

LINEAR SPEED OF LIGHT

According to 'MATTER (Re-examined)'

Nainan K. Varghese, matterdoc@gmail.com

<https://www.matterdoc.in/>

Abstract: Light is a flow of three-dimensional material-corpuses, each corpuscle accompanied by a separate set of structural distortions in the universal medium. Together, they constitute radiation of photons. For existence, it is essential for the 3D matter-core of a photon to move at the highest possible linear speed, at which the universal medium can move it. This limit endows light with the constancy of its linear speed. Constancy of linear speed is related to and hence depends on the nature of the universal medium in the region of space, where light is radiated. This essay briefly describes the mechanism of light's motion and the stabilizing mechanism of its linear speed, as envisaged in an alternative concept presented in the book, 'MATTER (Re-examined)'. For details, kindly refer to the same [1].

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

Introduction:

Light is observed to have linear motion in space at a constant linear speed. Matter is inert. It has no ability to move or to act on its own. Therefore, light being a composite 3D material body, needs 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. Such an agency is the universal medium. 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 speed cannot be related to them. Another 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 light should always be in relation to and through the universal medium. [We shall consider only linear motion of light in this article]. Universal medium should not only move light, but it should also stabilise any variation and maintain its linear speed, at a constant magnitude, irrespective of any influence that may tend to vary its linear speed. Universal medium should provide mechanisms for all other properties of light as well.

An alternative concept:

Alternative concept, presented in the book 'MATTER (Re-examined)', is based on a 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 coexist at their intersections and thus fill the entire space, outside basic 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 stress due to the work (structural distortions) is energy. Frequent local breakdowns of the universal medium ensure the availability of free quanta of matter and ample opportunities for them to migrate back into the latticework structures of the universal medium. This keeps the quanta-chains of the universal medium under compression, even without a definite container. They are continuously under stress to expand.

Local breakdown, in any part of the universal medium, releases quanta of matter from latticework structures and forms a gap. Universal medium from all around (being under compression) moves towards the centre of the gap to re-establish continuity. Due to inward radial movement, the universal medium presses on any disturbance (3D matter-particle) present in the gap and compresses it. The disturbance breaks the continuity in the latticework structure of the 2D energy-field. 2D energy-fields from all around continue to thrust themselves into this space to compress the disturbance. Application of pressure, by the universal medium on a disturbance, is gravitation. Latticework structures of the universal medium impose certain restrictions on gravitational actions. Gravitation is unable to act on flat surfaces or 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 convex curvature of its perimeter.

Gravitational action, by the universal medium, on a 3D disturbance is through direct contact between them. During this action, the latticework structures of surrounding 2D energy-fields are structurally distorted. A structurally distorted region in the universal medium around a 3D disturbance is its 'inertial-pocket'. All actions by the universal medium on the 3D disturbance are through the inertial-pocket. Gravitational action tends to reduce 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 larger convex curvature, experiences greater gravitational effort compared to the side of the same disturbance with lesser convex curvature. The result of these efforts tends to push the disturbance in the direction of greater gravitational effort.

Variation in the 3D disturbance's shape, from a perfect circle in various planes, produces unevenness in gravitational compression on it, from all around. To establish 2D energy-field's homogeneity, structural distortions tend to move from regions of high distortion-density to regions of low distortion-density. 3D disturbance, held within the gap in the structurally distorted region of 2D energy-field (inertial-pocket) is also carried along with the structural distortions towards the direction of lower distortion-density. This phenomenon produces inherent linear motion of every basic 3D matter-particle in space. In their stable state, the 3D matter-core of a 3D disturbance and its inertial-pocket, together, form a corpuscle of radiation (a photon).

Photon:

3D matter-core of a photon, being a disturbance in the universal medium, is ejected out of each of the 2D energy-fields of its existence. This is the mechanism of motion of photons through the universal medium. As a photon moves forward, latticework structures of 2D energy-fields in front are parted to create a passage, and latticework structures at the rear join back to restore continuity of the universal medium. Pressure (resistance) from the front, due to collision between the 3D matter-core of the photon and quanta of matter in the latticework structures of 2D energy-fields, is balanced by the ejection effort on it from the rear. This balancing action maintains the linear speed of a photon at the highest possible level (hence constant) in the universal medium.

