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Wu's Spacetime Transformation and Wu's Spacetime Field Equation

Edward T. H. Wu

[Abstract]
Under both thermal equilibrium and subatomic equilibrium, all objects and events are corresponding identical objects and events. Based on Principle of Equilibrium, Principle of Parallelism and Principle of Correspondence, as well as Wu's Spacetime Equation $t_{yy} = \gamma l_{yy}^{3/2}$, all quantities of the properties of an object or event can be transformed to Wu's Unit Length of a reference subatomic particle at the same location and time (same gravitational field and aging of the universe). These transformations are called "Wu's Spacetime Transformation". Furthermore, the correlations between the quantities of the properties of the corresponding identical object or event at different gravitational field and aging of the universe can be realized based on Wu's Spacetime Shrinkage Theory. As a result, in accompany with Wu's Spacetime Shrinkage Theory, Wu's Spacetime Transformation can be used to interpret the changes of the properties of an object or event affected by gravitational field and aging of the universe, such as Cosmological Redshift, Gravitational Redshift, Time Dilation, Light Deflection, Perihilion Precession of Mercury, etc. In addition, Wu's Spacetime Transformation can be used to derive Wu's Spacetime Field Equation which correlates acceleration and gravity compared to Einstein's Field Equation which correlates Energy and acceleration.

[Keywords]
Spacetime, General Relativity, Einstein's Field Equation, Yangton and Yington, Wu's Pairs, Subatomic Equilibrium, Corresponding Identical Object, Principle of Equilibrium, Principle of Parallelism, Principle of Correspondence, Wu's Spacetime Equation, Wu's Spacetime Shrinkage Theory, Wu's Spacetime Transformation, Wu's Spacetime Field Equation.

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I. Thermal Equilibrium versus Subatomic Equilibrium

The quantities of the properties of an object or event are dependent on two equilibriums: (1) Thermal Equilibrium: At a constant temperature and pressure, all the atoms and subatomic particles in an object or event are stabilized with a fixed structure by thermodynamic interactions, and (2) Subatomic Equilibrium: Under thermal equilibrium, at a constant gravitational field and aging of the universe, all the Wu's Pairs of the subatomic particles in the object or event are stabilized with a fixed Wu's Unit Length and Wu's Unit Time by bombardment of graviton and attraction of Force of Creation, such that a fixed quantity can be attained for each property of the object or event.

II. Subatomic Equilibrium

At thermal equilibrium, temperature and pressure are fixed, and all the atoms and subatomic particles of an object or event are stabilized with a fixed structure. Under thermal equilibrium, at a constant gravitational field and aging of the universe, all the Wu's Pairs of the subatomic particles in the object or event are stabilized with a fixed Wu's Unit Length and Wu's Unit Time by bombardment of graviton and attraction of Force of Creation, such that a fixed quantity can be attained for each property of the object or event. This is called "Subatomic Equilibrium" [1].

Under thermal equilibrium, as an object or event moves to a location at a constant gravitational field, because of the bombardment of gravitons caused by gravitational field based on Graviton Radiation and Contact Interaction, complying with Gravity Affected Wu's Spacetime Shrinkage Theory, all the Wu's Pairs of the subatomic particles in the object or event shall attain a fixed quantum energy and stabilized with a fixed Wu's Unit Length and Wu's Unit Time.

On the other hand, as an object or event moves to a location and time at a fixed aging of the universe, because of the attraction caused by Force of Creation in Wu's Pairs, complying with Aging Affected Wu's Spacetime Shrinkage Theory and CMB radiation, all Wu's Pairs of the subatomic particles in the object or event shall attain a fixed quantum energy and stabilized with a fixed Wu's Unit Length and Wu's Unit Time.

III. Principle of Equilibrium

As an object or event under co-thermal and subatomic equilibriums at a location and time with a constant temperature and pressure, also a constant gravitational field and aging of the universe, not only all the atoms and subatomic particles in the object or event have a fixed structure, but also all Wu's Pairs of the subatomic particles in the object or event have a fixed Wu's Unit Length and Wu's Unit Time (a quantum energy state). Since all the quantities of the properties of an object or event are dependent on Wu's Unit Length and Wu's Unit Time of Wu's Pairs of the subatomic particles in the object or event, therefore, as an object or event under co-thermal and subatomic equilibriums at a location and time with a constant temperature and pressure, also a constant gravitational field and aging of the universe, all the properties of the object or event shall attain a fixed quantity. This is named "Principle of Equilibrium" [2].

