Modifying Relativity Theory

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CONTENT

1. INTRODUCTION

This document is a modification of both special and general relativity in that one-half lightspeed instead of lightspeed is the upper limit of attainment for mass. According to a Schwarzschild metric, light propagates slower within a gravitational field. Although there are deniers of slower lightspeed occurring in a gravitational field, there is confusion of Albert Einstein (1879–1955) explaining gravity simply as spacetime curvature with no explanation of curvature itself. Local clocks are slower in a gravitational field and light needs to be slower for it not to be perceived as faster. Although gravity can curve light for there to be blackholes, it slows lightspeed as well. Modification of theory regarding its slowing resolves such paradoxes as to why the universe is able to expand contrary to the blackhole condition whereby not even light is able to escape.

Einstein stated theory only needs to be mathematically formulated, but correct interpretation of mathematical application is required in order to ensure truth of its particular application. It can be misleading according to interpretation. Although one plus one is correct for counting two apples, it can be misleading in other respects. For instance, is the square root of one either plus or minus one or plus or minus ten? If the number one denotes a meter, which equals one-hundred centimeters, then its square root equals ten centimeters. Similarly, surface area and volume vary with variance in size. If the side length of a square is one, then the total area of a cube of six sides equals six squares whereas its volume is merely one cubic unit. However, in terms of centimeters instead of meters, the ratio of area to volume is six-hundred square centimeters to one-million cubic centimeters. The ratio of surface area to volume is 6/1000 instead of 6/1.

Area ratios themselves need to be compared to other volume ratios. The ratio of surface area ratios to the volume ratios is the same either as meters or centimeters in that the ratio of ten meters to a meter is the same as the ratio of a thousand centimeters to a hundred centimeters.

The gravitational constant G is an example of proper comparison between chosen units being of the same outcome. If units of measure are of grams and centimeters, its numerical value is of the order G^{-8}. If they are of kilograms instead, its numerical value is of the order G^{-11}. Results of measurement are the same if mass and radius units of what is being measured are the same as those determining the value of the constant. Even though there is Boyles Law relating surface area and volume to temperature and pressure, and temperature and weight became included as opposing variables determining the nature of mass according to its atomic structure, there is no apparent misuse as of yet according to chosen units of measurement.

Internal mass-energy itself is according to lightspeed squared: mc^2. The Standard Model of physics has yet to include gravity as consistently explained according to how it interrelates with electromagnetism and quantum forces of the atom. Although there are such mathematical implications of variable lightspeed in a gravitational field, unification of gravity with light energy is only indicative, not being accepted as verifiable according to observation. A particular claim to its non-unification is of the complexity of virtual particles associated with quantum physics and the difficulty of including a graviton as a particular virtual particle. Its minute effect is too difficult to accurately detect and measure in comparison to atomic and electromagnetic effects. Various proposals of unification have not been verifiable in view that gravitational force between an electron and proton is about 10^{40} times less than electromagnetic force. However, there have been reasonable contributors worthy of consideration that are to be noted of.

Modification of general relativity is only with regard to the slowing of lightspeed by gravity. It is only locally nullified to be perceived as lightspeed because of contraction occurring of mass and measuring rods, and because of clocks being slower within the field. Further analysis indicates that an escape speed of one-half lightspeed is only obtainable as an upper limit instead of lightspeed itself. The one-half lightspeed upper limit is somewhat speculative according to the Schwarzschild metric, but indications of it are here considered reasonable enough for them to provide more indebt explanation of theory.

Similar modification of special relativity is included. A main difference between special and general relativity is only that light in the gravitational field is actually slower whereas spacetime is only what varies according to relative motion. In both cases, the reason given for one-half lightspeed as an upper limit is it pertains to more energy needed than is available to accelerate to an energy level higher than the upper limit of one-half lightspeed.

Modification of relativity theory is only of this upper limit condition. Other conditions are maintained. However, how they apply to a more complete unification of all theory is of further consideration. The upper limit of one-half lightspeed consists of itself paradoxes to be resolved. Light itself is an energy source of some kind of containment perceived as moving at lightspeed. It needs to somehow differ from the nature of gravitational mass and the atomic structure.

More explanation here includes historical development of theory from Newtonian mechanics to quantum physics, and with inclusion of Hubble cosmology either of an expanding universe theory or of a tired light one.

Possible explanation of gravity itself has been given according to vacuum effect along with wave action. It is continued here as such. Interrelation of gravity with electromagnetism and quantum theory is further explained in manner consistent with Hubble cosmology. Unification of theory is then considered as a possible outcome.

2. EXPLAINING GRAVITY

Newton was critical of himself for not being able to explain the cause of gravity by particles directly acting on other particles. Attraction by vacuum effect is a reasonable alternative, but it is also more complex. Total momentum of collision between incoming and outgoing particles somehow needs to counterbalance.

A reasonable alternative to particle action is wave action. It is possible for waves to pass through undetected for vacuum effect to occur. Energy waves can superimpose to pass through each other undetected whereas different particles of mass cannot occupy the same space. Gravitons and photons can thus be waves of zero mass according to particular circumstances. Ocean waves, for instance, have no resulting mass momenta if there is no difference in momenta before and after they move on top of a surface area. As for wave conversion from non-massive to massive particles, there is a Higgs mechanism that applies to photons of light but not to gravitons of gravity whose constant action results as constant change in mass momenta.

Gravity is explainable according to massless gravitons gradually converting into a positive form of energy needed to push inward for vacuum effect to occur along with maintaining the atomic structure of matter. Waves can become wave packets by means of their superimposing. They can also be emitted or reflected, and the emitted waves could be partially absorbed by the medium of space for the accumulation of outside positive energy needed for vacuum effect. A particular quantity of mass as a wave-packet is thus emitted to become partially invisible except for gravitational effect.

Conditional to vacuum effect is also the second law of thermodynamics known as entropy. William Thompson (1824–1907), also known as Lord Kelvin, provided an example of how it relates to disorder: Two stones of the same temperature cannot directly alter the other. It is because they reside within a particular state of equilibrium that only changes by means of intrusion by an outside source partly residing in a different state of equilibrium.

Equilibrium states exist. For example, we humans maintain one of a temperature being about ninety-eight degrees Fahrenheit.

