

CORONAL HEATING PROBLEM

According to 'MATTER (Re-examined)'

Nainan K. Varghese, matterdoc@gmail.com
<http://www.matterdoc.in/>

Abstract: Sun's corona appears much hotter than its surface. The temperature of the coronal region, which is farther from the surface by more than eight times the radius of the sun, is estimated to be over 1 million degrees Kelvin, while the temperature of the sun's surface is only about 6000 degrees Kelvin. (The temperature at the centre of the sun is estimated at about 15 million degrees Kelvin). Earth, with an average 3D matter density of 5515 Kg/m^3 and a mean radius of 6371 km, has an atmosphere that extends to about 700 km (approximately 11% of its radius). Beyond this distance, there is no perceptible concentration of 3D matter-particles. On the other hand, the Sun, with an average 3D matter density of 1408 kg/m^3 and a mean radius of 696,000 km, is determined to have an atmosphere that extends to its coronal region at a distance of about eight times its mean radius (approximately 800% of its radius). It is absurd to think that the sun can sustain a concentration of 3D matter-particles at this distance, with sufficient 3D matter-density that can heat up to the estimated temperature of the coronal region. As contemporary physical theories are unable to explain any logical mechanism that can produce this difference, it is considered a 'coronal heating problem' in physics. Alternative concept, presented in the book 'MATTER (Re-examined)', presents a logical mechanism that can produce the observed radiation from the coronal region (which is far beyond the limit of the Sun's atmosphere).

Keywords: Coronal heating problem, Sun's corona.

Introduction:

The reader, who is familiar with the alternative concept in the book 'MATTER (Re-examined)', will be in a better position to appreciate the contents of this article. For others, in order to understand this brief explanation on the mechanism of coronal heating, it is necessary to take a few conclusions (mentioned herein) for granted. All conclusions presented in this essay are from the above-mentioned book. For details, kindly refer to the same.

The alternative concept mentioned above envisages that unstructured matter exists in the form of small bits – quanta of matter. Quanta of matter form latticework structures of 2D energy-fields, separately in each plane, which extend to infinity and are under compression. Actions by and in a 2D energy-field are limited to its own plane. 2D energy-fields in all possible planes in space, together, constitute the universal medium. The universal medium fills the entire space, outside the basic 3D matter-particles without voids. It accomplishes all actions, including the creation of 3D matter.

Discontinuity in a 2D energy-field compels it to close in on the gap, even if it contains 3D matter. This action is gravitation. The magnitude of pressure applied by the universal medium is proportional to its extent, acting on a basic 3D matter-particle in the gap. The extent of universal medium between two basic 3D matter-particles is always less than the extent of universal medium on their outer sides. Excess pressure on the outer sides and lesser pressure from the inner side compels them to move towards each other, which appears as gravitational attraction. Due to the latticework structures in the universal medium, gravitation acts only on curved surfaces of basic 3D matter-particles.

The presence of too many free quanta of matter in a region breaks down the latticework structures in the universal medium to form disturbances. Latticework structures, closing in on the gap, gather and compress free quanta of matter to create 3D matter. Work done about the 3D matter appears as structural

distortions (inertial-pocket) in the surrounding universal medium. Inertial-pocket moulds the newly created 3D matter into disc-shaped 3D matter-cores. In order to achieve stability, it is essential for the universal medium to move the disc-shaped 3D matter-core at the highest possible (constant) linear speed and spin it about one of its diameters at a speed proportional to its 3D matter-content. Inertial-pocket moves in the universal medium by transfer of structural distortions, while carrying the included 3D matter-core along with it. Disc-shaped 3D matter-core and associated inertial-pocket, together, form a photon – a corpuscle of light or other radiation.

Photon is the most basic 3D matter-particle, and all other 3D material bodies are made by their unions. 3D matter-core provides photons' 3D matter, and the surrounding inertial-pocket appears (in each plane) as an electromagnetic wave. To sustain stability, it is essential for the photons to move at the highest (constant) linear speed and spin at a speed proportional to their 3D matter-contents with respect to the universal medium. An attempt to increase the linear speed of a photon results in its 3D matter-core gaining additional matter-content from the universal medium and thereby increasing its frequency, rather than increasing its linear speed. Attempting to reduce the linear speed of a photon results in its 3D matter-core losing part of its 3D matter-content into the universal medium and thereby reducing its frequency, rather than reducing its linear speed. Radiation (of 3D matter) is a continuous flow of photons. It is classified according to the frequency of constituent photons, heat rays being the lowest and cosmic rays being the highest.