The most fundamental property of a photon is the motion of its 3D matter-core at constant linear velocity (for a general description of light's speed, in this article, we will not consider the spin motion of the photon's 3D matter-core at an angular speed proportional to its 3D matter-content). In fact, a photon exists in a stable state only because of the motions of its 3D matter-core at constant velocities, with respect to the universal medium. It is a necessity of the universal medium to maintain the linear velocity of the photon's 3D matter-core at this critical level. Hence, we can say that a stable photon maintains its linear velocity at a critical constant value. Universal medium's continuous gravitational actions, on photon's 3D matter-core, overcome instability in its linear speed. [Here, motions are assigned to the photon's 3D matter-core for clearer understanding. In reality, a photon's 3D matter-core, being a corpuscle of matter, is incapable of any actions or movements on its own. It is the inertial actions of the universal medium about it, which move the photon's 3D matter-core]. Inertial-pocket, in the universal medium (similar to an electromagnetic wave) about the photon's 3D matter-core, is the photon's moving part that carries its 3D matter-core.

The difference between instantaneous convex curvatures at the front and rear parts of the photon's 3D matter-core determines the resultant gravitational action that moves the photon's 3D matter-core in its linear path. Inertial-pocket of a photon continuously moulds its (spinning) 3D matter-core, so that the magnitude of convex curvature of the forward surface is always less than that of the rearward surface. Gravitational actions on the spinning 3D matter-core of a photon regulate its instantaneous shape, so that latticework structures in the universal medium are not damaged, and at the same time, external and internal pressures about the 3D matter-core of a photon remain in balance. Under this condition, a photon moves at a critical constant (maximum) linear speed through the universal medium (space).

Stabilizing mechanism:

We shall examine the principle of linear motion of the 3D matter-core of a photon, while (for the present) ignoring its spin motion. Let us assume the 3D matter-core of a photon as a stretchable balloon filled with unattached but flexible marbles. Flexible marbles represent the quanta of matter in their 3D status. Balloon represents gravitational pressure, holding the constituent quanta of matter together and compressing them into 3D states; thus making the photon's 3D matter-core, a 3D matter-particle. Let us also assume that the 3D matter-core of the photon is disc-shaped with slightly bulging faces. [The following description is about the linear motion of a photon's 3D matter-core in a perpendicular direction to its disc-plane. Linear speed is controlled by the difference in the curvatures of the forward and rearward faces of the disc-shaped 3D matter-core of the photon. When the direction of linear motion is not perpendicular to the disc plane, the difference in curvatures of forward and rearward surfaces of the perimeter also comes into play].

Radial size of a photon's 3D matter-core is limited within the critical limits set by the latticework structures of the universal medium. Its periphery (being disc-shaped) has convex curvature. Gravitation continuously acts all around the periphery to compress the 3D matter-core. Stable radial size of the photon's 3D matter-core is a critical constant. Any variation is immediately stabilised by varying the gravitational efforts at the periphery. In the meantime, variation in the radial size of a photon's 3D matter-core stabilises changes in its linear speed.

Figures 1, 2, and 3 show cross sections of the 3D matter-core of a hypothetical photon (that does not spin) in a plane passing through its spin axis and perpendicular to the line of the photon's linear motion. Figures are not to scale. Sizes and bulges are highly exaggerated. They are intended only to show the principle of stabilisation of a photon's linear speed. Grey figures show 3D matter-core. Block arrows represent average magnitudes of gravitation in the form of various efforts, acting on the 3D matter-core. The red outlines in figures 2 and 3 show the relative sizes and shapes of the 3D matter-core of the same photon, for comparison, when it is moving at its critical linear speed.

Figure 1 shows the status of the cross-section of a stable photon's 3D matter-core, moving rightward. Gravitational actions all around the disc-shaped 3D matter-core, shown by representative

vertical block arrows, maintain its critical radial size. The magnitudes of gravitational efforts acting on the disc faces depend on the magnitudes of their convex curvatures. The rear face of the 3D matter-core bulges outward by a greater degree and thus provides greater convex curvature compared to the front face. Gravitational effort from the rear is greater, and hence, in the figure, it is marked as 'ejection' effort. The front face, having a lesser convex curvature, receives lesser gravitational push-effort. This, being in the opposite direction to the linear motion of the photon, is marked as 'resistance' effort. The result of the ejection and resistance efforts acts to move the 3D matter-core of the photon linearly. As long as the parameters of the 3D matter-core do not vary, in a homogeneous universal medium, magnitudes of efforts from all sides remain constant and maintain the photon's linear speed at constant magnitude, with respect to the surrounding universal medium.

