

AURORA

According to 'MATTER (Re-examined)'

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Abstract: Entire space, outside the most basic 3D matter particles, is filled with an all-encompassing universal medium, structured by quanta of matter. Each of the basic 3D matter particles is accompanied by a separate set of structural distortions in the universal medium that sustains the integrity and movements of its 3D matter-core. The 3D matter-core and the associated structural distortions in the surrounding universal medium, together, constitute a corpuscle of radiation—a photon. Light (and other types of radiation of matter) is a continuous flow of photons (the most basic three-dimensional matter). For the existence of both the photon and the universal medium, it is essential for the universal medium to move the disc-shaped 3D matter-core of a photon at the highest possible linear speed and spin it (about one of its diameters) at a frequency proportional to its 3D matter content, within certain limits. An attempt to increase the linear speed of a photon's 3D matter-core compels it to assimilate quanta of matter from the surrounding universal medium, thereby increasing the thickness of its disc-core and increasing its spin speed (frequency) correspondingly. In the case of a very high-frequency photon, the increased thickness of its 3D matter-core reduces torque on it and encourages it to discard quanta of matter from its core body. These two opposing phenomena, acting simultaneously, on very high-frequency photons radiated from the sun and passing through the vicinity of the earth (or any other moving macro body), ensure ample supply of free quanta of matter in the universal medium in the region. The universal medium gathers, shapes, and compresses these free quanta of matter to form new photons to be radiated from the region. These radiations of newly created photons appear as auroras to us. This essay very briefly describes the mechanism of creation of photons (corpuscles of light) of varying colours and complexity displayed during aurora borealis (northern lights) and aurora australis (southern lights), as envisaged in an alternative concept presented in the book, 'MATTER (Re-examined)'. For details, kindly refer to [1].

Keywords: Universal medium, radiation, light, photon, corpuscles of light, aurora borealis and aurora australis.

Universal medium:

All real entities have substance. Substance provides objective reality and positive existence in space. Only entities with substance are real, and any entity without substance is imaginary and invented for assumed purposes. In the material world, matter alone provides substance to all real entities. Therefore, it is safe to consider the existence of matter closest to absolute truth. This concept considers the 'existence of matter' as a single assumption required to logically explain all phenomena in natural philosophy.

Light is a real entity that has substance, and hence it is made of matter. Light is observed to have a linear motion in space at a critical constant speed. Matter is inert. Except for its ability to exist, matter has no capability to move or act on its own. A corpuscle of light, being a composite 3D material 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. 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.

An 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. Due to its ability to exist, matter in a quantum of matter inherently grows in the first spatial dimension while reducing its measurements in all other spatial dimensions. Free quanta of matter (in the vicinity of each other) tend to form quanta-chains in straight lines. Quanta-chains in perpendicular directions in a plane form two-dimensional latticework structure, 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 the universal medium. 2D energy-fields are able to co-exist at their intersections and thus fill the entire space (outside the most basic 3D matter particles) without gaps or voids. Though they are formed by solid quanta of matter, due to its latticework-structures, the universal medium has all the properties of an ideal fluid. Structural distortions in the universal medium, associated with a 3D object, constitute 'work' and stress due to the work (structural distortions) in the universal medium is the energy associated with that object. Frequent local structural breakdowns of the universal medium ensure the availability of free quanta of matter and ample opportunities for them to migrate into its latticework structures. This keeps the quanta-chains of universal medium under compression, even without a definite container. They are continuously under stress to expand. The pressure applied by this stress is called gravitation.

The universal medium should not only move basic 3D matter particles, but it should also stabilise variations and maintain their linear and spin speeds, irrespective of external influences that may tend to vary them. The universal medium provides mechanisms for all other physical phenomena of real objects, including light, as well.

Local structural breakdown in any part of the universal medium releases quanta of matter from the structures in it, and a gap may be formed in the latticework structure. The universal medium, from all around (being under compression), moves towards the centre of the gap to re-establish the continuity of its structure. Excessive numbers of free quanta of matter (more than that can be absorbed into the latticework structures of the universal medium) in a region of space also produce similar effects. Due to the inward radial movement of quanta-chains in the latticework structures, the universal medium gathers free quanta of matter in the gap to form a 'disturbance'.

The presence of a disturbance in the structure of a 2D energy-field breaks the latticework's continuity. As far as the universal medium is concerned, the space occupied by the disturbance remains a gap in its structure. 2D energy-fields from all around continue to thrust themselves into this space and keep the disturbance under compression. The application of pressure by the universal medium around 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 the 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 pressure converts suitable disturbances into 3D matter-cores of corpuscles of radiation.