Gravitational attraction between macro bodies is between the 3D matter-cores of their constituent photons. The 3D matter-core of each photon in a macro body experiences gravitational attraction towards the 3D matter-cores of photons in the other macro body, when median disc planes of their 3D matter-cores coincide. At any instant, there are extremely few photons in each macro body under gravitational attraction. This is the reason for the gravitational effort to appear very weak compared to other manifestations of 'natural forces'. In reality, gravitational effort is enormously stronger compared to any of them. A photon experiences gravitational attraction towards another photon, disc-plane of whose matter-core is situated in the disc-plane of its own 3D matter-core, twice every spin.

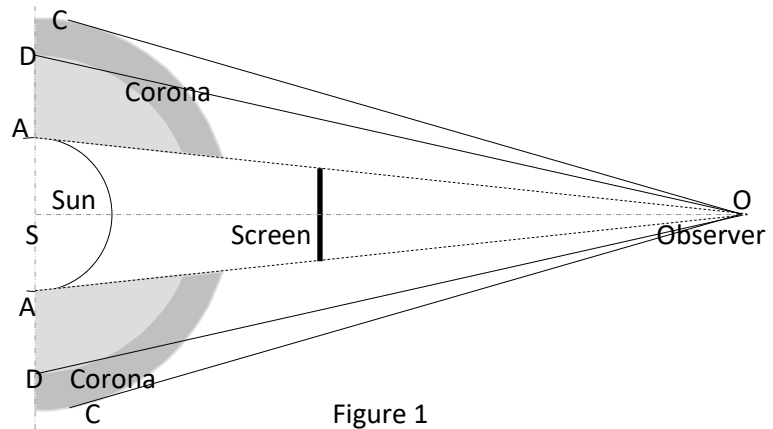
All very large macro bodies are under continuous gravitational collapse. Gradually, increasing the pressure (compression) heats them and produces appropriate radiations from their region. Atomic (nuclear) actions are not required to produce radiation from a large macro body. During compression, primary 3D matter-particles lose 3D matter-contents (in the form of free quanta of matter) from their constituent photons and expand to further increase the internal pressure of the macrobody. Thus, heating is a process of losing 3D matter-content (reducing the 3D matter-content level) of a macrobody. The hotter a macro body is, the lower its 3D matter-content level. With minimum (or no) external pressure (as in free space), a macrobody is at its highest 3D matter-content level (coolest state).

If free quanta of matter, released from primary 3D matter-particles during heating, are in sufficient quantity (more than that could be assimilated into the latticework-structures of 2D energy-fields), they form disturbances that lead the universal medium to create new photons from them. The frequency of photons, created by the universal medium, depends on the rate of availability of free quanta of matter in the region. Greater availability of free quanta of matter causes the production of higher-frequency photons. This, in turn, is interpreted as radiated from a hotter region. However, it should be noted that the availability of higher-frequency radiations from any region does not indicate a direct relation to the temperature (3D matter-content level) of that region of the macrobody. Radiation of higher-frequency radiation merely indicates the availability of free quanta of matter at a higher rate in the region. This could be due to various other reasons also.

Coronal temperature:

A macro body under compression loses 3D matter-content from its primary 3D matter-particles. The rate and quantity of quanta of matter, released free, from the 3D matter-cores of constituent photons, depend on the magnitude of compression. Universal medium gathers these free quanta of matter into disturbances, which in turn are converted into photons and radiated from the region. 3D matter-contents (frequency) of the majority of newly created photons (as dictated by the rate and quantity of free quanta of matter available in a region) tend to form a close band in the spectrum. As compression on the macrobody increases, the frequency of the major part of the radiated photons increases. Let us consider photons radiated in radial directions from the sun's interior region. As these photons move outwards, gravitational