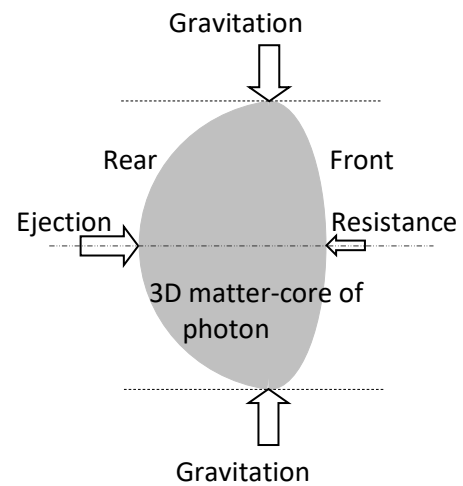


Figure 1

Various efforts, mentioned above, do not act as we consider normal 'forces' in mechanics. It is the transfer of structural distortions in the universal medium that carries the 3D matter-core along. Movement is directly imparted to the 3D matter-core rather than by external 'force' acting on it to move. Hence, the phenomena of acceleration, velocity, motion, etc., do not apply in the case of a photon's linear motion. A photon's 3D matter-core gets displaced in space with respect to the universal medium, which fills the entire space. In fact, 3D matter-cores of photons do not move at all with respect to their surrounding structural distortions (inertial-pockets) in the universal medium. Transfer of structural distortions within the universal medium carries the photon's 3D matter-core with it, thereby affecting the photon's displacement in space. Structural distortions in the inertial-pocket, surrounding the photon's 3D core body, tend to redistribute every instant, so that the universal medium regains its homogeneity. During re-distribution of structural distortions, the inertial-pocket is transferred in the direction of the region of lesser distortion-density from the region of higher distortion-density, while the universal medium (as a whole) does not move. In reality, redistribution of structural distortions around the photon's 3D matter-core is a continuous process so that at any instant, the 3D matter-core's size, shape, linear speed, and spin speed are maintained at critical values. Internal and external pressures at every point on the surface of the 3D matter-core remain in balance.

Inertial-pocket in the universal medium (surrounding photon's 3D matter-core) is the creation of 3D matter-core's shape. Therefore, wherever the 3D matter-core moves in the universal medium, similar structural distortions surround the photon's 3D matter-core. In other words, as long as the photon's 3D matter-core is in existence, the surrounding universal medium has similar structural distortions in the inertial-pocket, which carries the 3D matter-core at a constant linear speed, indefinitely. As the 3D matter-core of the photon moves along with surrounding structural distortions in a steady universal medium, we may relate the photon's motion to the steady universal medium. The magnitude of its linear speed depends on the parameters of the photon's 3D matter-core and the nature of the universal medium in any region of space. As long as these remain steady, the linear speed of light (or similar radiation of matter) remains constant with respect to an absolute reference, provided by the universal medium.

To understand the mechanism of stabilisation of actions about a photon, let us consider the reduction in the 3D matter-content of a stable photon, which was moving at a constant linear speed through a homogeneous region of the universal medium. Envelope of a photon's 3D matter-content is provided by the surrounding gravitational pressure. In a stable photon, external pressure at any point on the surface of its 3D matter-core is always balanced by the internal pressure of the photon's 3D matter-core. The pressure difference required to maintain a balance between internal and external pressures depends on the curvature of the interface between them. A reduction in the matter-content

in the 3D matter-core reduces its internal pressure, during the time before gravitational efforts commence their action on the 3D matter-core. Gravitational pressure all around the 3D matter-core asserts and reduces the radial size of the 3D matter-core, as shown in Figure 2. Compare the radial size of the 3D matter-core shown in grey with its original radial size shown in red outline.

Figure 2 represents the actions of gravitational pressures on the 3D matter-core of a photon that has lost part of its 3D matter-content. Gravitational action reduces the size of the 3D matter-core from all around until external and internal pressures are balanced at every point on its surface. Radial size and thickness of the 3D matter-core decrease due to a decrease in the quantity of 3D matter it contains. Internal pressure of the 3D matter-core is restored to its original value. However, a reduction in radial size necessitates an increase in the curvatures of disc-faces. Increase in curvatures of forward and rearward faces offsets the balance between external and internal pressures at the respective faces. An increase in the curvatures increases the magnitudes of gravitational action at the disc-faces.

