Big Bang or Tired Light Cosmology

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Abstract

An explanation of gravity consistent with tired light theory is given. Tired Light theory is contrary to Big Bang theory according to a Tolman Brightness Test. Nonetheless, possible unification of theory is here proposed with regard to relativistic nullification of effect and according to the probability condition of quantum physics.

Explaining Gravity

If gravity is some form of radiation, as consisting of gravitons, how does a graviton continually gravitate mass and maintain conservation of momentum? For an explanation, consider gravity results as a vacuum effect occurring in the wake of emitted radiation that is created, say, from the conversion of matter and antimatter of the spacetime medium. The escaping radiation is nearly invisible in resulting in a vacuum effect (as gravitational effect) from the wake of its emission.

The reason radiation is invisible is because it is able to occupy the same space whereas matter cannot. Such invisibility is typical of wave action. Waves can superimpose to produce visible effect only if the medium of wave action changes in a way it becomes observable. If the total action within a space large enough to be measured is counterbalanced, then no change of the medium need be seen.

Although light is invisible to other light, as massless effect, it still has momentum with regard to the presence of mass, and sometimes it even converts to mass by interacting with it. Mass in relative motion is relatively greater than mass relatively at rest. If the relative motion is caused by the reflection of light, then light loses energy in increasing the mass it reflects. There is also the Higgs Mechanism to consider whereby massless particles similar to light become mass by moving slower through the Higgs Field. Light also moves slower through a gravitational field, but an increased mass effect is nullified by matter also moving slower in the field and itself increasing in mass-energy. More in general it is assumed vacuum space is not empty but contains instead a virtual energy field whereby massless particles moving at light speed are somehow slowed for them to convert into a new form, mass.

As for non detection of radiation by matter, in quantum physics there is a virtual field of energy that is detectable according to the quantum probability of the virtual field. According to the Born rule, a quantum wave function is interpreted as a probability amplitude (measure of change) for detecting a particle within a given time and/or a particular location. The probability of detection can be extremely slight. Billions of neutrinos, for instance, move through our bodies every second, but Earth only detects a few of them. Neutrinos are thus virtually invisible for the most part.

As for the difference between light and mass, suppose mass is an equilibrium state of light waves moving at light speed and crossing paths from every direction. It is contained by not allowing other waves to pass through it. It allows some of the waves to pass through while it reflects others in maintaining its form. The form itself is also capable of moving through space at different speeds, as does mass. How this free motion is possible is according to its particular state of equilibrium. If in motion, then it reflects less energetic waves counter to the direction of relative motion in allowing the more energetic ones to pass through, and it reflects more energetic waves arriving in the direction of relative motion in allowing the less energetic ones to pass through. In effect, mass itself is wavelike motion moving through quasi-vacuum space as its medium of propagation.

Suppose that this new wave form of energy has additional properties, such as further converting energy of the spacetime medium to gravitational energy, as constantly in proportion to the amount of mass according to the principle of equivalence. Also consider the probability of detecting this massless gravitational energy is extremely slim in providing a vacuum effect in the wake of its emission. It thus converts into a new form of energy that is only detectable as gravitational effect. Since it does not directly change the motion of other matter, it does not violate conservation of momentum. Moreover, the extremely slim probability of its detection renders it as a long range effect consistent with the force of gravity being relatively weak compared to the electrostatic force of such atomic masses as that of the electron and proton.

If our observable universe is a finite anomaly of an infinite source of virtual energy, then the supply of energy converted to gravitational radiation could be indefinite, such that there could be no observable effect of its recycling back into its original form after escaping the anomalous field of mass and gravity. However, there could be observable momentum effect for it recycling back into its original form before leaving the confines of our observable universe. Perhaps it recycles back as dark energy to cause the universe to expand at a greater rate, as consistent with Einstein's cosmological constant as a repulsive force. This effect could occur if the recycling is between galaxies where gravitational fields neutralize in becoming a homogeneous state. On the other hand, if our universe is infinite in extent, then the radiant energy recycling back into its original form is merely an equilibrium state of existence. It would be consistent with a tired light theory of a multiverse of an infinite amount of finite universes with each observationally separated by the life span of tiring light, which could vary with a variation of its original energy for a more complex observation of the universe.