Corpuscles of radiation (photons) are created, moved, and sustained by the universal medium. Each photon has a disc-shaped (segmented spherical) 3D matter-core that spins about one of its diameters at a spin speed proportional to its 3D matter-content and moves at the highest possible (hence constant) linear speed with respect to the surrounding universal medium.

Mechanism of motion:

The universal medium is a self-stabilising entity. Structural distortions in its latticework structures (work) spread out in such a manner as to ensure the homogeneous and isotropic nature of the universal medium. Structural distortions (work) are transferred from the higher distortion-density region to the lower distortion-density region without moving the structure itself. The transfer of structural distortions (work) in the universal medium carries 3D matter-particles in the region along with the structural distortions. Displacements of constituent 3D matter-particles in an object result in the movement of the whole object. This is the mechanism of motion of 3D material objects.

Since an observer or a '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 the corpuscles of light to move them) is the universal medium. Therefore, the universal medium should be the agency that moves light, and hence the motion of light should always be in relation to and through the universal medium.

The universal medium, in and about a large material body, has all the structural distortions (work) required to sustain the integrity of all its constituent 3D matter-particles and to maintain the body's linear motion in a straight line and its spin motion at a constant angular velocity. Therefore, structural distortions in the region of universal medium about a planet continue to transfer at constant speed along a planet's path.

Photon:

Gravitational action by the universal medium on a disturbance is through direct contact between them. During this action, the latticework structures of the surrounding universal medium are deformed. The distorted region in the universal medium around and about a 3D disturbance is its 'inertial-pocket'. All actions by the universal medium on a 3D disturbance are through its 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 extreme pressure by gravitation is also capable of converting the disturbance into a 3D status. 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 push the disturbance in the direction of greater gravitational effort.

Variations in the 3D disturbance's shape, from a perfect circle in various planes, produce unevenness in the magnitudes of gravitational compression on it from all around its body. In order to establish the 2D energy-field's homogeneity in each plane, structural distortions in the latticework structures tend to move from the region of high distortion-density to the region of low distortion-density. The 3D disturbance, enclosed within the gap in the structurally distorted region of the inertial-pocket in the universal medium, is also carried along with structural distortions in the direction of lower distortion-density. The transfer of structural distortions in the universal medium produces the inherent linear and rotary motions of every basic 3D disturbance (3D matter-core of a photon) in space. Moving structural distortions in the universal medium surrounding the 3D matter-core of a photon have many similarities with EM waves in each plane. The spinning 3D matter-core and the linearly moving structural distortions in the surrounding universal medium, together, form a photon. Its spinning 3D matter-core provides a photon's particle nature, and the rotating structural distortions in the surrounding universal medium

provide its wave nature.

The 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. The universal medium is everywhere, and hence the momenta on the photon exist continuously throughout its life. This is the mechanism of motion for the photons through space. As a photon moves forward, the latticework structures of 2D energy-fields in the front are deformed to become part of the inertial-pocket, and the distortions in the latticework structures at the rear are relieved to restore them to their original form in the universal medium. Pressure (resistance) from the front of a photon, due to collision between its 3D matter-core and quanta of matter in the latticework structures of 2D energy-fields, is balanced by the ejection efforts on it from the rear. This balancing action maintains the linear speed of the photon at the highest possible (hence constant) level with respect to the surrounding universal medium. Similar actions on the rearward and forward faces of segments of the photon's 3D matter-core maintain the rotary speed of the 3D matter-core proportional to its 3D matter content.

The most fundamental property of a photon is the linear motion of its 3D matter-core at a critical constant velocity and the spin motion of the same at an angular speed proportional to its 3D matter-content. In fact, a photon exists in a stable state only because of these motions at constant velocities with respect to the surrounding universal medium. It is a necessity of the universal medium to maintain the linear velocity and rotary speed of the photon's 3D matter-core at these critical levels. Hence, we can say that a stable photon maintains its linear velocity and rotary speed at critical constant values.

The universal medium's continuous gravitational actions on a photon's 3D matter-core overcome instability in its linear and angular speeds. [Here, motions are assigned to the photon's 3D matter-core for a clearer explanation. In reality, a photon's 3D matter-core, being a corpuscle of 3D matter, is incapable of any actions or movements on its own. It is the inertial actions of the universal medium about and around it that move a photon's 3D matter-core]. The inertial pocket in the universal medium (similar to an electromagnetic wave in each plane) around a photon's 3D matter-core is the photon's moving part that carries its 3D matter-core.

Differences between instantaneous convex curvatures at the front and rear parts of a photon's 3D matter-core determine the resultant gravitational action that moves the photon's 3D matter-core in its linear path and rotates it about one of its diameters. The inertial pocket of a photon continuously moulds its (spinning) 3D matter-core so that the magnitude of convex curvature of its forward surface is always less than that of its rearward surface. Gravitational actions on the spinning 3D matter-core of a photon regulate its instantaneous shape so that the 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) and spins at an angular speed proportional to its 3D matter-content. The 3D matter-cores of all photons have identical radial sizes. The thickness of their segments depends on the amount of their 3D matter-content.