Such equilibrium states are visible by various interactions. We experience differences of temperature and can determine particular outcomes of it. However, interaction between one type of virtual particles with another type can be either a visible or invisible result, and the assumed existence of the ethereal medium is invisible inasmuch as its primary existence is not directly determinable, but it somehow interacts with itself to combine in ways for observable effects to occur within itself.

Gravitons can be invisible except for gravitational effect. After being newly created, the form of the new energy interacts within the equilibrium states of a medium to gradually convert into a positive form of energy in manner of a recycling process whereby the lost mass-energy for gravitational effect occurring as vacuum effect by previous loss of mass-energy is immediately replaced in order for it to be in compliance with conservation of both mass and energy.

Such a recycling process is explainable, but no acceptable wave theory had been developed in Newton's time. He was thus critical of a needed medium for wave action to occur, suspecting it could interfere with the natural motion of the planets. It was not until the 19th century for a wave theory to develop in manner of being able to consistently explain experimental results. Accordingly, the numerical value of lightspeed in gravitational free space was determined to be nearly exactly the same as its present determination.

Wave theory developed whereby the superimposing of wave effects became measurable. Thomas Young (1773–1829) considered allowing light to pass through two tiny holes for effects of their superimposing to be detected on a screen. With lightspeed being extremely fast, it needs to pass through two tiny holes of a screen close enough for the superimposing effects to appear on the screen. However, such effects were unexpectedly identified as transverse waves instead of longitudinal ones, and it was not understood at the time as to how transverse waves moving along a rope or on the surface of water can proceed inside such a three dimensional medium similar to sound waves moving through air as longitudinal ones.

Still, wave theory of light developed in relation to electromagnetism. Hans Christian Oersted (1777–1851) discovered a possible connection between electricity and magnetism whereby an electric current within a wire reflects a magnetic needle. Michael Faraday (1781–1867) also discovered a changing magnetic field induces an electric current in a wire. With such natural forces as wind moving magnetic poles of the electric current, it produces even more current that is now referred to as green energy. Jean-Baptist Biot (1774–1862), Felix Savart (1701–1841) and Pierre Simon Laplace (1749–1827) also equated lightspeed according to a constant c equal to a unit of charge e passing through a particular property of space analogical to a section of wire of length d per time t. James Clerk Maxwell (1881–1879) formulated an electromagnetic theory whereby material wires are not needed for the passage of electricity. It was theorized that light propagates through an electromagnetic field contained within the continuum of space as a medium referred to as ether.

With light determined to move at constant speed c through its space medium, it was then questioned as to whether the medium itself either moves or remains in place. Contrary results were detected from different experiments. To explain them according to a single theory, Hendrik Lorentz (1853–1902) proposed that the equilibrium state of ether remains at absolute rest while the length of mass contracts in the direction of motion for nullification of effect. The contraction equalizes the distance moved of lightspeed from that of straight forward and back to that of sideways and back. This principle in particular, along with clocks in relative motion being slower, was formulated by Einstein as his special theory of relativity. He formulated it according to two particular postulates: 1. Lightspeed propagating through the medium is locally perceived as relatively constant regardless of what the inertial velocity of the observer in relative motion is in relation to any other observer's perception of it. 2. The laws of physics are the same in all inertial frames, being covariant.

Covariance is a particular aspect of these postulates. It applies in manner of lightspeed being perceived the same no matter what is the inertial speed of the observer. Its equilibrium state is conditional to symmetry whereby asymmetrical conditions of acceleration provide paradoxes to be resolved. A particular one is known as the clock paradox. How is it that an observer can move away from another one, stop, return and find out that its clock had been the slower one? Symmetrical covariance is according to the stay-at-home observer accelerating instead to catch up with the other one. The amount of acceleration is the same either to higher speed or reverse in direction.

Gravity is another form of acceleration with similar paradoxes, such as the blackhole one. Its derivation is according to a Schwarzschild metric that is here applied in manner of obtaining a resolution of the blackhole paradox being contrary to an expanding universe theory.

3. BLACKHOLE PARADOX

There are other paradoxes to consider because of gravity being another form of acceleration. A particular one relates to the blackhole condition included in general relativity according to the Schwarzschild metric proposed by Karl Schwarzschild (1873–

1916). Derived from it is the condition that no energy can escape from a gravitational field if its escape speed is the same as lightspeed. As to why photons moving at lightspeed are unable to escape, it is due to lightspeed decreasing in opposite ratio to increase in gravitational field strength.

Lightspeed c is slower within a gravitational field according to the Schwarzschild metric even though Einstein proposed it is constant according to spacetime curvature with regard to gravitational effect. The slowness is merely nullified by slower clocks and shorter measuring rods. Slower lightspeed c' is thus according to speed c multiplied by a relativistic factor squared: $c[1 - 2GM/Rc^2] = c'$. The number one minus escape speed squared per lightspeed squared of mass M at radius R comprises the relativistic factor squared in the manner G is the gravitational constant and 2GM/R is escape-speed squared for mass M of radius R. If gravitational escape-speed-squared is $2GM/R = c^2$, then c' is zero speed for no possibility of escape to occur by internal means.

This blackhole result is reversible by means of more presence of outside mass nullifying inward gravitational attraction. If all mass could be evenly distributed throughout all of infinite space, then all gravity would cancel out. The blackhole is therefore not necessary a permanent condition of reality. However, zero lightspeed includes infinitely slower clocks and zero length measuring rods. There is thus the paradox of mass-energy becoming non-existent except for non-local gravitational effect, which includes perception from the center of the blackhole due to counter effect of its own mass resulting in zero gravity at its center.

Lightspeed is thus faster either nearer to the center of mass or farther away from its surface. There is possible symmetry regarding inward and outward acceleration, and another indication to consider is that of a stable state of equilibrium that can form into a particular volume of mass regarding how atomic particles exist. There is also an astronomical indication according to the expanding universe theory whereby observers at the edge of the observable universe are able to perceive themselves as being at its center instead. However, the infinite time and zero length paradox still needs resolution for fully understanding its possible truth.

Lightspeed either within gravitational free space or at the center of mass is c. Its perception within a gravitational field is locally maintained by slower clocks and shorter measuring devices. With each being according to a relativistic factor, spacetime perception varies instead according to the relativistic factor squared. However, local perception can be both relatively the same but different in other respects.