attraction between them and constituent photons of the sun tends to retard them. An attempt to retard a photon tends to reduce its 3D matter-content by discarding quanta of matter from its 3D matter-core, into space. Free quanta of matter form new photons, which radiate in all directions from the region. The region from where a major part of this radiation appears to originate is the coronal region of the Sun. Photon (radiation) received by the observer from the coronal region has no direct relation to the temperature or any other state of the sun. Magnitude and frequency of coronal radiation depend only on the rate and quantity of free quanta of matter available in that region. The temperature of a region on or about a very large macro body (like stars) is assessed by determining the frequency of radiation that reaches an observer from the region. Corona is far away from the outer region of the Sun's atmosphere. The coronal region can be viewed separately only from the sides. Figure 1 represents a plane passing through the centre of the sun and the observer. The sun is represented by a semicircle on the left. A screen (or an eclipsing macrobody) is shown in the figure that blocks direct radiation from the sun's body towards the observer. This prevents all radiation emanating from the region of the sun's body from reaching the observer. The shaded region in the figure represents part of a spherical shell-like region, formed by the corona, around the sun. The region in a darker shade shows the coronal shell in the plane, and the region in a lighter shade shows the inner part of the corona from where radiations of relatively lower frequency are received. Although regions are shown with definite borders, they represent vague separations between regions.



The region, from where the highest-frequency radiations are available, is considered the sun's corona. The highest concentration of radiation corresponding to the corona is available to the observer within the angular sector between lines OD and OC. Hence, the temperature of the corona is determined by measuring the frequency of radiation received from this sector. In other sectors, radiations corresponding to coronal temperature have lower concentrations. The coronal region is very far from the Sun's atmosphere. Magnitudes of all efforts/actions in the 3D spatial system (that radiates spherically) diminish in inverse proportion to the square of distance from the origin. Considering actions in the 3D spatial system, as a photon moves away from the sun, the magnitude of gravitational attraction, F , between them reduces in inverse proportion to the square of the distance between their centers.

$$F = \frac{k_1}{D^2} \quad (1)$$

Where F is the magnitude of gravitational attraction, k_1 is the constant of proportionality that includes their 3D matter-contents and gravitational constant, and D is the distance between their centres.

The magnitude of gravitational attraction between two material bodies is proportional to their 3D matter-contents (not necessarily masses). 3D matter-content is mathematically represented by mass. Due to the highest possible linear speed of a photon, no external effort in the direction of its linear motion can act on it. Although a photon has 3D matter-content, its mass in the direction of its linear motion is infinity, and a photon is generally considered a massless entity. However, external efforts, acting on a photon in directions other than the direction of its linear motion, have appropriate effects on it. When the direction of external effort is in a direction opposite to the direction of its linear motion, external effort is fully effective on the photon, and this effect is exhibited in the form of its mass. G is the gravitational constant.

$$\text{Hence, magnitude of gravitational attraction between photon and sun, } F = \frac{k_1 GMm}{D^2} \quad (2)$$

Where M is the mass (matter-content) of the sun and m is the mass (3D matter-content) of the 3D matter-core of the photon.

As a photon moves away from the sun, it loses part of its 3D matter-content and reduces its frequency. Reduction in the frequency reduces the number of times the disc-plane of photon's 3D matter-core coincides in any one plane. Hence, a reduction in the frequency reduces the average gravitational attraction on a photon in inverse proportion to the distance from the sun. Hence, another factor governing gravitational attraction between a moving photon and the sun is the loss of its 3D matter-content (frequency). However, the effects of this change, being comparatively very small, are neglected in this illustration, as explained below.

Gravitational actions are originated by the universal medium, separately in each 2D energy-field (plane). Hence, gravitational actions and gravitational attractions have a 2D nature in space. For approximate calculation (only for illustrative purposes), we may use the gravitational constant, G , determined for macro bodies in a 3D spatial system, with certain modifications. Gravitational attraction is between a moving photon and each of the constituent photons in the sun, disc-planes of whose 3D matter-cores coincide with that of the moving photon's 3D matter-core. Gravitational attraction between each pair lasts only when disc-planes of their 3D matter-cores coincide. Therefore, although the gravitational attraction from the sun has a 3D nature, the gravitational attraction on a moving photon has 2D nature. The inverse-square law in a 3D spatial system uses spherical space with inverse proportion of D^2 . While considering action in a 2D spatial system for the moving photon, circular space with inverse proportion of D is more appropriate.

Hence, the magnitude of gravitational attraction between the photon and the sun,

$$F = \frac{k_1 GMm}{D} \quad (3)$$

There is an enormous difference between the sizes of the sun and a photon. 3D matter-cores of photons experience gravitational attraction only on the curved periphery in their disc-planes. The 3D matter-core of a photon is of segmented-spherical shape. Moving photon experiences gravitational attraction towards the sun only from the constituent photons of the sun within the angular sector encompassed by the segments of its 3D matter-core. The width of the angular segment of the 3D matter-core depends on the total 3D matter-content of the photon. Let the angle subtended by the segments of the photon's 3D matter-core at its spin axis be equal to 2α degrees. As the photon moves outward, a reduction in 3D matter-content reduces the angle subtended by the segments of its 3D matter-core in space.