IV. Corresponding Identical Transformation

Under thermal equilibrium, as an object or event moves from one location and time to the other location and time, or two identical objects or events take place at two different locations and times, also the objects or events are in subatomic equilibrium respectively at each location and time (or gravitational field and aging of the universe), Wu's Unit Length and Wu's Unit Time (or quantum energy states) of the subatomic particles in the object or event can change from one fixed quantity to another fixed quantity, as is the quantities of the properties of the object or event, while the intrinsic atomic and subatomic structures of the object or event remain unchanged. This is named "Corresponding Identical Transformation" and these objects or events are named "Corresponding Identical Object or Event" [2]. Because of the unchanged intrinsic atomic and subatomic structures, the quantities of the properties of a corresponding identical object or event are solely dependent on Wu's Unit Lengths and Wu's Unit Times of the subatomic particles in the object or event.

Corresponding identical object likes a stretched rope of rubber bands. Each rubber band has a unit length. The total amount (intrinsic structure) of rubber bands doesn't change, but the length of each rubber band and the total length of the rope can be different subject to the stretching force. Corresponding identical object also likes the giant in "Jack and the Beanstalk" and the dwarfs in "Snow White". They all have the same features as that of a normal man except in different sizes.

Corresponding identical event on the other hand likes a movie, where each picture runs by a unit time, the total amount (intrinsic structure) of pictures doesn't change, but the duration of each picture and the total playing time can be different subject to the running speed of the movie. Corresponding identical event also likes the Mickey Mouse cartoon pictures, the entire show can be completed by different time durations subject to the rolling speed of the pictures.

When a photon (free Wu's Pairs) intrudes in earth at an extremely high speed from a far distance star or a massive star, it carries Wu's Unit Length and Wu's Unit Time of its original light source (for example H_α) in the star, which is different from that of the photon generated from the same light source (H_α) on the present earth. In other words, the intruded photon is quenched from its original quantum energy state which is not in subatomic equilibrium with that on the present earth thus it is not a corresponding identical object or event. This "quenching effect" is the reason that causes Cosmological Redshift [3] and Gravitational Redshift [4].

A typical example can be found in H_2 absorption spectrum observed at two locations (star and earth). Each characteristic line in the spectrum represents the wavelength of a photon emitted from a specific light source (for example H_α). The fixed quantity of the wavelength of the photon (H_α) can be found at each location, where the wavelength is the property of the photon and the photon is the corresponding identical object or event.

V. Principle of Parallelism

Furthermore, because of the Corresponding Identical Transformation in which the intrinsic atomic and subatomic structures of the object or event remain unchanged, the correlations between two corresponding identical objects or events should remain unchanged no matter gravitational field and aging of the universe. Therefore, for two corresponding identical objects or events at the same location and time (or at the same gravitational field and aging of the universe), the ratio (real number) between the quantities of the same property of the two objects or events remains constant, no matter gravitational field and aging of the universe. This is named "Principle of Parallelism" [5].

$$P = nP'$$

Where P and P' are quantities of the same property of two corresponding identical objects or events, n is a real number constant.

According to Principle of Parallelism, same Redshift of different characteristic lines can be obtained across the H_2 absorption spectrum from a far distance star, which can be proved as follows:

Because

At G_1, T_1

$$P_1 = nP_1'$$

At G_2, T_2

$$P_2 = nP_2'$$

Therefore,

$$(P_1-P_2)/P_2 = (P_1' - P_2')/P_2'$$

And

$$\Delta P/P = \Delta P'/P'$$

Where G_1 and T_1 are gravitational field and aging of the universe at first location and time (gravitational field and aging of the universe), P_1 and P_1' are the quantities of the same property of Object 1 and Object 2 at the first location and time. As is G_2, T_2, P_2 and P_2' are defined. n is a constant associated to the two objects or events.

Similarly,

$$\Delta\lambda/\lambda = \Delta\lambda'/\lambda'$$

Where λ and λ' are the wavelengths of two photons in H_2 absorption spectrum (for example H_α and H_β), Δλ and Δλ' are the difference of the wavelengths of the same photon (H_α or H_β) in two different spectrums (star and earth).

In addition, Principle of Parallelism works not only for simple properties of an object or event such as length (meter) and time (second), but also compound properties including vectors such as velocity (m/s) and acceleration (m/s^2). Furthermore, Principle of Parallelism is true, only if Wu's Pairs is the building blocks of the universe and law of conservation of mass is true as well.

VI. Principle of Correspondence

According to Principle of Parallelism, as the property of a corresponding identical object or event measured by the unit quantity of the same property of a reference corresponding identical object or event at the same location and time (or at the same gravitational field and aging of the universe), the amount of the unit quantity remains constant, no matter gravitational field and aging of the universe. This is named "Principle of Correspondence" [6]. In fact, Principle of Correspondence is a special case of Principle of Parallelism.

$$P = mU$$

Where P is the quantity of the property of a corresponding identical object or event and U is the unit quantity of the same property of a reference object or event, m is a real number constant.