The rearward face, which has greater curvature, experiences a greater increase in gravitational action. Internal pressure throughout the 3D matter-core is identical. As the curvature of the rearward face is greater than that of the front face, it requires greater external pressure to balance the internal pressure. (Similar to 'Gibbs-Thomson effect' with respect to the relation between vapour pressure and surface curvature of a droplet). Greater change in the curvature of the 3D matter-core's rear face increases the magnitude of gravitation by a greater margin, compared to a lesser increase in the magnitude of gravitation due to a lesser increase in the curvature of its forward face. Resultant of increased gravitational actions, on the rearward and forward faces of the 3D matter-core, attempts to move the photon at greater linear speed. This increases resistance to the photon's linear motion.

However, gravitational actions, from both the front (resistance) and the rear (ejection), have increased. These two, together, compress the 3D matter-content of the photon to increase its radial size back to its original value. As the radial size of 3D matter-core increases to its critical size, 3D matter-content of photon re-shapes to bring down the additional ejection and stabilise photon's linear speed by reducing the curvatures of disc-faces. Loss of 3D matter-content would result only in a reduction of the 3D matter-core's thickness. By the time external and internal pressures are in balance, the relation between ejection and resistance would have changed to provide the correct magnitude of resultant action to move the photon at its critical linear speed.

Let us consider an increase in the 3D matter-content of a stable photon, which is moving at a constant linear speed through a homogeneous region of universal medium. An increase in the 3D matter-content of a photon enhances the 3D matter-core's radial size and thickness. Gravitational pressure all around the 3D matter-core is offset to increase the 3D matter-core's radial size, as shown in Figure 3. Compare the radial size of the 3D matter-core, shown in grey, with its original radial size, shown in red outline.

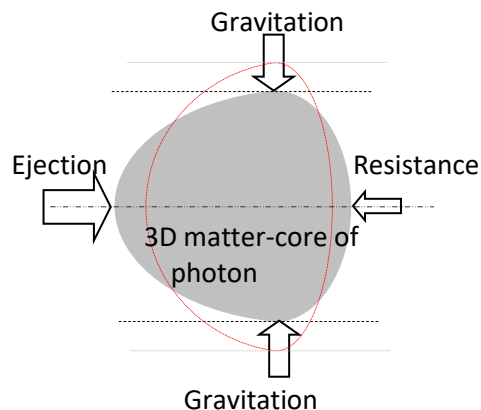


Figure 2

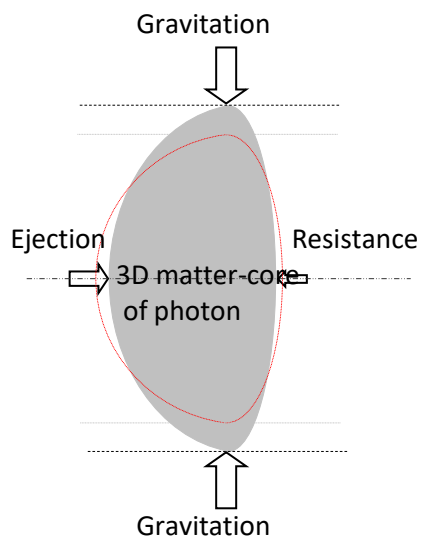


Figure 3

Gravitational actions increase the size of the 3D matter-core until the external and internal pressures are balanced at every point on its surface. The radial size of the 3D matter-core increases and reduces the curvatures of both rearward and forward disc-faces. As the curvature of the rear face is greater than that of the front face, it requires greater external pressure to balance the internal pressure. (Similar to 'Gibbs-Thomson effect' with respect to the relation between vapour pressure and surface curvature of a droplet). A greater reduction in the curvature of its rear face reduces the magnitude of gravitation by a greater margin, compared to a lesser reduction in the magnitude of gravitation due to a lesser reduction in the curvature of its front face. The resultant of actions tends to move the photon at a slower linear speed.

However, gravitational actions from the front (resistance) and from the rear (ejection) have decreased. Reduction in these two, together, allows gravitational action at the disc's periphery to compress the 3D matter-content and thereby reduce the radial size of the 3D matter-core back to its critical radial size. As the radial size of the 3D matter-core reduces to its critical value, the 3D matter-core of the photon re-shapes to bring down the reduction in ejection effort and stabilise the photon's linear speed. Gain of 3D matter-content would result only in an increase in the 3D matter-core's thickness. By the time the external and internal pressures are in balance, the relation between ejection and resistance would have changed to provide the right magnitude of resultant action that moves the photon at its critical linear speed. Similar actions take place in every other plane as the 3D matter-core spins.