The large circle in figure 2 represents the sun, whose radius is R , and P represents a photon, moving away from the sun. P_1 shows the future position of the photon when the whole of the sun is encompassed within the angular sector occupied by a segment of its 3D matter-core. $OP = D$ is the distance between the photon and the sun. Until the moving photon reaches position P_1 , only those photons in a part of the sun's body (apparently) interact with it to produce gravitational attraction between them. At P_1 , the angular sector of the segment of the photon's 3D matter-core encompasses the whole of the sun's body. From P_1 onwards, the magnitude of gravitational attraction between the moving photon and the sun is according to equation (2). But until the moving photon reaches position P_1 , the magnitude of gravitational attraction corresponds to part of the sun covered by a segment of its 3D matter-core. Let us assume the part of the sun, subscribing to the gravitational attraction, is proportional to distance D .

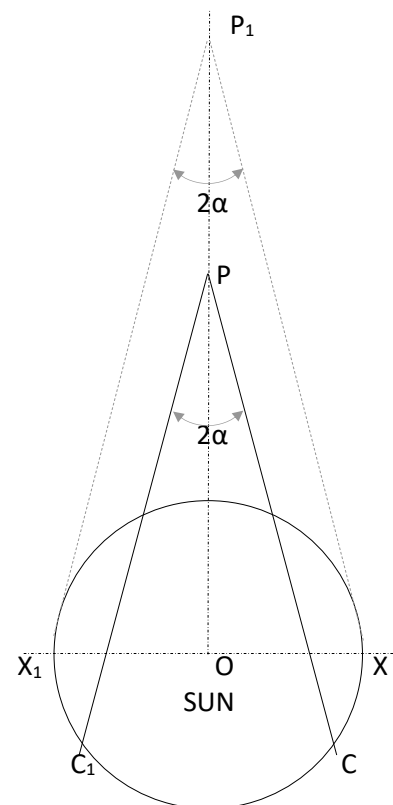


Figure 2

$$\angle OP_1X = \alpha, \quad \tan \alpha = \frac{OX}{OP_1}, \quad OP_1 = \frac{OX}{\tan \alpha} = \frac{R}{\tan \alpha}$$

Let F be the magnitude of gravitational attraction when the photon is at P_1 .

For illustrative purposes (with respect to Figure 3), we may take that the sun's macrobody is homogeneous throughout, and its constituent photons are evenly distributed. The number of photons in any part of the sun's macrobody is proportional to its volume. We shall analyze the magnitude of gravitational attraction when a segment of the photon's 3D matter-core is evenly positioned about the direction of the photon's motion and moving outward along line OP_1 . When the photon is in position P, photons in the part of the sun AA_1C_1C provide gravitational attraction.

$$\text{Volume of sun} = \frac{4\pi R^3}{3}, \angle OPB = \alpha, \sin \alpha = \frac{OB}{OP} = \frac{OB}{D}, OB = D \sin \alpha,$$

$$\text{Height of spherical segment } ABCH = BH = OH - OB = R - D \sin \alpha$$

$$OA = R, AB = \text{Radius of spherical segment} = \sqrt{OA^2 - OB^2} = \sqrt{R^2 - D^2 \sin^2 \alpha}$$

Volume of one spherical segment of sun's macrobody, ABCH

$$= \frac{\pi AB^2 BH}{3} = \frac{\pi (\sqrt{R^2 - D^2 \sin^2 \alpha})^2 (R - D \sin \alpha)}{3} = \frac{\pi (R^2 - D^2 \sin^2 \alpha)(R - D \sin \alpha)}{3}$$

Volume of sun excluded from sweep area of evenly paced segment of photon's 3D matter-core

$$= \frac{2\pi (R^2 - D^2 \sin^2 \alpha)(R - D \sin \alpha)}{3}$$

Volume of sun, whose photons are (apparently) interacting with moving photon to produce gravitational

$$\text{attraction} = \frac{4\pi R^3}{3} - \frac{2\pi (R^2 - D^2 \sin^2 \alpha)(R - D \sin \alpha)}{3}$$

$$\text{Mass of sun, producing gravitational attraction} = K \left\{ \frac{4\pi R^3}{3} - \frac{2\pi (R^2 - D^2 \sin^2 \alpha)(R - D \sin \alpha)}{3} \right\}, \text{ where } K \text{ is}$$

constant of proportion (3D matter-density) between volume and mass.