Perceptional nullification is of local events. Non-local perception of events differs from that of local perception. Lightspeed on the moon's surface, for instance, is faster than on Earth's surface. However, Earth observers have slower clocks and shorter measuring rods in comparison to those of moon observers. With lightspeed still interpreted the same whether on Earth's surface or the moon's surface, Earth observers interpret moon events as being of longer distance. Included is the moon's distance from Earth. For a planet having lightspeed reduced to one-half lightspeed, length in gravitational free space theoretically doubles for perception of lightspeed not to be interpreted as twice lightspeed. The moon is thus perceived by Earth observers as slightly more massive than it actually is.

Moon observers also perceive lightspeed on Earth's surface as one-half slower except for events being interpreted as shorter instead. Covariance applies whereby the moon is perceived by Earth observers as larger and Earth is perceived by moon observers as smaller. Observers at the edge of the universe could perceive themselves to be at its center instead.

There is still the paradox to resolve regarding gravitational escape speed squared as $2GM/R^2$ indicating local clocks and lengths on the surface of mass M are perceived by outside observers as being of zero time and no length. If true, local observers should then have no awareness of their own existence as well as any awareness of outside observers. They, in effect, do not exist unless they somehow maintain awareness of their presence in infinite time and of zero-length space.

How can increase in mass M result in its non-existence except for gravitational effect of the blackhole? The paradox needs to be resolved for more complete explanation of theory for it to be consistent with covariance and conservation of energy conditional to both special and general relativity. Its resolution includes spacetime curvature. At the one-half lightspeed condition of the upper limit whereby surface observers perceive themselves to be at its center instead, it indicates a finite universe of observation only within itself. Lightspeed not only slows; it tends to curve back towards the center of the universe except for nullification of gravity also being at the center of the universe.

Relativistic effects of gravity also need to be consistent with those of relative motion. According to special relativity, for instance, mass-energy decreases by means of inelastic collision. According to an observer relatively at rest perceiving two equal masses approaching each other at one-half lightspeeds in the opposite directions, the actual rate of approach is lightspeed itself. If each approach is even faster than one-half lightspeed, then they approach each other faster than lightspeed, but not to a local observer of one of the approaching masses. The speed of the other mass in the opposite direction is according to an addition of velocities theorem whereby the addition of velocities v_1 and v_2 are according to how local observers perceive the other different than how an observer relatively at rest between them perceives them. The equation, as in case of the example of the addition of one-half lightspeeds, is of the form $[v + v] \div [1 + v^2/c^2] = [½ + ½] \div [1 + (½)^2] = 1 \div 5/4] = 4/5$. The numerical result represents the ratio of velocity v to lightspeed c.

The relativity of covariance is more complex. If observer B moves past observer A at one-half lightspeed, then the total time for light from B to reach A after one-second of A’s clock is three-halves seconds: one second for B to reach one-half distance d at one-half lightspeed and one-half second for light to move from B to A at one-half d. If observer C also moves past observer B relative to B’s time and distance measurements, then the addition of velocities theorem applies whereby C moves relative to A at four-fifth lightspeed: $(½ + ½) \div (1 + ¼) = 4/5$. The one-fourth fraction in the denominator is one-half lightspeed squared according to the fraction $(v + v)/(1 + v^2/c^2)$.

The addition of velocities theorem is conditional to lightspeed itself being an upper limit. An addition of gravitational potentials theorem is analogical but assumed to also be according to one-half lightspeed as an upper limit according to particular conditions.

Regarding gravitational influence, complexity of mathematical verification can be simplified by using variable lightspeed c’ in place of lightspeed c. One-half plus one-half is still the number one. One-half lightspeed squared per lightspeed squared is also one for the denominator to be twice one. With B's shorter distance and slower time canceling each other, the extended time of unity for light to reach A from B locally remains as one-half lightspeed that also relates to three-halves seconds indicating covariance applies more generally to any speed in relation to the slowing of lightspeed according to gravitational potential. Still, it is in relation lightspeed itself being the upper limit.

There is also relative increase in mass m in relation to relative velocity v per lightspeed c according to a relativistic factor, being the square root of $(1 – v^2/c^2)$: such that m' moving at velocity v equals $m/(1 – v^2/c^2)^{½}$. If, for instance, $v = 0.6c$, then $v^2 = 0.36c^2$, the relativistic factor squared per lightspeed becomes $(1 – 0.36) = 0.64$. Its square root is numerically 0.8 for the numerical value of m to increase to $m/(0.8) = 1.25m$. In reverse, masses become less as much after inelastic collision because of them locally being of zero motion relative to each other. The loss of mass energy could be, according to theory, due to emission of radiant energy caused by an increase in action between internal particles.

How is a tremendous amount of internal mass-energy mc^2 maintained.

Consider how internal energy of mass interacts with itself as collisions between internal photons moving at lightspeed. With mass M moving at velocity v, internal photons moving at speed c collide with the forward parts of M at speed difference c minus v in the direction of relative motion but at speed difference c plus v in the opposite direction of its relative motion. As particle interaction, there is more kinetic energy pushing backward than forward. It should slow down contrary to conservation of momentum except for the back-and-forth transfer of momenta between internal particles of mass M. According to Doppler effect, more energy transfers into the particle from backward collision than from forward collision. There is an increase in particle energy for relatively more forward push and a decrease in particle energy for less backward push.

How distribution of energy maintains is questionable regarding how the container does not come apart by the back-and-forth motion of its internal structure.

Consider M being a container with enough energy to not be pushed apart by elastic collision of the particles. Somehow it is able to maintain its state of relative motion as if there is no outside influence to change it. Conservation of momentum maintains after each back-and-forth collision. For continuance, a more complex interaction of the system as a whole somehow needs to occur. Internal mass-energy is thus more complex than that of a container moving through space with an object inside moving back and forth.

How, then, does interaction occur of internal mass-energy?

Mass could also be moving through a medium of otherwise vacuum space according to some kind of wave action. Waves differ from particles inasmuch as particles cannot occupy the same space whereas waves can superimpose to pass on through. By the Higgs mechanism, for instance, light of zero mass can become massive in analogy of ocean waves leaving momentum of water the same after passing on over but also being able to push something forward that is either in the water or on the shore.

How mass exists is itself questionable. It could be composed of waves superimposing as wave-packets. Their equilibrium states further depend on how they interact with the medium of space itself, whose existence is another questionable aspect of reality not fully understood as completely verifiable by direct observation. It nonetheless allows for explanation.