Stability of photon's linear speed:

Universal medium cannot move 3D material bodies at linear speeds higher than the speed of light. Hence, the linear speed of light is the ultimate linear speed of any 3D material body. As the linear speed of 3D material r-bodies approaches the linear speed of light, they break down to inferior constituents. At the linear speed of light, only the photons can survive.

Due to the inertial properties of the universal medium, the efficiency of external effort acting on 3D material bodies reduces as their linear speed increases. When the linear speed of a 3D material body approaches the linear speed of light, the efficiency of external effort on it (in the direction of its motion) reduces to zero. External efforts cannot act on the 3D material bodies that are moving at the linear speed of light in the same direction. [This phenomenon is often interpreted as infinite relativistic mass]. Therefore, no external effort can act on a photon in the direction of its motion and change (increase) its linear speed. However, linear speeds of photons are susceptible to changes (reduction) by external efforts in directions other than the direction of their linear motion.

Matter is inert. Transfer of structural distortions (inertial-pocket) in the universal medium, surrounding the 3D matter-core of a photon, causes a photon's linear (and spin) motion(s). Since it is the structural distortions that carry the 3D matter-core, it is imperative that both the 3D matter-core and the inertial-pocket move in synchronism with each other. A misalignment between them affects the stability of the photon.

Photon's inertial-pocket, being a region of structural distortions in the universal medium, has only one steady linear speed in space. This is the linear speed of electromagnetic waves. Depending on the structural parameters of the universal medium in a region, the speed of transmission of free structural distortions (which are not linked to superior 3D matter-particles) is limited to the highest linear speed possible without damaging the universal medium. As long as a photon's 3D matter-core moves in synchronism with the surrounding structural distortions, the universal medium causes no resistance to the motion of the photon's 3D matter-core or its stability. The tendency of relative displacement between a photon's inertial-pocket and 3D matter-core creates instability in the photon's motion. Forward displacement of the photon's 3D matter-core with respect to its inertial-pocket (by which 3D matter-core tends to push at the front of inertial-pocket) may be considered as an increase in the photon's linear speed. Rearward displacement of the photon's 3D matter-core with

respect to its inertial-pocket (by which 3D matter-core tends to push at the rear of inertial-pocket) may be considered as a reduction in photon's linear speed.

An increase in the ejection effort from the rear, without a corresponding increase in resistance from the front, tends to increase photon's linear speed. Photon's 3D matter-core is pushed forward (by structural distortions at the rear) onto latticework structures in the distorted region of universal medium at the front. This can happen when a photon is moving in a region of universal medium with a gradient in distortion-density, in a direction towards the lower distortion-density. In this case, the universal medium at the rear of its 3D matter-core has higher distortion-density than its forward part. Correspondingly, ejection effort remains higher than that which can be balanced by lower resistance, and the photon has a tendency to increase its linear speed.

An increase in a photon's linear speed moves its 3D matter-core forward, with respect to the inertial-pocket, to cause additional forward compression. 3D matter-core may be assumed to rub or collide bodily into the forward part of the latticework structure of the inertial-pocket. This may cause excessive external pressure (resistance) from the front on the photon's 3D matter-core and result in a few quanta of matter (from latticework-structure) piercing into the 3D matter-core of the photon to be converted into 3D status and assimilated into the 3D matter-core. Increased ejection, during this process, effectively compresses the photon's 3D matter-core to increase its radial size. Change in the radial size of photon's 3D matter-core initiates stabilisation process of photon's linear speed (by use of curvatures of its forward and rearward faces) as described above.

Quanta of matter, assimilated into the photon's 3D matter-core, increase its 3D matter-content. Increased 3D matter-content (rest mass) of photon's 3D matter-core, requires higher ejection effort from rear, to move it at the same linear speed as it was moving earlier. Since the ejection effort from the rear is already higher, the increased bulk of photon's 3D matter-core would compensate for the higher ejection from the rear and restore its linear speed to a critical constant value. As the linear speed of the 3D matter-core reduces to its critical value, excessive pressure between it and the inertial-pocket is relieved. Thus, an attempt to increase the linear speed of a photon results in the photon gaining additional 3D matter-content (with corresponding increase in its energy-content) from the surrounding universal medium, instead of increasing its linear speed. Increase in 3D matter-content is indicated by an increase in photon's spin speed - frequency or colour. An attempt to increase the linear speed of a photon (light) results in an increase in its frequency (colour of light) rather than its linear speed.

