AURORA

According to 'MATTER (Re-examined)'

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Abstract: The 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, which sustains the integrity and movements of its core body. 3D matter-core and the associated structural distortions in the surrounding universal medium, together, constitute a photon. Light (radiation) is a flow of photons (corpuscles of 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. Motion of a very high-frequency photon's 3D matter-core, towards or away from different structural distortion-density regions in the surrounding universal medium, compels them to discard quanta of matter from it. This phenomenon, acting simultaneously on very high-frequency photons radiated from the sun and passing through the vicinity of Earth (or any other moving macrobody), ensure an ample supply of free quanta of matter 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 appear as aurora to us.

This essay very briefly describes the mechanism by which the photons (corpuscles of light) of varying colour and complexity are created during the 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 the same [1].

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

Universal medium:

In the material world, all real entities are made of matter. Light is a real entity; therefore, it is made of matter. Light is observed to move in space at a critical constant linear speed. Matter is inert, and it has no ability to move or act on its own. Therefore, a corpuscle of light, being a composite 3D material body, should 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 to produce its motion, the universal medium has to be a real entity. To be real, a universal medium has to be made of matter.

The alternative concept, presented in the book 'MATTER (Re-examined)', is based on a single assumption: '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 (in proximity to each other) tend to form quanta-chains in straight lines. Quanta-chains in perpendicular directions in a plane form a 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 a universal medium. 2D energy-fields coexist at their intersections and thus fill the entire space (outside the basic 3D matter-particles) without gaps or voids. Due to its latticework structures, the universal medium has all properties of an ideal fluid. Structural distortions (strain) in the universal medium constitute 'work', and the stress due to work (structural distortions) is the energy. Frequent local breakdowns of the universal medium ensure the availability of free quanta of matter and ample opportunities for them to migrate 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. The pressure applied by this stress is the property of gravitation.

The universal medium should not only move the basic 3D matter-particles, but it should also stabilise the variations in their 3D matter contents and maintain their linear and spin speeds, irrespective of external influences that may tend to vary their linear or spin speeds. The universal medium should provide mechanisms for all other properties of real objects (including light), as well.

Local breakdown, in any part of the universal medium, releases quanta of matter from its latticework structures and forms a gap within the structure. Universal medium from all around, under compression, moves towards the centre of the gap to re-establish 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 the latticework structures in the universal medium, it gathers free quanta of matter in the gap to form a 'disturbance'.

The presence of a disturbance in the latticework structure of a 2D energy-field breaks its 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 on a disturbance is a gravitational action. Latticework structures of the universal medium impose certain restrictions on gravitation. 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 actions on a disturbance compress the quanta of matter in it, and convert them into higher spatial states to create a 3D matter-particle that in association with the structural distortions in the surrounding universal medium forms a photon. Corpuscles of radiation (the 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-stabilizing 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 higher distortion-density regions to lower distortion-density regions without moving the structure itself. The transfer of structural distortions (work) in the universal medium carries the most basic 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 the motion of the objects in space.

Since an observer or a 'source-body of light' may move at any speed in any direction, the constancy of light's speed cannot be related to them. An entity, present everywhere in space (and acts on the corpuscles of radiation to move them), is the universal medium. Therefore, the universal medium is 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 body, has all 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 constant angular velocity. Therefore, the structural distortions in the region of the universal medium about a planet continue to transfer it at constant speed along the planet's path.

Photon:

Gravitational action, by the universal medium, on a disturbance is by direct contact between them. During this action, latticework structures of the surrounding universal medium are distorted. A 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 the number of or the size of disturbance(s) in the universal medium to a minimum. This is achieved either by combining the disturbances present in a region or by ejecting them out 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 the greater gravitational effort.

Variation in a 3D disturbance's shape, from a perfect circle in various planes, produces unevenness in gravitational compression on it from all around. In order to establish the 2D energy-field's homogeneity,

structural distortions in it tend to move from the region of higher distortion-density to the region of lower distortion-density. 3D disturbance, held within the gap in the distorted region of the 2D energy-field (inertial-pocket), is also carried along with the structural distortions towards the direction of lower structural distortion-density region in space. Transfer of structural distortions in the universal medium produces inherent linear and rotary motions of every basic 3D matter-particle 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 3D matter-core and the structural distortions in the surrounding universal medium, together, form a photon – a corpuscle of radiation. 3D matter-core provides a photon's particle nature, and the structural distortions in the surrounding universal medium provide its wave nature in each plane.

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. This is the mechanism of motion of the 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 the latticework structures at the rear join back to restore the continuity of the universal medium. Pressure (resistance) from the front, due to a collision between the 3D matter-core of the photon and quanta of matter in the latticework structures of 2D energy-fields, is balanced and exceeded by the ejection efforts on it from the rear. This balancing action maintains the linear speed of a 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 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 a photon's 3D matter-core at this critical level. 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, the motions are assigned to the photon's 3D matter-core for clearer explanation. In reality, a photon's 3D matter-core, being a corpuscle of 3D matter, is incapable of any action or movement on its own. It is the inertial actions of the universal medium about it that move the photon's 3D matter-core]. Inertial-pocket, in the universal medium (similar to a group of electromagnetic waves in each plane) about a 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 a photon's 3D matter-core determines 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 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 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 the 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. 3D matter-cores of all photons have identical radial size. The thickness of their segments depends on the amount of 3D matter they contain.