Since waves themselves can be invisible moving through a medium, it is possible a medium itself composed of wave action is itself invisible. As to how conservation of momentum applies, superimposing of wave-packets depends on wave frequency. By the Doppler principle, waves and wave-packets approaching each other reflect each other with more energy. The shorter time of wave impact constitutes its more energy density in terms of frequency. Optional, however, is whether waves are reflected or allowed to superimpose and pass on through. It could be the decision is according to the packet's state of relative motion along with its internal interaction between particle-like waves. If mass M allows more frequent waves to superimpose while moving towards them, and allows lesser frequency waves to superimpose in the same direction of relative motion, internal and external interactions then balance out in manner of maintaining conservation of momentum. Mass moving forward can thus interact with an outside medium in different ways than merely as particle interaction.

However, the relativity of mass-energy is a lot more complex than that of Newtonian mechanics. According to relativity, for instance, elastic collision is not necessarily totally elastic. A transfer of mass from one wave-particle to another occurs instead. Its occurrence prevents mass itself from accelerating to lightspeed in being consistent with the addition of velocities theorem. Even the reflection of light is more complicated. Consider, for instance, a mass completely absorbing a photon for its additional momentum to equate to that of the photon. If the velocity becomes three-fifth lightspeed before mass reflects the photon in the opposite direction, then the mass should obtain six-fifth lightspeed regarding conservation of momentum, which is contrary to the principle of special relativity theory requiring mass neither exceed nor even reach lightspeed. For consistency of theory, the condition is explainable as an increase in mass at faster speed for maintaining conservation of momentum at lesser speed than it would without absorption of mass. The increase in mass is simply from the more massive particle that accelerates the less massive one to the faster speed.

Although photons are considered massless, explanation is merely according to particular aspects of wave action. Waves themselves are considered massless insofar as their movement through mass only momentarily changes its internal composition. After the waves pass through, the content of mass can return back to the same state it was in before encountering the wave. However, change in the state of mass can also occur. By a Compton effect, for instance, gamma rays cause radioactive decay of atomic nuclei. By Einstein's photoelectric effect, waves of enough frequency cause electrons to be emitted from a metal. For these effects to occur, waves themselves need to be comprised of a substance whether it is of ocean waves of water or of ethereal waves of a general medium for all mass.

By the Pauli exclusive principle, particles cannot occupy the same space of other particles whereas waves can superimpose to pass on through for possible invisible effect. Assume mass consists of particular states of wave superposition as wave packets. Further assume matter and light exist as two different forms of energy that can, according to particular conditions, convert from one form to another. Superimposing of light waves is thus conditional. For explaining a possible condition of relative motion, assume massive forms of electromagnetic energy exist as within the equilibrium state except for reflecting waves within a range of particular lengths and frequencies.

Certain conditions for either reflection or passing on through are consistent with relativity theory. If the wave-packet is relatively at rest, then what waves are reflected is according to how their potential energy frequencies change accordingly. More frequent waves reflect when the wave-packet is relatively at rest. When it is in relative motion, less frequent waves are reflected forward in the direction of relative motion and more frequent ones are reflected backward in the opposite direction of relative motion. Overall, the wave packet merely obtains a new state of equilibrium consistent with the relativity of motion.

More detailed explanation includes, in view of the Doppler effect, frequency of shorter waves being of more dense energy per time because of approaching. With gravity slowing clocks and contracting matter, perception of slower lightspeed is nullified; except for it also becoming slower if propagating through a more massive medium composed of ordinary matter. The latter is of local observable effect in compliance with covariance.

The relativity of motion is only one circumstance. Others are of gravity and the quantum nature of the atom. Gravitons are also considered massless. How they can gravitate as such for change in momentum is more complex. Even more complexity occurs according to the atomic structure whereby the Higgs Mechanism of a Higgs Field somehow allows particular massless bosons of light energy to transform into massive ones.

How can massless gravitons continually change mass momenta. It is more complex. For mass evenly distributed throughout space, gravity nullifies itself. Gravitons have massive effect only in ratio to an uneven distribution of mass.

The massless graviton effect is another paradox to later be explained. What is now explained is how one-half lightspeed instead of lightspeed itself can be an upper limit propagating through mass at various speeds in relation to momentum.

Momentum is the product of mass and speed. Twice mass at one-half as much speed has the same momentum. Consider light moves in all directions at one-half lightspeed through a mass of a particular density. If the same mass density moves instead at one-half light speed, then it encounters light moving in the opposite direction at three-half lightspeed, and it encounter light moving in the same direction only at one-half lightspeed. Their difference is unity: (3/2) – (1/2) = 1.

This unity is in further relation to resistance. Momentum and energy are conserved by means of light contributing the same amounts of them that it reflects from in accordance with covariance and in maintaining a particular state of equilibrium. For relative motion being one-half lightspeed, unity is evident, but not at other speeds. It compares with mass being relatively at rest whereby difference is zero. Being less than unity is indicative of less need of resistance in contrast to more need of resistance for greater than unity.

At issue here is with regard to resistance in ratio to the slowing of lightspeed. If mass m moves at one-half lightspeed, then resistance to light moving in the same direction is one-half as much, and resistance to light moving in the opposite direction is three-halves as much. The latter minus the former is unity. If mass m moves at one-third lightspeed, resistance to it moving in the same direction is one-third, and its resistance in the opposite direction is four-thirds. The latter minus the former is two-thirds unity. To the contrary, if mass moves at two-thirds lightspeed, then resistance to it moving in the same direction is one-third as much, and resistance to it moving in the opposite direct is five-thirds as much. The latter minus the former is four-thirds unity.

More resistance to lightspeed in the reverse direction of relative motion indicates the mass should be slower, and one-half lightspeed resistance being unity again indicates that one-half lightspeed is the upper limit of attainment by mass.

It also relates to the attainment of internal energy as mc^2. How can such internal energy be maintained? If the container is moving nearly at lightspeed, theoretical indication indicates there is nearly no light energy pushing forward from the rear to maintain its internal energy.

Light energy is described according to both particle and wave effects. Einstein named light energy as photons in 1905 after it was discovered that those of higher frequency rather than more intensity by a greater number of photons cause the ejection of an electron from a metal. Arthur Holly Compton (1892–1962) explained the interaction between photons and electrons according to his Compton Effect. According to particular circumstances of an equilibrium state, photons possess momentum and energy. However, that does not mean that mass itself is not of a superimposing of waves in particular equilibrium states reflecting some waves and allowing others to pass through according to massive states of relative motion. If mass increases speed, then it could reflect in the direction of motion less frequent waves of longer wavelength of less energy and reflect in the opposite direction more frequent waves of more energy. It would be according to Doppler effect, and the difference in frequencies is needed to maintain relative motion along with the relative mass of particles.

