photon. This accounts for its dual nature: simultaneously being a 3D matter body and an electromagnetic wave. Unfortunately, in current theories, these characters are looked upon and used separately for different purposes.

Stress produced in the universal medium due to structural distortions in the inertial-pocket is the energy part of the photon. Hence, this part of the photon may be understood as a segment of electromagnetic wave of frequency corresponding to the photon's spin speed.

The 3D matter-core of a photon is a spinning disc of 3D matter. Because of the disc-shapes of their 3D matter-cores, gravitational attraction between two photons (or between photons in different 3D matter bodies) occurs only when their disc planes coincide. If the disc-plane of a photon's 3D matter-core is intercepted by the 3D matter-core of another photon, whose disc-plane is different, the first photon experiences partial gravitational attraction towards the second photon, and the second photon does not experience gravitational attraction towards the first photon. This phenomenon is the reason for very weak gravitational attraction between macro bodies, despite the enormous strength of gravitation.

The axis of a photon's spin is one of its diameters, passing through the centre of its 3D matter-core. The direction of the spin axis with respect to an external reference is the 'polarity of the photon'. The end points of the spin axis are the photon's 'poles'. The spin motion of a photon about its spin axis may be in either direction, clockwise or anti-clockwise, with respect to a reference. For convenience, we may classify photons according to their direction of spin with respect to an external reference into 'clockwise spinning photons' and 'anti-clockwise spinning photons'. Depending on the chosen reference, the class of a photon may change. The polarity of a photon is set during the formation or re-formation of its 3D matter-core. External efforts may change it during a photon's unstable (by its 3D matter content) state. A photon's 3D matter-core is most unstable at the instant of reflection from a reflecting surface. By producing structural distortions in the universal medium, at the point of incidence of a ray of light, the polarity and direction of spin of photons in the ray can be changed during its reflection. A strong magnetic field, applied at the place of reflection, is found to change the polarity of its photons.

In its unstable state, the spin axis of a photon may develop independent turning motion in any plane under the action of external efforts. The spin motion of a photon provides its 3D matter-core with rigidity in space (gyroscopic inertia). An external effort on its axis is likely to precess its axis instead of turning it.

Due to the combination of linear and spin motions, the speeds of segments of a photon's 3D matter-core with respect to the universal medium differ. The difference in their relative speeds compels a photon's 3D matter-core to lose its 3D matter content (gradually) during long passages through space. This is one of the reasons for the reduction in its frequency that leads to the phenomenon of 'redshift'. As and when a photon loses all its 3D matter content and its 3D matter-core becomes non-existent, its residual low-frequency inertial-pocket in the universal medium appears as a low-frequency EM wave (background radiation) in space.

The 3D matter-cores of all photons are of the same radial size. There are no basic 3D matter particles with radii larger or smaller than the photons. Photons may have different quantities of 3D matter content, as indicated by their frequencies. Under suitable conditions, the universal medium compels complimentary photons in various combinations to form diverse fundamental particles. Further developments into superior 3D matter particles and macrobodies and their sustenance are guided and accomplished by the gravitational actions of the universal medium.

In a stable state, photons move in linear paths. During reflections and refractions, their 3D matter-cores and inertial pockets become unstable, and the universal medium stabilises them through natural processes. However, when high-frequency photons form binary systems to develop superior 3D matter particles, their 3D matter-cores remain stable, while their inertial-pockets are unstable due to the curved paths of the constituent photons. In this state, interactions between structural distortions in their inertial-pockets give rise to various types of 'natural forces'. Different types of 'natural forces' originate from the universal medium's gravitational efforts. Hence, basically, there is only one type of effort ('natural force').

The current concept of a photon is quite different from what is explained above. A photon is usually considered a quantum of energy, an electromagnetic wave, or a particle (?) with zero rest mass. The mass of a 3D material body depends not only on its 3D matter content (rest mass) but also on its linear speed. Accordingly, a photon moving at the speed of light should have infinite mass. In order to overcome this illogical result, it has become necessary to arbitrarily assume a photon as a massless entity. Its mass should always remain zero, irrespective of its linear speed.

The momentum of a 3D matter body is related to its mass. Momentum is essential for a 3D matter body to do work. Yet, the photons are found to do work on collisions. In order to overcome these contradictions, even though they possess no rest mass, in mathematical equations, a photon is also considered (simply) to possess certain momentum (in some cases, enough momentum to knock out orbital electrons from the atoms!). A photon is assumed to have no matter content but carries only (undefined) energy, which can do work. Contemporary theories also assume that matter is vested only in subatomic particles and larger 3D matter bodies, which have rest mass. How or from where this 3D matter came into being is not explained. Hence, the search for mysterious particles, which may endow the property of mass to 3D matter bodies, continues.

In this concept, a photon is a basic 3D matter particle that has definite 3D matter content, as indicated by its rest mass. It also has associated work (energy), which was instrumental to its creation and sustains its 3D matter-core, or which can do external work on the photon's disintegration. This part of the associated energy is considered the mathematical equivalent of an electromagnetic wave of the same frequency as the spin speed of a photon's 3D matter-core.

Structural distortions (equated to electromagnetic waves) associated with a photon exist within the surrounding universal medium but are coupled with the 3D matter-core of each photon. The 3D matter-core of a photon is formed from 'real' 3D matter. The 3D matter-core of a photon and its associated inertial-pocket (structural distortions in the surrounding universal medium) are developed and maintained by mutual actions.

A photon is the smallest 3D matter particle that can exist independently and in reality. It is a physical (materialistic) entity that has objective reality and a positive existence in space. It is a corpuscle of light or any other similar radiation. All other 3D matter particles and macrobodies are made of combinations of photons.

Light:

Light (or similar radiation) is constituted by numerous 3D matter-corpuscles moved by associated (electromagnetic wave-like) structural distortions in the universal medium. Therefore, light exhibits all the characteristic properties of photons. The number of photons per unit time indicates the amplitude of light. The frequency of photons in a ray of light shows the intensity and colour of the light. The direction of the spin of photons in a ray of light indicates the polarity of the light.

Structural distortions, formed in the universal medium to maintain and move a photon's 3D matter-core, are transferred at (the highest) constant linear (and angular) speeds that the universal medium can provide without causing its own break-down. The 3D matter-core of a photon is carried by the moving structural distortions in the universal medium. The magnitude of the speed of the transfer of structural distortions depends on the nature of the universal medium in any region of space.

A continuous flow of corpuscles of light (photons) is a ray of light. It consists of 3D matter particles as 3D matter-cores of photons and associated distortion-fields. As it is the 3D matter content that is transferred in a light ray, the process may be called radiation of matter. All similar radiations, by means of the displacement of photons in space, are radiations of matter. Depending on the quantity of 3D matter in the constituent photons of radiation, a radiation of matter may be classified into heat rays, infrared rays, visible light, ultra-violet rays, x-rays, or cosmic radiation. The quantity of 3D matter, a photon contains is indicated by its spin speed (frequency). The frequency of a photon is directly proportional to its 3D matter content.

Conclusion:

A beam of light is a continuous flow of photons (corpuscles of 3D matter accompanied by their inertial-pockets in the universal medium). Structural distortions in a moving inertial-pocket carry the 3D matter-cores of photons at constant linear speed. The linear speed of light is constant because that is the highest linear speed at which the universal medium can move 3D matter. Corpuscles of light, like any other 3D matter body, obey all laws of physics, including the laws of gravitation.

Reference:

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

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