Reduction in the ejection effort from the rear, without corresponding reduction in resistance from the front, tends to reduce photon's linear speed. This can happen when a photon is moving in a region of universal medium with a gradient in distortion-density, in a direction towards higher distortion-density. In this case, the universal medium at the rear of its 3D matter-core has lower distortion-density than its forward part. Correspondingly, ejection effort is lower than that which can be balanced by higher resistance, and the photon has a tendency to reduce its linear speed.

Compression on the photon's 3D matter-core reduces. Photon's 3D matter-core is (apparently) pulled rearward by a reduction in the distortion-density at the rear. Since magnitudes of changes are related to curvatures of disc-faces of 3D matter-core, the magnitude of change in ejection effort at the rear disc-face is much greater than the magnitude of change in resistance at the forward disc-face. As a photon's inertial-pocket is not a 3D matter-particle, it is not (apparently) attracted towards any other 3D material body. Due to a greater reduction in ejection effort, compared to a reduction in resistance, photon's 3D matter-core tends to shift rearward relative to its inertial-pocket. Photon's 3D matter-core tends to slow down.

Rearward displacement of the photon's 3D matter-core, with respect to the inertial-pocket, relieves compression of the 3D matter-core. 3D matter-core expands in volume to fill the inertial-pocket. All constituent quanta of matter of the 3D matter-core take part in this expansion. During this process, a few (randomly oriented but rightly placed) quanta of matter expand rapidly and escape from the 3D matter-core to join latticework structures of 2D energy-fields. 3D matter-content of

photon reduces, while 3D matter-core's volume increases. Radial size and thickness of the 3D matter-core increase. Increased radial size initiates the stabilising process of photon's parameters and linear speed, in relation to the curvatures of 3D matter-core's disc-faces, as described above.

Quanta of matter, lost from the photon's 3D matter-core, reduce the photon's 3D matter-content. Reduced 3D matter-content (rest mass) of the photon's 3D matter-core, requires lower ejection effort from the rear, to move it at the same linear speed as it was moving earlier. Since the ejection effort from the rear is already lower, the reduced bulk of photon's 3D matter-core would compensate for the reduced ejection effort from the rear and restore its linear speed to a critical constant value. As the linear speed of the photon increases to its critical value, the reduced internal pressure of the 3D matter-core is restored. Thus, an attempt to reduce the linear speed of a photon results in the photon losing 3D matter-content (with corresponding reduction in its energy-content) into the surrounding universal medium, instead of reducing its linear speed. Reduction in the 3D matter-content is indicated by a reduction in the photon's spin speed, frequency, or colour. Any attempt to reduce the linear speed of a photon (light) results in reducing the photon's frequency (colour of light) rather than its linear speed.

In this way, the universal medium maintains critical linear speed of photons (light or similar radiation), automatically, by changing their 3D matter-contents (frequency - rest mass), irrespective of any attempts to vary their linear speed.

The frequency of light can be varied only by changes in the 3D matter-contents of constituent photons. One way to vary the frequency of light is by attempting to change its linear speed. Corpuscles of light are related only to the surrounding universal medium. They are created from and by the universal medium. From the moment of their creation, they are independent 3D material bodies. They have no other 'source-bodies'. Hence, the assumption that parameters of light (like its linear speed or frequencies) are affected by the source-bodies or receptors (macro bodies in the region of creation of photons or which receive light radiation) is not correct. Hence, 'Doppler effects' or similar phenomena, which affect the wave motions like sound, electromagnetic waves, etc., do not affect the radiation of light.

Linear speed of light:

The linear motion of a photon is with respect to the universal medium, which is static in space. The number of latticework-squares of 2D energy-fields, traversed by a photon in (absolute) unit time, is a constant. If any part of the universal medium in a region of space is structurally distorted, the number of latticework-squares of 2D energy-fields in unit distance, in any direction, is greater than the number of latticework-squares in (absolute) unit distance in a structurally undistorted region of universal medium. Hence, the distance moved by a photon in a structurally distorted region of universal medium (in denser matter-field), compared to a structurally undistorted region, in unit time, is less. The absolute linear speed of light, in any region of space, depends on the distortion-density in that region of the universal medium (matter-field). This is variable from region to region in space. Matter-fields about very big macrobodies are denser in structural distortions than matter-fields about smaller macrobodies.

Therefore, the absolute linear speed of light appears slower near larger macro bodies, when compared (with respect to the distance measurement, used in another region of space) to the speed of light in other regions. Since the distance and time measurements are related, they vary with each other for any region of space. Hence, the absolute linear speed of light in one region of space with reference to the universal medium in the same region of space and the absolute linear speed of light in another region of space with reference to the universal medium in that region of space are identical. Discrepancies develop only when the absolute linear speed of light in one region of space is related to a universal medium in another region of space.