Tired light theory is now considered to be at odds with big bang theory, as established, but here it is proposed that they can be equated as parts of a more general, unified theory.

The Big Bang

When Edwin Hubble published, in 1929, his findings of a redshift in starlight as proportional to distance, two explanations were offered. Georges Lemaitre had already proposed in 1927 the idea that the universe is expanding. According to the Doppler effect, there is a redshift in the spectrum of light if the source is receding from the observer. Since there is a linear increase in the redshift in the spectrum of starlight per distance, greater recessional speeds of stars and galaxies are evident. The redshift is also explainable as a partial loss of energy while moving through space, but a Tolman Surface Brightness Test offers further distinction of effect between the two causes.

The Tolman Surface Brightness Test proposed by Richard C. Tolman in 1930 correlates redshift with light intensity in distinguishing further difference of effect between an expanding universe from one that is static according to tired light theory. As light spreads from the center of its source, the outer surface area of an imaginary sphere encompassing it increases per distance squared, such that light brightness, or light intensity, also decreases per distance squared. This condition applies to both Big Bang and Tired Light theories, but there is an additional factor with regard to the recessional motion of the Big Bang theory. Greater recessional speed also adds distance of separation between light emissions to further decrease the intensity per distance. Since the additional intensity decrease is in proportion to distance and speed, the total decrease in intensity per distance is in proportion to the third power of distance. Observational data now complies with a power of 2.6 or 3.4, which is more favorable with such expansion models as that of Bruzual & Charlot.

The main feature of big bang theory is it provides a time frame for the evolution of the universe in accordance with how heavier elements of matter have formed from a cooling of the universe because of its expansion. The present age of the universe is now claimed to be about 13.8 billion years old. This age correlates somewhat with a singularity wherefrom the universe expanded from its seemingly no volume space. Shortly after the singularity expanded to a particular volume, its cooling allowed matter to form from a plasmatic state of such atomic particles as electrons and protons. The most distance light sources thus reveal an earlier epoch of the universe, as back to its earlier creation of matter.

As with regard to the time scale of an expanding universe, uniquely the radius $R = c/H \approx 1.3 \times 10^{28}$ centimeters is an upper limit for radius R of the observable universe at present, as where light speed c per Hubble Constant $H \approx 70$ kilometer per second per million parsecs. Dividing R by c obtains a time of about 4.4×10^{10} sec $\approx 7.3 \times 10^{15}$ min $\approx 1.2 \times 10^{14}$ hr $\approx 5 \times 10^{12}$ day $\approx$ 13.8 billion years. By Euclidean space and time, if an expansion of the universe occurred from a singularity to radius R in 13.8 billion years.

The material universe created is somehow unique with regard to a Cosmic Principle whereby it is isotropic and homogeneous on a relatively large scale. By homogeneity, large scale density is the same near center as it is near the outer edge. By isotropy, it appears the same in all directions whether the observer is nearer to center or nearer to the outer edge. How it can appear isotropic to an observer at the outer edge is conditional to general relativity theory whereby the path of light is curved due to the presence of mass. However, on a smaller scale, the material content of the universe is neither isotropic nor homogeneous, as various stars and galaxies vary in amount of mass and its density here and there.

Relativistic Nullification

The condition of homogeneity is consistent with the principle of equivalence of general relativity with regard to the relative distribution of mass in the universe. Einstein initially related gravitational free fall to inertial motion with regard to no internal awareness of gravitational acceleration because all mass falls at the same rate for the observer to maintain in uniform motion with the falling environment. However, the inhomogeneous nature of gravity results in tidal effects. Ocean tides on Earth occur while in free fall with the moon because of some parts of Earth being closer to the moon. It is thus only on a larger scale that gravity from opposite directions counterbalances for more homogeneous effect.