Further speculation, as previously noted, is of one-half lightspeed being particularly unique regarding relative motion itself. Internal wave-energy vibrating back and forth maintains the equilibrium state of the particle according to lightspeed. At the surface of a particle moving at one-half lightspeed, the interaction speeds in opposite directions of relative motion are twice lightspeed, but interactions between the equilibrium state of the particle and outside photons from opposite directions are one-half and three-half. Their difference is lightspeed. However, at a particle speed faster than one-half lightspeed, the difference is faster than lightspeed. For example, a particle moving at two-third lightspeed has interaction speeds of one-third and five-thirds and a difference of four-thirds, being greater than lightspeed in contrast to less lightspeed than if the particle moves slower than one-half lightspeed. Gravitational interaction is of similar result.

Regarding gravity, an increase in gravitational escape speed v_e of mass is due to combining mass into lesser volume. Twice mass at twice radius maintains the same gravitational potential, but merely an increase in mass or decrease in radius results in a faster escape speed along with slower light overcoming increased gravitational strength. The processes of relative motion and gravity thus differ from each other. Whereas internal mass energy of mass in relative motion decreases from inelastic collision being allowed by emission of radiant energy, internal mass energy from gravitational attraction of mass into less space results in slower speeds of internal particles and radiation. As to speculate, decrease in internal speed of radiant energy of greater mass density could be consistent with it obtaining a different state of equilibrium allowing for more vacuum effect. Greater radiant energy outside the gravitational field simply allows for more inward penetration.

How, then, is internal decrease in mass energy conserved?

Conservation can be maintained by emission similar to that of relative motion, but being of different form suggest that its energy is also of different form. To further speculate, the decrease of light energy becoming slower might be a contributing part of a requirement to maintain a new equilibrium state for the mass to have a greater amount of outside force for more vacuum effect of more gravitational potential of more mass. Lightspeed becoming slower because of mass becoming denser simply equates as light energy transforming into gravitational energy.

Inelastic collision, according to special relativity, results in a relative decrease in mass. As to how the decrease is possible in compliance with conservation of mass-energy, it could possibly be emitted as some form of radiant energy due to resisting temperature increase from internal particle interaction, thus allowing inelastic collision to occur according to such a particular condition of having relatively less mass because of less relative forward motion along with the same internal motion. Observational wise, continuous increase in relative motion is conditional to the addition of velocities theorem. It results from more mass accelerating less mass to a faster speed that does not reach lightspeed because of collision being partly inelastic. Lesser mass thus absorbs part of a more massive particle in manner of maintaining conservation of mass and energy.

Similarly, an analogical addition of gravitational potentials theorem indicates there is also a relative decrease in internal mass-energy in relation to internal motion being slower along with local length and clocks being relatively shorter and slower. It is consistent with special relativity of relative motion inasmuch as the reduced mass combined by gravity is consistent with that of inelastic collision of relative motion. Both result in loss of energy, one by its emission and the other by its internal radiation becoming slower.

Relative mass increases with increase in relative motion by absorbing part of the mass that accelerates it. Masses combined by gravitational interaction relatively decrease in total mass in accordance with an addition of gravitational potentials theorem. This consequential difference is further to be explained in reference to how reduced lightspeed equates to gravitational escape speed whereby an escape speed equal to one-half lightspeed is of the same numerical value of the reduced lightspeed. An increase in gravitational potential is thus partly lost due to a loss of light energy by means of it becoming slower.

Further speculation is with regard to one-half lightspeed instead of lightspeed itself possibly being particularly unique as a limiting condition of attainment. If true, then the zero length and infinite time paradox is resolvable. However, consistency of theory also needs to be maintained along with explaining paradoxical situations. In particular, escape speed conditions need to be consistent with orbital speed conditions whereby their ratios remain the same along with the slowing of lightspeed being proportionally the same as the slowing of orbital speed in manner of resolving the paradox.

Gravity is another form of acceleration with similar paradoxes to those of relative motion. They are explainable in consistent manner according to covariance and lightspeed modification according to the Schwarzschild metric of general relativity as here proposed. Unification with the Standard Model, however, is not achieved. The problem is not with theory itself but with how it relates. Quantum physics contains virtual particles calculating according to probability. Being directly non-observable, they can become partly observable according to a probability analysis. Although gravitons can be considered as virtual particles as well, as being necessary for vacuum effect, the degree of their individual force is too small for empirical verification. For instance, the ratio between electromagnetic force to gravitational force between the proton and electron in the hydrogen atom is about 4.4×10^{-40}.

4. SCHARZSCHILD METRIC

The Schwarzschild metric is analyzable according to relativistic consistency of how escape and orbital speeds interrelate. Escape speed squared is 2GM/R, being twice GM/R as orbital speed squared. Escape speed is thus faster than orbital speed by the square root of 2.

Slower lightspeed is consistent with being affected the same as is local measure by shorter rods and slower clocks each multiplied by the relativistic factor to be relativistic factor squared derived as $[1 - 2GM/Rc^2]$ from the Schwarzschild metric. If escape speed squared is 2GM/R = c/2, then reduced lightspeed calculates in the manner c’ = c[1 – ½] = c/2. It squared becomes $c^2/4$. Rotational speed itself is the square root of it as c/2. At this particular value it and reduced lightspeed seem to equate. However, local clocks and measuring rods are relatively slower and shorter whereby both rotational and light speeds are reduced by the same factor. Local observers thus perceive orbital speed as c/2 and the reduced lightspeed as c. Whereas escape speed is the square root of $c^2/2$, it is faster than orbital speed according to the ratio of the square root of $(c^2/2)(c^2/4) = 2$ being $(2)^{½}$.

How, then, is 2GM/R prevented from becoming lightspeed squared at mass surface M?

What determines relativity of escape speed as well as orbital speed and reduced lightspeed is questionable. Escape speed increases along with increase in gravitational potential and those increases appear to correspond with decrease in lightspeed. The speed energy of mass particles decreases as well in manner consistent with constant acceleration according to special relativity. Suggestive is that the reduced light speed c’ = c/2 is unique inasmuch as an escape speed squared greater than it results in reduced lightspeed along with reduced internal mass energy equating to more loss of gravitational energy than gained. Escape speed thus relatively decreases along with decreases in light and orbital speeds in symmetrical manner from which local observers at the edge of the universe perceive themselves as being at its center instead.