Magnitude of gravitational attraction according to equation (4);

$$F = \frac{k_1 G m \tan \alpha}{R} \times K \left\{ \frac{4\pi R^3}{3} - \frac{2\pi (R^2 - D^2 \sin^2 \alpha)(R - D \sin \alpha)}{3} \right\}$$

$$F = \frac{k_1 G m \tan \alpha}{R} \times K \left\{ \frac{4\pi R^3}{3} - \frac{2\pi (R^3 - R^2 D \sin \alpha - R D^2 \sin^2 \alpha + D^3 \sin^3 \alpha)}{3} \right\}$$

$$F = \frac{K k_1 2\pi G m \tan \alpha}{3R} \times \left\{ 2R^3 - (R^3 - R^2 D \sin \alpha - R D^2 \sin^2 \alpha + D^3 \sin^3 \alpha) \right\}$$

$$F = \frac{K k_1 2\pi G m \tan \alpha}{3R} \times \left(R^3 + R^2 D \sin \alpha + R D^2 \sin^2 \alpha - D^3 \sin^3 \alpha \right)$$

As magnitudes of m and α are too small compared to M , we may (for the time being) ignore changes in them. As changes in M are at a higher rate than the changes in m and α , gravitational attraction between the photon and the sun gradually increases until the photon reaches the vicinity of position P_1 . After crossing the point P_1 , gravitational attraction between them gradually reduces as per equation (3).

Due to the very large size difference between the sun and the 3D matter-core of a photon, it is not correct to consider the direction of gravitational attraction between a moving photon and each of the photons in the sun's macrobody as acting in a direction opposite to the moving photon's motion. Parts of gravitational attraction on the photon's 3D matter-core are available in various directions spanning across the macrobody of the sun. The direction of (whole of) gravitational attraction becomes directed towards the centre of the sun only when the distance between them is such that the whole of the sun's macrobody is included within the angular sector covered by the segments of the photon's 3D matter-core. Angular sectors of high-frequency photons, below the range of gamma rays, are less than one degree of arc in width. Hence, results may be further refined by modifying equation (4) for the component of gravitational attraction in direct opposition to the direction of the photon's linear motion.

As the sun is a gaseous macro body, it has no definite border to mark or measure distances from its surface. The distance to the sun's coronal region from its surface is currently estimated as about eight times the sun's radius. To create a coronal region at this distance, the majority of photons radiated from the region of the sun should have a near or about 14° width for segments of their 3D matter-cores. This corresponds to a frequency of about 2×10^{20} Hz . Photons, above this range of frequency, are fewer, and they would have crossed the threshold of the highest gravitational attraction before reaching the coronal region. Quanta of matter released from them, being fewer in quantity, would form photons of a lower frequency range. Residual parts of photons would pass the coronal region as radiation in the range of gamma/cosmic rays.

Conclusion:

Sun's coronal heating problem is the result of misunderstandings of certain fundamental physical phenomena. Although the frequency of radiation from a hot body may be related to its temperature, radiation of various frequencies from a region in space may be produced by other means also. Hence, it is not correct to assume a direct relation between the frequency of radiation and the temperature of the (radiating) macrobody in all cases. The temperature of the sun's macro body has no direct relation to radiation from its coronal region. These radiations originate in the coronal region, where 3D matter-particles are not present in any appreciable concentration.

Radiation is a continuous flow of photons (corpuscles). Due to the particular shape of photons' 3D matter-cores, a very large difference in sizes of photon and sun, and peculiarity of gravitational actions, gravitational attraction between the adiated photons and the sun's macrobody gradually increases until photons reach the coronal region and decrease after they cross the coronal region. Gravitational attraction, being in the opposite direction to their linear motion, tends to retard the photons in radiation. An attempt to retard a photon compels its 3D matter-core to discard quanta of matter and reduce its 3D matter-content. Free quanta of matter in space form photons. The highest rate of availability of free quanta of matter occurs in the coronal region, and hence, photons formed in that region are of very high frequency. Radiation of high-frequency photons from the coronal region, which is very far from the sun's surface, is misunderstood as radiation produced by heating from the sun.

Reference:

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

* * * * *