The magnitude of the resultant moving effort on each of the segments of the 3D matter-core of a photon has two components. The component in the direction of its linear motion provides linear impetus for the linear motion of the 3D matter core, and the transverse component provides the torque to rotate the 3D matter-core. Relative magnitudes of linear effort and torque depend on the instantaneous curvatures of the forward and rearward faces of the segments of a photon's 3D matter-core. As the thickness of the 3D matter-core's segments increases with an increase in the photon's 3D matter-content, the effort for linear motion reduces and the torque increases. Opposite happens when the 3D matter-content and the thickness of segments decrease. As a result, the instantaneous displacement of any point on the 3D matter-core of a photon is at a critical constant rate with respect to the universal medium.

The axis of rotation of the 3D matter-core of a photon is always perpendicular to the direction of its linear motion. Due to the superimposition of linear and spin motions of the 3D matter-core of a photon, its forward rotating segment has a higher instantaneous rate of displacement compared to that of its

rearward rotating segment. Hence, to maintain an average critical linear speed of the 3D matter-core, the forward rotating segment moves at a slightly higher speed and the rearward rotating segment moves at a slightly slower speed from the optimum speed. Because of this speed difference, the forward rotating segment continuously assimilates quanta of matter from the surrounding universal medium, and the rearward rotating segment continuously discards quanta of matter at a slightly higher rate into the surrounding universal medium. This phenomenon causes the photons to gradually lose their 3D matter-content. Gradual reduction of the 3D matter-content causes a frequency reduction (leading to the phenomenon of redshift) until the photon's death, when the whole of its 3D matter-content is lost. At this point, when a photon is at its lowest frequency and it ceases to exist as a corpuscle of 3D matter, its associated inertial pocket (the wave-part of the photon) is left in the universal medium to appear as CMB radiation.

Effects of external factors on the linear speed of a photon:

Depending on its instantaneous orientation, gravitational (apparent) attraction between a photon's 3D matter-core and another 3D matter-body tends to either accelerate or decelerate the photon's 3D matter-core. An attempt to increase relative speed compels the photon's 3D matter-core to assimilate quanta of matter from the latticework structures of the universal medium, and an attempt to reduce its relative speed compels the photon's 3D matter-core to release quanta of matter free into the surrounding universal medium. This mechanism sustains the photon's critical constant speeds, irrespective of external influences. For brief details on the stabilisation mechanism of the linear speed of light, kindly refer to the short article '[Linear speed of light](https://www.matterdoc.info/articles/download.php)' from <https://www.matterdoc.info/articles/download.php>. (Apparent) gravitational attraction is the only external effort that can act on a photon.

Another factor that affects the impetus on the 3D matter-core of a photon is the gradient of structural distortion-density in the surrounding universal medium. As a photon approaches a higher distortion-density-region in the universal medium, resistance to its forward surface is comparatively higher than driving effort from the rear surface. Higher distortion-density in front of the 3D matter-core produces higher resistance to its motion and thereby increases interaction between the 3D matter-core and the universal medium. The effect on the photon's 3D matter-core is equivalent to that of an attempt to accelerate it, which helps its 3D matter-core acquire quanta of matter from the surrounding universal medium (inertial pocket) to augment its 3D matter-content and increase spin speed (frequency). This phenomenon increases the number of quanta of matter absorbed from the universal medium by the 3D matter-cores of photons.

Similarly, as the 3D matter-core of a photon moves away from a higher distortion-density region in the universal medium, resistance to its forward surface is comparatively lesser than driving effort from the rear surface. Higher distortion-density in the universal medium, behind the 3D matter-core, produces a higher impetus to accelerate its motion and thereby increases the interaction between the 3D matter-core and the universal medium. The effect on the photon's 3D matter-core is equivalent to an attempt to accelerate it, which helps it acquire quanta of matter from the surrounding universal medium (inertial pocket) to augment its 3D matter-content and increase spin speed (frequency).

In either case, whenever a photon moves through the universal medium of varying distortion-densities, its 3D matter-core assimilates quanta of matter from the surrounding universal medium, which increases its 3D matter-content and frequency. Therefore, a photon passing through a variable distortion-density region in the universal medium gains 3D matter and increases its frequency.

Aurora:

The angular speed of a photon's 3D matter-core, in terms of the number of rotations in unit time, is its frequency. A photon's frequency is proportional to its 3D matter content. Due to the absence of segments, the spherical 3D matter-core of an imaginary photon cannot have driving effort on it. As the 3D matter content of a photon's 3D matter-core increases, the curvatures of the faces of its segments, and hence their angular departure from the direction of linear motion of the photon, increase. As a result, the direction of driving effort on the 3D matter-core deflects from the direction of the line of its motion, OA, as shown in figure 1.