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 for the rotation of the 3D matter-core. Relative magnitudes of linear effort and torque depend on the instantaneous curvatures of forward and rearward faces of segments of the 3D matter-core. As the thickness of the segments increases with an increase in the 3D matter-content, linear effort reduces and torque increases. The reverse happens when 3D matter-content and the thickness of segments are reduced. As a result, 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 displacements compared to that of the 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, and the rearward rotating segment continuously discards quanta of matter at a slightly higher rate. This phenomenon causes the photons to gradually lose their 3D matter contents. Gradual reduction of the 3D matter content causes a frequency reduction (leading to the phenomenon of redshift of radiation) 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, the 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 linear speed of a photon:

Depending on its instantaneous orientation, gravitational (apparent) attraction between a photon's 3D matter-core and another 3D material 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 this relative speed compels the photon's 3D matter-core to release quanta of matter free from it into the surrounding universal medium. This mechanism sustains a photon's critical constant linear and spin speeds irrespective of external influences. The (apparent) gravitational attraction is the only external 'force' 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. Each photon has a segmented spherical 3D matter-core that spins about one of its diameters. The thickness of the segments is proportional to the quantity of 3D matter in them. Each segment has a convex curved rear face and is almost flat at its forward face. The radial sizes of 3D matter-cores of all photons are identical; the magnitude of convex curvatures of the forward and rearward faces of the segments depend on the total 3D matter-content of the 3D matter-core, and the balance between internal and external pressure at its periphery.

As a photon approaches a higher distortion-density region in the universal medium, resistance to its forward surface is comparatively higher than the driving effort from the rear surface. Higher distortion-density in front of the 3D matter-core produces increasing 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 decelerate it. An attempt to reduce the linear speed of a photon compels its 3D matter-core to gradually discard constituent quanta of matter free into the surrounding universal medium. Continuous reduction in the 3D matter-content (mass) of a photon compensates for the increased resistance from the front to maintain its constant linear speed. All photons in the light from the region of Sun, approaching the Earth lose parts of their 3D matter-content as free quanta of matter in Earth's matter-field and reduce their frequency. If a sufficient number of free quanta of matter are available in a region, they may form new photons, and radiate away in various directions.

As a photon approaches a lower distortion-density region in the universal medium, resistance to its forward surface is comparatively lower than the driving effort from the rear surface. Lower distortion-density in front of the 3D matter-core produces lower resistance to its motion, thereby reducing the interaction between the 3D matter-core and the universal medium. As a result, forward surfaces of segments of the 3D matter-core bulge outwards to increase their convex curvatures. Gravitational actions at the forward surfaces increase to oppose driving effort from the rear face of the segment. The effect on the photon's 3D matter-core is equivalent to that of an attempt to decelerate it. An attempt to reduce the linear speed of a photon compels its 3D matter-core to gradually discard constituent quanta of matter free into the surrounding universal medium. Continuous reduction in the 3D matter-content (mass) of a photon compensates for the increased resistance from the front to maintain its constant linear speed.

All photons in the light from the region of Sun approaching the Earth or moving away from the Earth lose parts of their 3D matter-content as free quanta of matter in Earth's matter-field and reduce their frequency. If a sufficient number of free quanta of matter are available in a region, they form new photons, and radiate away from the region in various directions. This phenomenon has noticeable effects on very high-frequency photons (above about 10^{22} Hz) passing through the Earth's matter-field.

Aurora:

Very high-frequency photons (above about 10^{22} Hz), originating from the region of the Sun and passing through the matter-field of the Earth, lose parts of their 3D matter-content in the form of free quanta of matter, discarded into the surrounding universal medium. Therefore, a very high-frequency photon (above about 10^{22} Hz) moving through the higher distortion-density region (towards or away from the matter-field about the

Earth) in the universal medium would gradually discard quanta of matter from its 3D matter-core. 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.

In the region 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 these disturbances are in sufficient quantity, the universal medium gathers, compresses and moulds the free quanta of matter in these disturbances into 3D matter-cores of new photons to be radiated in various directions from the region. These photons, radiated from suitable regions, appear to the dwellers of the planet as auroras.

A typical auroral display on Earth consists of photons created from free quanta of matter available in the universal medium in the polar regions of Earth (or any other macrobody of considerable size) on its night side. Although a similar phenomenon takes place on the day side of the Earth, sunlight overcomes 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 in the auroral displays.

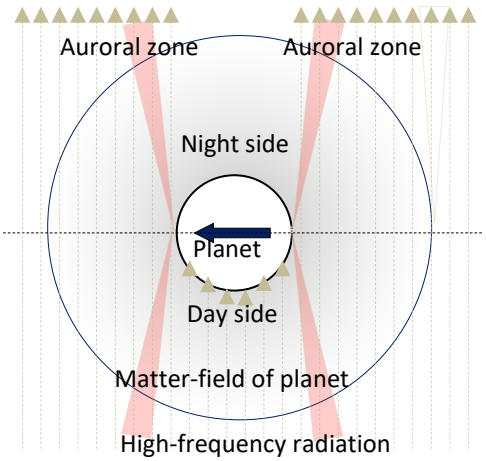

Figure 1

Most auroras occur in the auroral zone (a narrow band above the surface of planets, as shown by the reddish conical region in Figure 1) all around the polar region of a planet. They are clearly visible on the night side of the planet between 10 degrees and 20 degrees elevation from the planet's poles. Photons created in the outer regions do not reach 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 very high-frequency radiation (photons) radiated through the region of the universal medium, where the matter-field of the body has a gradient in structural distortion-density. High-frequency photons passing through this region discard quanta of matter from their 3D matter-cores, free into in the surrounding universal medium. Further, the universal medium forms new photons from these free quanta of matter. Radiation of new photons from these regions appears as auroras to the observers on the surface of the large macrobody.

Reference:

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

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