The limiting escape speed condition is more of a potential than observable reality. To reach it according to local perception, some form of energy needs to accelerate mass to speed c, except that c tends to decline towards c’ = 0 instead. Mass thus relatively decreases in internal energy. However, according to special relativity, there is a contrary condition whereby a relative increase in mass occurs along with an increase in relative motion. It is conditional to mass being unable to obtain lightspeed because of a gain in mass resulting from collision being partly inelastic. A greater amount of mass colliding with a lesser one is unable to accelerate the lesser one to lightspeed because of a transfer of mass to the lesser one contributing to gain in momenta being of more mass in place of faster speed.

Regarding gravitational action, the transfer of mass is extensively more complex. How can two distant masses gravitate towards each other to increase in both speed and mass and then be of their original mass after inelastic collision? The increase and decease in mass energies somehow needs to equate. Simply put, increase in mass potential corresponds to a decrease in lightspeed energy, but the ratios of increase and decrease also decreases by approaching a particular limit.

Internal mass-energy mc^2 decreases because of lightspeed becoming slower. From a non-local perception in gravitational free space, the slower lightspeed of more mass maintains conservation of momentum along with conservation of energy. Whereas internal mass-energy of inelastic collision complies by means of radiation being emitted, the gravitational process is that of mass gravitating inward to become a greater gravitational strength per volume of space from which its escape speed need not be able to reach lightspeed.

Orbital speed and reduced lightspeed both being $c' = c/2$ is unique for resolving the blackhole condition along with an expanding universe paradox inasmuch as it is questionable as to how the universe can have an escape speed the same as lightspeed and still be able to expand.

The uniqueness pertains to light-speed-energy. If escape speed v_e squared becomes $(½)c^2$, then slower lightspeed compares in the manner $c' = (½)c$ and $c'^2 = (¼)c^2$. Also, gravitational potential of rotational speed squared being one-half of escape speed v_e squared equals slower lightspeed c' squared.

The ratio of gravitational potential to slower lightspeed energy is thus unity. However, if v_e squared equals $(1/3)c^2$, then $c'^2 = (2/3)^2c^2 = (4/9)c^2$. In contrast, orbital speed v_o squared is only $(1/6)c^2$. Their ratio is $(4/9)/(1/6) = 8/3$. There is thus less reduced light energy in ratio to gravitational potential energy.

In further contrast to this result is escape speed v_e squared being $(2/3)c^2$ whereby $c' = (1 – 2/3)c = c/3$ and $c'^2 = (1/9)c^2$, whereas gravitational orbital potential squared is $(v_o)^2 = [(1/3)c]^2$. The ratio to 1/9 to 1/3 being 1/3 in contrast to the previous one of 8/3 indicates more light energy is lost than gained for the addition of mass potential of the latter to actually decrease in amount instead of increasing more towards c^2.

Further significance is with regard to covariant symmetry according to the addition of gravitational potentials theorem. Addition of either velocities of relative motion or gravitational potentials equates in the manner of becoming (4/5)c with regard to the relativistic doubling of speed c' = c/2. Further regard is of (4/5)c as part of a relativistic factor squared becoming [1 – 16/25] = 9/25. Its square root is 3/5, and it as part of the relativistic factor squared becomes [1 – 9/25] = 16/25. This process is just an example of a general application inasmuch as covariance and symmetry indicate observers at the edge of the universe perceive themselves to be at its center instead.

5. RELATIVITY OF HUBBLE COSMOLOGY

There are further possible applications of this analysis according to Hubble cosmology. Einstein attempted to explain how a finite universe can neither continue to either contract inwards or expand outwards. He inserted by means of mathematical integration a constant into his field equations as a measure of some kind of positive force to counter gravitational attraction. However, the modification was not accepted by other physicists and it was soon discovered that light spectra from more distant sources is of less frequent energy. An expanding universe theory thus became more established instead that interprets a decreased spectrum of light frequency according to Doppler effect. According to such effect, sound and light are perceived to be of less energy if receding from the observer and of more energy if approaching the observer.

A different interpretation other than the Doppler effect is according to another theory named tired light. According to it, photons decrease in energy while propagating through space. Such decrease is continuous and separate from the slower speed resulting from the gravitational field. The lost energy could even contribute as positive energy needed for vacuum effect. However, the manner of its rate of losing energy is questionable regarding its observable effect. Is it of a constant decrease or of a proportionate one decreasing along with less energy to decrease? The latter seems more reasonable, but the former could have some support in assuming dark energy is needed to explain how the universe's rate of expansion has itself seemed to have increased.

Whether Hubble cosmology is according to universal expansion or of light itself decreasing in energy per distance, there are equations to consider linking gravity to electromagnetism and quantum theory. At a distance from the observer being a million parsecs–a parsec being about 3.09 X 10^{13} kilometers–a recessional speed of 70 kilometers per second has been observed to occur within our more modern time. Being proportionally constant for any distance according to theory, this recessional speed divided by that distance equates to a frequency of H = 2.233 X 10^{-18} per second. Multiplying it by the nuclear diameter of the hydrogen atom equates it in the manner $2r_n$ = 2.1881991 X 10^{12} centimeters, and then dividing by c = 2.9979 X 10^{10} centimeters per second equates it to a gravitational-electromagnetic ratio between the electron m_e and proton m_p in the manner $H(2r_n)/c = Gm_pm_e/e^2 \approx 4.4 \times 10^{-40}$.

A similar value of the Hubble constant is obtained by simply dividing a gravitational constant G by lightspeed c in relation to centripetal force. Its frequency is about H' = 2.225 X 10^{-18} per second, whereby H'/H approximates to about 1.0036, being less than one percent difference.

Although the numerical value of the gravitational constant is dependent on the chosen units of measure, they cancel out in terms of centripetal force per lightspeed being of the form $Gm^2/cr^2 = mv^2/rc$. Dividing v^2 by c cancels out one radius r and one time interval t. Dividing by the other radius r cancels out the remaining r of v to result in mass energy per time as frequency. Unit mass m also cancels out in relation to it being proportional to the measure of light energy as mass energy. The mathematical result is per time in relation to frequency.