VII. Wu's Unit Quantities

Since Wu's Pairs are the building blocks of all matters, therefore, for the measurements of the properties of an object or event, the following Wu's Unit Quantities of a reference subatomic particle at a reference location and time (or gravitational field and aging of the universe, either at the same or different locations and times as that of the object or event), can be used as the basic unit mass, basic unit time and basic unit length [7].

(1) Wu's Unit Mass (m_{yy}) – the mass of a single Wu's Pair
(2) Wu's Unit Time (t_{yy}) – the circulation period of Wu's Pair
(3) Wu's Unit Length (l_{yy}) – the diameter of Wu's Pair

VIII. Wu's Spacetime Equation

The period (t_{yy}) and the size (l_{yy}) of the circulation orbit of Wu's Pairs are correlated to each other as follows:
Because Wu's Pair Circulation Theory [7]

$$V^2r = K$$

Where K is Wu's Constant, V is the speed of circulation and r is the radius of the circulation orbit.

$T = 2\pi r/V$

$T^2 = 4\pi^2r^2/V^2 = 4\pi^2r^3/V^2r = 4\pi^2r^3/K$

$T = 2\pi\, K^{-1/2}\, r^{3/2} =\pi\, (2K)^{-1/2}\, d^{3/2}$

Given

$\gamma = \pi\ (2K)^{-1/2}$

Because

$T = t_{yy}$

$d = l_{yy}$

Therefore,

$$t_{yy} = \gamma l_{yy}^{3/2}$$

Where K is Wu's Constant, t_{yy} is the circulation period (T) of Wu's Pairs, named "Wu's Unit Time", l_{yy} is the size of the circulation orbit (2r = d) of Wu's Pairs, named "Wu's Unit Length", and γ is "Wu's Spacetime Constant". This equation is named "Wu's Spacetime Equation" [7].

Wu's Spacetime Equation gives the correlation between Wu's Unit Time and Wu's Unit Length in a Wu's Pair. As a result, based on Principle of Parallelism and Wu's Spacetime Equation, all quantities of the properties of an object or event such as dimension, duration, velocity and acceleration can be correlated to Wu's Unit Length of a reference corresponding identical subatomic particle at the same location and time (gravitational field and aging of the universe) which can be used to explain many important physical phenomena such as Gravitational

Redshift [4], Cosmological Redshift [3], Gravitational Time Dilation [8], Hubble's Law [9], Spacetime Reverse Expansion (Universe Expansion)[10], Deflection of Light [11], Perihelion Precession of Mercury [11] and Einstein's General Relativity [12], Spacetime [13] and Field Equations [13], etc.

IX. Wu's Constant and Wu's Spacetime Constant

Like all other physical constants, Wu's Constant is composed of a real number and a group of unit quantities with arithmetic operations, therefore, K is dependent on gravitational field and aging of the universe.
Furthermore, because of Wu's Constant K,
$K = V^2r = ½ k q_{yy}^2/m_{yy}$
$k = 8.99 \times 10^9 K_gm^3s^{-2}C^{-2}$
Where V is Wu's Pair's circulation speed, r is the radius of Wu's Pair ($r = ½ l_{yy}$), k is Coulomb's Constant, K_g is Normal Unit Mass and C is Normal Unit Charge, q_{yy} is Wu's Unit Charge of a single Yangton or Yington, and m_{yy} is Wu's Unit Mass of a single Wu's Pair (K_g, C, q_{yy} and m_{yy} are fixed mass and charge quantities, they are independent of gravitational field and aging of the universe).
Because
$\gamma = \pi (2K)^{-1/2} = \pi k^{-1/2}(q_{yy}^2/m_{yy})^{-1/2}$
Therefore,
$\gamma = \pi (8.99 \times 10^9)^{-1/2} q_{yy}^{-1}m_{yy}^{1/2} (m^3s^{-2})^{-1/2}$
$\gamma = \pi (8.99 \times 10^9)^{-1/2} (q_{yy}^{-1}m_{yy}^{1/2} CK_g^{-1/2}) (m/s)^{-1}m^{-1/2}$
$\omega = q_{yy}^{-1}m_{yy}^{1/2} CK_g^{-1/2}$
$\gamma = 3.313 \times 10^{-5} \omega (m/s)^{-1}m^{-1/2}$
According to Principle of Parallelism,
$m = k_1l_{yy}$
$S = k_2 l_{yy}^{3/2}$
Therefore,
$(m/s)^{-1}m^{-1/2} = (k_1/k_2 l_{yy}^{1/2}) (k_1^{-1/2}l_{yy}^{-1/2}) = k_1^{1/2}/k_2$
$\gamma = 3.313 \times 10^{-5} \omega (m/s)^{-1}m^{-1/2} = 3.313 \times 10^{-5} \omega k_1^{1/2}/k_2$
Because ω is a fixed constant physical quantity and $k_1^{1/2}/k_2$ is a real number constant, therefore Wu's Spacetime Constant γ is also a fixed constant physical quantity independent of the local gravitational field and aging of the universe (revised from [14]).