Due to circular logic, we define time; the unit of time within the matter-field of a macro body also depends on the distortion-density of the universal medium in the same region of space. Thus, the

‘absolute unit of time’ in any region of universal medium may be different from the ‘absolute unit of time’ as determined in a structurally undistorted region of universal medium. Although the unit of time and linear speed of light are constant and equal in every region of universal medium, a discrepancy develops when the unit of time or linear speed of light, determined in one region of universal medium, is related to the unit of time or linear speed of light, determined in another region of universal medium. This has given rise to many speculations about the nature of time and its variations. Linear speed of light, in outer space or near another macro body (whose 3D matter-content is not equal to the 3D matter-content of Earth), should not be compared with linear speed of light on the surface of Earth, using units of distance and time, determined on or near the surface of Earth.

An observer is a large macrobody compared to a photon. A static observer and his surroundings are within the matter-field of a macrobody, where the observer is situated. Observer is static only when considered in a relative reference frame with respect to the macrobody, which may be in any state of motion. Observer moves with the matter-field in the region of his existence. Critical linear speed of light (motion of photons) is with respect to structural distortions in the surrounding universal medium and depends only on the distortion-density of the matter-field of the region. Therefore, a photon always appears to move at the same linear speed within the same region of space, irrespective of the direction of the macrobody’s (matter-field’s) motion. Linear speed of a photon, with respect to the matter-field of the region, is a critical constant. This is essential for the integrity and stability of the photon.

The entire space is filled with the universal medium. There is no empty space. Air or other 3D matter-particles in a part of space may be removed to create a vacuum. This may remove refractive media from the region, but it does not create an empty space. Therefore, by comparing the linear speed of light in vacuum and in air (or other media), we cannot determine light’s absolute linear speed. A photon is radiated at its absolute linear speed in regions of space, far away from any other macrobodies, where the surrounding universal medium is free of any structural distortions other than those required to maintain the stability of the photon in consideration. In all other regions of space, the linear speed of a photon is determined with respect to structural distortions in the universal medium in that region. For a constant magnitude of structural distortions in the universal medium, the linear speed of a photon and the unit of time in it are constants.

If the observer (laboratory) develops motion, with respect to the surrounding matter-field, it will be reflected in the linear speed of light he is observing. If the observer is so small that he can be accommodated on a photon, he will be moving at the same (critical constant) linear speed as other photons in the matter-field, in the direction of his own motion. Other photons moving within the region will also be moving at their critical constant linear speeds. Under this condition, the observer sees other photons in relation to himself. Each of the other photons will appear to move at linear speeds relative to his motion. A photon moving in the opposite direction will appear to the observer as moving at double the critical linear speed, and a photon moving in the same direction will appear to have no linear motion at all. Photons moving in various other directions will all appear to move at their relative linear speeds. Photons (light) radiating in any region have relative motion with respect to other photons in the same region. But, with respect to the surrounding matter-field, all photons are moving at their critical constant linear speed. Since a static observer is a large macro body, moving with and is a part of the surrounding matter-field, he observes all photons in the region as moving at a critical constant linear speed irrespective of their directions of motion. This phenomenon has led to the assumption of ‘universal constancy’ of light’s linear speed.

This is the reason why all attempts to measure the relative linear speed of light beams, moving in various directions, failed to register any difference in their linear speeds from a constant critical value. All experiments (like Michelson & Morley experiments) were conducted within the matter-field of Earth and on light beams moving within the same matter-field, by observers who were steady within the matter-field of Earth. Irrespective of changes in the directions of radiation, all light beams (in various directions) registered the same linear speed.

If an observer places himself outside the region of a matter-field, where the light beams are radiated, he can notice that the linear speed of light is different from the critical linear speed of light in his surroundings. This is how the linear speed of light is found to be slower in denser refractive media. We have no hesitation in accepting this fact. All refractive media usually have denser matter-field compared to the atmosphere near the surface of Earth. Observer, being outside the region of matter-field, where light is being radiated, and measuring the linear speed of light by using the 'distance-measurements' for his own region of space, correctly finds that the light has slowed down.

Similarly, using our standard of distance-measurements, the linear speed of light is higher in outer space, away from Earth's (and other large macro bodies') matter-field. This fact is not recognized due to our adamant belief in the assumed constancy of the linear speed of light. Instead, we prefer to mystically dilate the functional entity of 'time'. General (unscientific) rule, followed at present, is that: in denser media, light slows down and in rarer media, time dilates.