Supposedly the value of the Hubble constant increases towards the edge of the universe for it multiplied by radius R_u to equal lightspeed c. Furthermore, $GM_u/R_u = c'^2$ whereby $G/c' = c'R/M_u$. It indicates G/c' equals light frequency at radius R_u per mass M_u of the universe. By theory, the same changes in mass and radius maintain the same gravitational potential and frequency per distance. Orbital acceleration is less per mass for less change in direction around a larger orbital distance, but twice mass counters half as much acceleration.

There is only a slight difference in the values of H and H’, and the gravitational constant is considered the least accurate measure in relation to electromagnetic and atomic forces because of its minute degree of measure per mass being difficult.

6. INCLUDING TEMPERATURE

There is historical support for temperature being a developmental part of atomic theory as a counter measure. In this respect, Lord Kelvin’s example of entropy as disorder is of further significance. Equilibrium states regarding temperature are critical conditions of life. We humans need to maintain close to ninety-eight degrees Fahrenheit as an equilibrium state. Daniel Gavriel Fahrenheit (1686–1736) discovered a failure of temperature to change when particular bonding changes occur of mass. Color is another factor regarding temperature according to absorption and reflection of light. Black colored mass absorbs a greater amount of light whereas white colored mass reflects more of it. Both absorption and reflection involve energy interaction. They differ according to equilibrium states of existence.

Analyses of temperature itself has a long history. Boyle’s law was proposed in 1662 whereby the product of gas pressure and volume remain constant at a particular temperature. Pressure relates to particle collision as kinetic energy. According to Boyle’s law, a sphere of one-half radius is of one-eighth volume and one-fourth surface area. One-half radius allows twice as many collisions per one-fourth surface area and as eight more collision per surface area.

Gravity is also consistent with the law in terms of centripetal force, which equates in the manner $Gm^2/r^2 = mv^2/r$. In comparison to one-eighth volume at one-half radius r, it becomes $Gm^2/(r/2)^2 = m(2v)^2/(r/2) = 8mv^2/r$. Gravitational force squeezed into eight times less volume is simply eight times as much force per spatial volume.

Regarding different temperatures for comparison, no ideal gas law has been confirmed according to an absolute temperature scale. Boyle’s law did not comply in proportion to one, and atomic theory developed from observational evidence that increase in temperature and its pressure is to the fourth power instead of to the third power. It is known as the Stefan-Boltzmann Fourth Power Law that applies according to a blackbody of zero temperature in relation to continuous absorption and emission of light. According to theory, incandescence of becoming visible light is reached at a particular temperature and pressure that continues to increase proportionally to the fourth power according to a perfect blackbody able to absorb all visible light.

Light energy also relates to Boyle's law whereby it is cubed at one-half radius, being eight times greater within one-eighth volume. How, then, does it relate with surface area being one-fourth as much and diameter being half as much length? Particles of same speed within it encounter one-fourth as much surface area eight times as often whereas outside particles moving towards the center encounter the same one-fourth proportion only four times as often. It is explainable according to the superimposing of waves causing lightspeed to become one-half as fast.

In effect, the superimposing of light causes it to be internally contained as mass-energy mc^2. The doubling of mass-energy within one-eighth volume increases its mass-energy to the fourth power, which is consistent with how the Planck constant h relates to atomic structure. It relates in the manner of its constancy pertaining to the product of mass m, velocity v and radius r. Velocity v represents a fine structure constant being about 137.036 tunes slower than lightspeed. The product mr remains constant by an increase in m being compensated for by a proportionately equal decrease in r. The electron in the hydrogen atom, for instance, is about 1836 times less mass than the proton, and the nucleus containing the proton has a radius about 1836 times shorter than the atom as a whole. The nuclear mass-energy density is thus about $(1836)^4$ times more than the outer part of the atom containing only the mass-energy of the electron.

The equilibrium state of nuclear existence is changeable according to various effects of relative motion, electrostatics and gravity. If mass containment is according to superimposed waves becoming wave-packets, relative motion is according to the packet containing waves of particular frequencies. Waves of different frequencies are either reflected or allowed to pass through. Change in relative motion is also allowed by changes in frequencies of waves reflected and passing through. Reflected waves, being more frequent, accelerate the packet to a faster speed because of their shortness allowing them to be more quantitatively active. Doppler effects of relative motion are also indicative of denser energy containment.

Internal change of the wave packet is also possible regarding difference in frequencies being contained. Gravitational and electrostatic effects are also possible regarding changes of equilibrium state. They could be consistent with relative motion whereby waves can differ according to frequency and the equilibrium condition of the wave packet. The equilibrium condition is according to both relative motion and gravity. Regarding relative motion, more frequent waves are reflected backward opposite from the wave-packet's direction of motion.

Gravity and electromagnetism can both relate in manner of how the equilibrium of change occurs. The electron energy as the outer part of the atom is of opposite charge but of the same charge strength as the proton. Change in equilibrium according to entropy could result in a momentary electrostatic charge whereas gravity could relate to other states of equilibrium.

Although such forces as gravity and electrostatics are both according to an inverse square law, they differ in that electrostatic force varies according to difference in the amount of positive and negative charge it contains. Gravity could merely be the result of vacuum effect whereby wave energy escaping undetected, except for gravitational effect, is immediately replaced by wave energy superimposing to maintain the particular equilibrium effect. To the contrary, the electrostatic wave energy is such that both attraction from vacuum effect and repulsion from opposite vacuum effect occur because of more different circumstances that occur as well. Electrostatics is according to various attractive and repulsive changes whereas gravity conditions are merely analogous to those of relative motion.

7. QUANTUM GRAVITY THEORY

After Max Planck (1858–1947) derived his quantum condition, he attempted to explain how it relates to relative motion. Although his attempt failed, it remains essential to the inclusion of gravity within the Standard Model of physics.

Relativity of motion is included in the Standard Model, and it is explainable according to wave-packet interaction. The quantum condition can maintain if waves partly superimpose according to relative conditions of impact. More frequent counter wave action of light in the opposite direction of relative motion superimposes more for less reflection of energy whereas less frequent waves of light in the same direction of relative motion superimpose less.

The Doppler effect applies regarding relative motion, and the process is consistent with a quantum condition insofar as the condition of more frequent light interacting in the opposite direction of relative motion constitutes more mass-energy per time. More frequent light of shorter wavelength is consistent with the quantum condition of a particle of greater mass is of shorter radius as well. It needs to be similarly explained according to gravity. Accordingly, mass in a gravitational field is similarly contracted in length from the center of the field.