According to general relativity, spacetime is curved due to the presence of mass (as gravitational effect). Conversely, spacetime curvature indicates the possible presence of mass. However, if all mass were distributed evenly throughout all of space, such that gravitational effect in one direction nullifies the same amount of gravitational effect in the opposite direction, then there is, in effect, no spacetime curvature and no indirect appearance of mass as such, unless it be dark matter and dark energy. (A large homogeneous field of gravity could still be inhomogeneous on an even larger scale, as to attract a more distant universe.)

The singularity itself is derived from the Schwartzschild Metric, which is a particular solution to Einstein's field equations. In ignoring polar coordinates, the metric is of the form

$$ds^2 = \left[1 - \frac{2Gm}{rc^2}\right] c^2 dt^2 - \left[1 - \frac{2Gm}{rc^2}\right]^{-1} dr^2 \tag{1}$$

The interval ds is merely the result of how the simultaneity of events compare with constant light speed. $2Gmr^{-1}$ equals the Newtonian escape speed squared at distance r from center of mass m. $[1 – 2Gmr^{-1}c^{-2}] = β^2$ is a relativistic factor squared for gravity in comparison for one squared for relative motion, as $β^2 = [1 – v^2c^{-2}]$, where v equals the escape speed at radius r of the gravitational field.

One particular indication of the Schwartzschild Metric is that light speed is relatively slower in a gravitational field by the relativistic factor squared, as in accordance with the principle of simultaneity determining a difference between light speed and relative motion of matter in the field. If the event of relative motion pertains to a photon moving at light speed, then the interval ds becomes zero such that light speed in the gravitational fields calculates in the manner

$$0 = dt^2\beta^2 - dr^2\beta^{-2} \tag{2.1}$$

$$dr^2\beta^{-2} = \beta^2 \tag{2.2}$$

$$\frac{dr^2}{dt^2} = \beta^4 \tag{2.3}$$

$$\frac{dr}{dt} = \beta^2 \tag{2.4}$$

Light speed is thus slower in a gravitational field by the relativistic factor squared. In contrast, c·dt is only shorter by the relativistic factor, and dr is only greater by the relativistic factor. These factors uniquely cancel each other in a way there is no local observance of relativistic gravitational effect in the field.

Consider an orbital distance r of the moon around Earth in time t as representing a natural clock. The moon's orbital speed in proportion to light speed is also slower by the relativistic factor squared, but the orbital distance is shorter only by the relativistic factor. Orbital time is thus longer by the relativistic factor such that earthlings with slower clocks by the factor detect no difference of local events whether the observers and Earth are inside or outside the sun's gravitational field. Because clocks are slowed by the relativistic factor, and because orbital distance is shorter by the relativistic factor, their measure of orbital speed and light speed is the same as if in gravitational free space, even if the spacetime of the field is a singularity. (It is non-local observers in gravitational free space outside the sun's field who determine events in the field as different.)

As our observable universe expands, even from a singularity, we on Earth should still measure events according to the adjustment of our distance and time scales coinciding with the expansion of the universe. The only differences should occur because of a local change of state. An increase in mass and gravitational strength of our solar system, for instance, still effects how we perceive spacetime and mass apart from our solar system. Our local state thus determines a changed state of the universe at large. (In this sense, conservation of mass-energy only applies if the relative state of the observer also determines what and how it is observable in compliance with the principle, as if a part of the universe that appears from one state of existence is not necessary the same part appearing from another state of existence.)