In figure 1, O represents the 3D matter-core of a photon, moving in the direction OA. As the 3D matter content of the photon increases and the enlargements of its segments shift the line of action of the driving effort in a direction along OB, the effective driving effort on the 3D matter-core along its direction of linear motion reduces to OC. This is as good as an external action to decelerate the photon.

In case of a very high frequency-photon, due to the geometry of its 3D matter-core, the

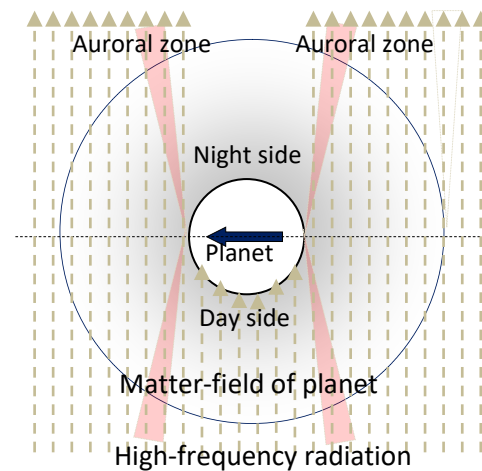
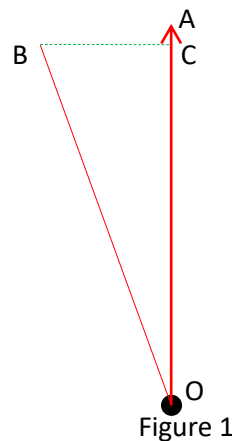


Figure 2

magnitude of forward driving effort reduces as its 3D matter content increases. As the thicknesses of the segments increase, the spin motion of the 3D matter-core of a photon increases, and its linear speed tends to reduce. Consequently, the linear speed of a high-frequency photon that absorbs quanta of matter from the surrounding universal medium tends to decrease. An attempt to reduce linear speed invokes actions similar to an attempt to decelerate the photon, and the photon gradually loses 3D matter in the form of free quanta of matter, discarded into the surrounding universal medium. Therefore, an attempt to increase the frequency of a very high-frequency photon beyond a certain limit (about 10^{22} Hz) would cause its 3D matter-core to gradually discard quanta of matter.

The tendency to reduce the linear speed of a photon reduces the internal pressure of its 3D matter-core, which leads to the dispersal of quanta of matter from the photon's 3D matter-core into the surrounding universal medium. The number of quanta of matter discarded from the 3D matter-core of a photon depends on its total 3D matter content. Very high-frequency photons discard a greater number of quanta of matter at higher rates into the surrounding universal medium.

Gradually, when the photon reaches a steady, stable state in a region of universal medium with a gradient in its distortion-density, the number of quanta of matter assimilated into the photon's 3D matter-core and the number of quanta of matter discarded by the 3D matter-core will equalize. In regions where the number of discarded free quanta of matter exceeds the number of quanta of matter that can be readily absorbed into the latticework structures of the universal medium, they form disturbances. If the discarded quanta of matter in the disturbances are in sufficient quantity, they may be used by the universal medium to form new photons and radiate them away from the region. The universal medium will gather, compress, and mould the free quanta of matter in these disturbances into 3D matter-cores of new photons to be radiated in all directions. These photons, radiated from the suitable regions, appear to the inhabitants of the planet as auroras.

A typical auroral display on the earth consists of photons created from the free quanta of matter available in the universal medium in the polar region of the earth (or any other macrobody of considerable size) on its nightside. Although a similar phenomenon takes place on the dayside of the earth, sunlight overcomes the auroral displays on that side. Variations in the 3D matter contents of newly created photons by the universal medium from the free quanta of matter produce effects of different magnitudes and colours of radiation.

Most auroras occur in the auroral zone (a narrow band above the surface of the planets, as shown by the reddish conical region in figure 2) all around the polar region of a planet. They are clearly visible on the night side of the planet, between 10 and 20 degrees above the planet's poles. Photons created away from these regions do not reach the observational points on the planet. It is not necessary for the planet to have an atmosphere or a magnetic field to produce auroral displays.

Conclusion:

Auroras, about any large macro body, are caused by the radiation of corpuscles of light (photons) from the regions of the universal medium, where the structural distortion-density in the universal medium about a body has a gradient. High-frequency photons passing through this region absorb quanta of matter from the structures of the universal medium and discard them free into the universal medium. Further, the universal medium forms new photons from these free quanta of matter. The radiation of new photons from these regions appears as auroras to observers on the surface of a macro body.

References:

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

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