As for the quantum contraction itself, it includes various quantum particles interacting in various ways. There are quarks interacting within the nucleus of the atom in ways that are classified as being parts of the strong nuclear force. There are such weak force particles as muons, as being classified as a weak force interaction between the electron and the nucleus of the atom.

As to how interaction occurs, a significant explanation is according to a theory proposed by a physicist named Harold Aspen (1927–2011). It includes a difference in internal and external energies of mass. The internal energy in relation to electromagnetism is according to a formula proposed by Joseph John Thomson (1856–1919) prior to Einstein's derivation of it. The relation according to Thomson is $2e^2/3x = mc^2$. The x represents the electron radius of mass m.

Contrary to internal energy is external energy constitutive of change relating to potential energy $mv^2 = -e^2/(x + y)^2$. It is similar to the Charles-Augustin de Coulomb inverse square law of electrostatics, but is particularly in reference to an extension of radius x between two charges as an extension of internal energy.

It is assumed that the two different formulas equate at a particular speed v = c whereby the extended distance y represents, in ratio form y^2/x^2, a decrease in energy during the forming of greater mass between particles. The decrease in energy is similar to how light energy decreases for gravitational mass to combine as one mass of less volume.

By equating the formulas, y^2/x^2 is determined to have a numerical value of 0.05051026 . . . The proton is then derived according to 9 virtual muons of less energy used up in the manner $m_p = (9 - 0.050510)m_u = (8.8989795)(206.3329) = 1836.1522$ electrons. This muon value is slightly less than its empirically determined value of about 206.7683 electrons.

Significant of Aspen's theory is that it provides gravitons needed to include gravity as part of the standard model of physics. Gravity is excluded from the standard model of physics because of the graviton being too weak to detect. However, Aspen's tau-graviton is of a mass equal to about 3485 electron masses in comparison to the proton mass being only about 1836 electron masses.

How can the graviton be of more mass than the atom itself?

The Aspen gravitons merely represent decaying processes. There is a neutrino of no electric charge having nearly invisible mass whereby only about one out of ten billion passing through an Earth diameter react with a proton or neutron. However, three parts of a neutrino–categorized as electron neutrino, muon neutrino and tau neutrino–have charge counter to their antiparticle of anti-matter. The neutrino itself having no charge could be an outside force needed for vacuum effect. They could be created by the interaction of mass within itself. The tau decaying into muons and electrons could thus be the main source of gravitational effect. Being nearly undetectable waves, the radiant decay passes on out to immediately be replaced by the more positive form of radiant energy. As for explaining the existence of the latter, it is of slight detection of the former gradually converting into it. The former is a long distance of conversion in relation to the size of the universe. The latter is of more present quantity to be absorbed by matter as immediate replacement.

Aspen's derivation is complex and the numerical value of his gravitational constant G was 6.67259×10^{-8} in comparison to the empirical determined value of 6.67259×10^{-8} in relation to cubic centimeters per grams and seconds.

His theory is also founded on the possible existence of an ethereal medium. There is a ratio between ethereal mass m_o and electron mass m_e as $m_o/m_e = 9r^2/4d^2 = 0.04117589$. Twice radius r equals $h/2\pi m_e c = r_a v/c = r_a/137.036$. It equates to radius of the hydrogen atom per find structure constant. The distance d equals the radius of the electron multiplied by 108π, which is 4π times 27 as a cubic lattice of 27 photons.

In comparison, the Standard Model excludes gravitons of gravity apart from unification of three fundamental forces categorized as electromagnetic, weak and strong interactions. The strong force is of the atomic nucleus. It includes quarks and antiquarks for composition of such hadrons as neutrons and protons. The weak force includes bosons of positive and negative charge. The electromagnetic force is mainly of photon interaction.

The weak nuclear force constitutes interaction between the strong nuclear force and the electromagnetic one of long range. Included in the weak force interactions are such leptons as muons and tauons. Positive and negative charge interactions result in renormalization. To the contrary, gravity has no such neutralizing charge. However, similar to gravitons of no charge are neutrinos that are also extremely massless. Only one in about ten billion of them are detected while moving through Earth. They could possibly be the outside force needed for vacuum effect, but it is here merely suggested as theoretical possibility similar to the indication of one-half lightspeed as an upward limit.

Incidentally, although the Standard Model does not presently unify gravity with the other forces of the atomic structure, such inclusion was indicated in relation to Boyle's law along with Avogadro's proposal of two atoms combining to become a molecule. It further included temperature and weight as conditional as well. There is also dispute of theory regarding rotational speeds of spiral galaxies. One theory known as MOND is a slight modification of Newtonian mechanics. Another theory explaining the discrepancy of theory with observation is because of some mass being unobservable dark matter.

MOND VERSUS DARK MATTER

Two controversial theories are of MOND versing Dark Matter. The main issue of concern is with regard to rotational motion of spiral galaxies being of the same speed per radius from the center of mass in contrast to Newton's inverse square law. One possible explanation is according to non-observance of dark matter only revealing its presence as gravitational effect. MOND is another possible explanation as a slight modification of Newtonian mechanics. Neither theory has been completely confirmed by astronomical observation; they but are only partly confirmed by observation.

How can the same speed per distance of rotation occur?

By Newtonian mechanics, rotational speed is slower farther away from the center of mass. It is also slower within the mass surface by means of gravitational cancellation by other mass being on opposite sides of a particular mass within the surface towards the center. Moreover, if mass is denser more towards center, then rotational speed can increase contrary to its decrease. The same amount of increase can cancel out the same amount of decrease.

According to MOND, modification of Newtonian mechanics is that such application is of much smaller gravitational force than that of Earth. Its measure is according to less but larger mass m compared to more but smaller mass M. With such gravitational force of m being much smaller, density distribution could more easily vary according to a slight increase towards the center of mass. MOND is thus possibly consistent with Newtonian mechanics, as merely to be extended explanation. Such minute difference in effect can also be less observable for dark matter to apply as well.

No modification of theory seems to be needed regarding this explanation except for extended application of theory. In according with MOND, a new constant of acceleration a_o applies, according to observational discrepancy, is approximately less than inverse-square-law one by about a ratio of $1/10^{10}$, which compares closely to lightspeed.