A Cosmic Coincidence

This constancy of the singularity, or black hole, might itself explain a remarkable coincidence of a theoretical recessional speed per light speed for distance $2r_a$ between centers of two touching hydrogen atoms, each of mass m_a and radius r_a, as seemingly equaling the ratio between their gravitational and electrostatic forces:

$$\frac{H_1(2r_a)}{c} \cong \frac{Gm_a^2}{e^2} \cong 8.08 \times 10^{-37} \tag{3.1}$$

By dividing by r_a and multiplying by the electrostatic unit of charge e squared, equation (3.1) becomes

$$\frac{2e^2}{c} \cong \frac{Gm_a^2}{r_a} \tag{3.2}$$

By substituting R for c/H, equation (3.2) becomes

$$\frac{2m_a}{R} \cong \frac{Gm_a^2}{r_a} \tag{3.3}$$

By substituting parameter $m_a v^2 r_a$ for e^2, where $cv^{-1} = \hbar ce^{-2}$ is the fine structure constant, equation (3.3) becomes

$$\frac{2m_a v^2 r_a}{R} \cong \frac{Gm_a^2}{r_a} \tag{3.4}$$

By diving both sides of equation (3.4) by r_a, it becomes

$$\frac{2m_a v^2}{R} \cong \frac{Gm_a^2}{r_a^2} \tag{3.5}$$

The centripetal force of two hydrogen atoms at opposite ends of the center of the observable universe thus equates with the gravitational force between two hydrogen atoms within the radius r_a.

If the universe expands, then the value of the Hubble Constant should decrease as the distances of galactic separation increases. It could be maintained according to the relativity of the singularity and the cosmological principle. Another possibility is that the Hubble Constant is a parameter with regard to a multiverse containing an infinite number of finite universes each observable from within according to the Hubble Constant for relative distance parameters for various magnitudes of light energy.

Cosmic Background Radiation

The CMB is assumed by big bang theory as a cosmic microwave background radiation that existed even before the creation of mass. Since its density decreased along with the expansion of the universe, its temperature has also decreased to 2.8 degrees Kelvin, according to conditions of blackbody radiation. The intensity of blackbody radiation is proportional to the fourth power of its temperature. Moreover, the energy density of the hydrogen nucleus is greater than the energy density of the hydrogen atom also by the fourth power, as having about 1836 times more mass within a cubic volume of space with about a 1836 times smaller radius.

Incidentally, a relativistic effect to the fourth power also appears evident with regard to the ratio of gravitational and electrostatic forces of the hydrogen atom with regard to a distance per second of a drift velocity approximating to CMB wavelength. The fourth power effect approximates in the manner

$$\frac{m_a u^2}{m_a c^2\left[1-\frac{u^2}{c^2}\right]} - \frac{m_a u^2}{m_a c^2} \approx \frac{m_a u^4}{m_a c^4} \approx \frac{G m_a^2}{e^2} \approx 8.0 \times 10^{-37} \tag{4}$$

The effect further relates to an average velocity of an atomic particle moving in a particular direction of an electric field, which is referred to as a drift velocity. For an electric current of three amperes moving through a cubic meter of copper wire, the drift velocity is calculated as 0.00028 meters per second. The velocity $u \approx 0.284$ meters per second is about a thousand times greater than the drift velocity of the copper wire, but the copper wire is about 10^6 times denser than the hydrogen atom. Since velocity u in the above approximation is in proportion to the square root of mass, it approximates very close to CMB wavelengths.

Further rationale for the drift velocity itself is with regard to the Druid Model and Ohm's Law. Paul Drude proposed colliding electrons move in zigzag paths while drifting in the opposite direction of an electric field. Ohm's Law is sometimes expressed as a current density per *frictional* resistance.

The fourth order effect has been proposed by such theorists as Charles Lucas Jr. He derived it according to a combination of the Lorentz Force and the Coulomb force. His formula has relativistic factors even though he himself denounces relativity theory.