Photon, being a 3D material body, obeys all natural physical laws, including laws of motion and gravitation, under all conditions. With respect to an observer (who is steady on the surface of a large macro body), the relative linear speed of a small free body, moving under constant inertia in the same region, is constant irrespective of its direction of motion. This common rule applies to the linear motion of photons (corpuscles of light) also. Relative linear speeds of smaller 3D material bodies, moving near Earth's surface, depend on the magnitude of effort ('force') acting on (or energy stored in) them. In a relative reference frame, we do not consider linear motion transferred to smaller macro bodies by Earth's motion.

In the case of photons, the external effort propelling them and their linear speed relative to Earth's surface depends on the distortion-density of Earth's matter-field. Assuming that the distortion-density of Earth's matter-field is constant throughout Earth's surface and in its surroundings, the linear speed of radiation of light near Earth is a critical constant irrespective of the direction of radiation. A change in the magnitude of structural distortions in the matter-field in the region of radiation (like within a refractive medium or near a large macro body of different size) varies the value of light's critical constant linear speed, when compared with a unit of distance in another region of space. The linear speed of light is not a universal constant. Light has its highest (constant) linear speed in free space, far away from 3D material bodies. As light approaches a very large macro body, its critical linear speed (and unit of time) reduces due to the higher distortion-density of the matter-field in that region. The more enormous a macro body is, the lower the critical constant linear speed of light, in that region of that macro body with respect to the standard of distance determined for free space. If the unit of time for that region of space is also varied correspondingly, there will be no change in the critical linear speed of light in that region.

However, as far as a photon is concerned, it always moves at a critical constant linear speed with respect to the universal medium around it. The number of latticework-squares in 2D energy-fields, traversed during an equal interval of time, is the same, irrespective of the distortion-density of matter-field of the region of radiation. Matter-field, with higher distortion-density, has a greater number of latticework squares of 2D energy-fields per unit distance than a matter-field with lower distortion-density. Consequently, light appears to move more slowly to an observer outside that region of space. To an observer within the same region of space, the linear speed of light does not change; it remains the same critical constant value.

Should an observer develop linear motion within a matter-field, where light is being radiated, his linear speed is algebraically added to the critical linear speed of light to obtain its relative linear speed. Since the critical linear speed of light is too high, and the highest linear speed an observer can attain and the straight-line distance available within a matter-field of constant distortion-density are too small compared to the distance traversed by light in unit time, it is impossible to determine this experimentally. [A fish, floating in a water current, observes any other material body, moving with respect to the water current, as moving at its true relative linear speed with respect to the current, irrespective of the direction of its motion. If this relative linear speed of material bodies is of constant

value with respect to the water current, all objects within the current and linearly moving with respect to the current appear to move at constant linear speed, irrespective of the directions of their motion. Relative linear speed of fish and other moving objects within the current comes into prominence only when fish is able to move with a speed comparable to the speed of moving objects with respect to the current]. However, by choosing a rotational frame of reference, this fact is confirmed by the phenomenon of ‘Sagnac effect’ [1]. Since the dual nature of light is not well recognized, the results of experiments, similar to Sagnac’s experiments are not satisfactorily explained.

Conclusion:

A beam of light is a continuous flow of photons made of 3D matter-corpuscles (matter-part of light) accompanied by their inertial-pockets (energy-part of light), in the universal medium. Structural distortions in the moving inertial-pocket carry 3D matter-core of the photon at a constant linear speed. The linear speed of light is constant because that is the highest linear speed at which the universal medium can move any 3D material body. The relative linear speed of light is a critical constant in any region of space. The magnitude of this constant value depends on the nature of structural distortions in the universal medium in the region where light radiates. Linear speed of light (with respect to a static observer on Earth), measured on or near the surface of Earth, is constant irrespective of the direction of radiation. Corpuscles of light, like any other 3D material body, obey all laws of motion and gravitation. Light has a relative linear speed with respect to a moving observer within the region of space of radiation. Critical linear speed of light is not a universal constant. It depends on the distortion-density in the universal medium in the region of space (where radiation takes place) and the units of distance and time in that region of space.

References:

- [1] Nainan K. Varghese, *MATTER (Re-examined)*, <https://www.matterdoc.in/>
- [2] Wikipedia, *Surface tension*, http://en.wikipedia.org/wiki/Surface_tension

* * * * *