Tired Light

As an alternative to a finite universe expanding, Fritz Zwicky suggested the redshift occurs due to light losing energy as it moves through a cosmic dust, which Tolman referred to as "tired light theory". However, with such findings with regard to the Tolman Surface Brightness Test and the discovery of the CMB, tired light theory was discarded eventually in favor of the big bang. However, Tolman's analysis is according to how the nature of the interaction of light with its spacetime medium is interpreted. By tired light itself, the intensity of light is determined by distance squared and the number of photons emitted regardless of how the energy of photons is partially lost through space. If all light loses the same amount of energy with each collision, then twice energetic light moves twice as far to lose twice as much energy. The redshift is thus linear with distance for all light.

To the contrary, if the partial loss of light energy is in proportion to the energy density, such that higher frequency light interacts more frequently with its spacetime medium to lose more energy, then the actual distance per redshift is non-linear. If starlight loses half its energy e_2 at distance d_1, then it loses the rest of its energy e_1 at distance d_2. If $e_2 = 2e_1$ and $d_2 = 2d_1$, such that $e_2 d_1 = e_1 d_2$, then half the distance for no longer twice energetic light is the same as that of the other light while the rest of the distance for twice energetic light losing it twice as often is half that of the other light. The total distance of the twice energetic light is thus one and a half times in comparison to it being constant with regard to its initial rate of loss. If the initial loss coincides with the Hubble Constant scale, then the total loss is of a longer distance. Stars are thus closer than what they appear to be according to the Hubble Constant scale, which could indicate the actual universe is smaller than what it appears to be, such that galactic rotations at their outer edges are not as fast as they appear. On the other hand, if the final loss of light energy is more consistent with the Hubble Constant scale, then the observable portion of the universe as a whole could be relatively larger than what it appears to be, as for greater mass for the same relative density, and as to approach a critical mass density without the need of dark matter.

In view of big bang theory, observation now indicates the rate of expansion has somehow been increased after half the age of the universe from now instead of having decreased due to the longer distance between light sources now at longer distance apart from each other. Dark energy is suggested as the cause of this increase. Furthermore, a Scientific America article "Mystery of the Hidden Cosmos" (Volume 313, July 7, 2015) by Bogdan A. Dobrescu and Donald Lincoln suggests the universe consists of a complex form of dark matter and dark energy in order to explain, in compliance with theory, abnormal effects as galactic motion too fast within clusters of galaxies, distribution of too much matter of colliding galaxies, gravitational curving of light from more distant sources, the spiral motion of galaxies too fast for their observed amount of mass, and why mass density on a larger scale of a more homogeneous condition of gravity is generally lacking. A particular condition required of this dark matter, which the authors points out, is that it must be electrically neutral in order not to absorb or emit electromagnetic radiation that is ordinarily absorbed and emitted by matter.

Dark matter thus absorbs and emits dark-light energy, but it is more complex than that of a single particle in order to explain various effects. The dark matter and dark energy must indeed be complex in order to explain its need to both accelerate the rate of expansion and increase gravitational attraction for faster rotations on the larger scale. It exists more inside the universe to push galaxies apart and not contain them from dark energy source outside the universe of infinite spacetime.

Cosmic Unity

Another possibility with regard to tired light theory is that some photons are completely absorbed by the medium of space for a reduction in relative intensity similar to that due to recessional speed. If it is relatively the same in effect, then whether the observable universe is either expanding or static is relative itself. Such a condition would relate to the probability condition of quantum physics inasmuch as a variable state of plasma in intergalactic space has a minute probability of converting whole photons into other forms of energy.

There has of yet been no direct confirmation of either dark matter nor dark energy among the countless different theories of it. It could exist, but if the stars are not as far away as they appear according to big bang theory, but are according to tired light theory instead, then speeds on the larger scale are not as fast as they appear. Moreover, if the universe is relatively denser, there might not be any need for either dark matter nor dark energy. Tired light thus appears to be a simpler explanation of observation than is big bang theory. However, more energetic events are more rare, but they are still predicted to occur according to the probability conditions of quantum physics, as does our observable universe occur one in every 13.8 billion years. Both explanations might thus be part of an all embracing more general theory, such as with regard to a multiverse.