X. Reference Object or Event and Reference Subatomic Particle

According to Principle of Equilibrium, under thermal equilibrium at a constant temperature and pressure, and subatomic equilibrium at a constant gravitational field and aging of the universe, all the quantities of the properties including length, time, velocity and acceleration of an object or event are dependent on the same gravitational field and aging of the universe. In addition, the Normal Unit Length (centimeter) and Normal Unit Time (second) of a reference object or event, as well as Wu's Unit Length and Wu's Unit Time of a reference subatomic particle are also dependent on the same gravitational field and aging of the universe. Because all of these quantities are one to one correspondence, therefore, all quantities of the properties of an object or event are dependent on the Normal Unit Length (centimeter) and Normal Unit Time (second) of a reference object or event, and also dependent on Wu's Unit Length and Wu's Unit Time of a reference subatomic particle at the same location and time (same gravitational field and aging of the universe) [1].

The correlation between the quantity of the property of a corresponding identical object or event and the unit quantity of the same property of a reference corresponding identical object or event, or the unit quantity composed of Wu's Unit Length and Wu's Unit Time of the same property of a reference corresponding identical subatomic particle, at the same gravitational field and aging of the universe, can be obtained by Principle of Equilibrium, Principle of Correspondence, Principle of Parallelism and Wu's Spacetime Equation. These correlations can be used successfully in the explanation of many important physical phenomena such as Gravitational Redshift [4], Cosmological Redshift [3], Gravitational Time Dilation [8], Hubble's Law [9], Spacetime Reverse Expansion (Universe Expansion)[10], Deflection of Light [11], Perihelion Precession of Mercury [11] and Einstein's General Relativity [12], Spacetime [13] and Field Equations [13], etc.

XI. Wu's Spacetime Shrinkage Theory

Under both thermal equilibrium and subatomic equilibrium, an object or event at a massive graviton bombardment (or at a large gravitational field in a stationary single parent object system) or in an early stage aging of the universe should have a larger Wu's Unit Length and Wu's Unit Time (based on Wu's Spacetime Equation $t_{yy} = \gamma l_{yy}^{3/2}$) than that at a less intensive graviton bombardment (or at a small gravitational field in a stationary single parent object system) or in a later stage aging of the universe. This is named "Wu's Spacetime Shrinkage Theory" [7]. Furthermore, according to Principle of Parallelism based on the intrinsic atomic and subatomic structures of a corresponding identical object or event, a bigger dimension and duration, as well as a larger wave length and a smaller light speed and slower clock can also be obtained.

More specifically, under thermal equilibrium, for an object or event at a massive graviton bombardment or at a large gravitational field, because of the heavy graviton bombardment caused by Graviton Radiation and Contact Interaction Theory [15], the circulation speed of Wu's Pairs is getting slower. As a consequence, a subatomic equilibrium with large Wu's Unit Length ($V^2R = K$) and Wu's Unit Time ($t_{yy} = \gamma\ l_{yy}^{3/2}$) of all the subatomic particles in the object or event can be gradually achieved. This is named "Gravity Affected Wu's Spacetime Shrinkage Theory" [7].

On the other hand, under thermal equilibrium, for an object or event at later aging of the universe, because of the attraction caused by Force of Creation based on Five Principles of the Universe [16] and complying with Cosmic Microwave Background Radiation (CMB) [17], the circulation speed of Wu's Pairs is fast. As a consequence, a subatomic equilibrium with small Wu's Unit Length and Wu's Unit Time of all the subatomic particles in the object or event can be gradually achieved. This is named "Aging Affected Wu's Spacetime Shrinkage Theory" [7].

XII. Wu's Spacetime Transformation

Under both thermal equilibrium and subatomic equilibrium, all objects and events are corresponding identical objects and events. Based on Principle of Equilibrium, Principle of Parallelism and Principle of Correspondence, as well as Wu's Spacetime Equation $t_{yy} = \gamma l_{yy}^{3/2}$, all the quantities of the properties of an object or event can be transformed to Wu's Unit Length of a reference subatomic particle at the same location and time (same gravitational field and aging of the universe). These transformations are called "Wu's Spacetime Transformation". For examples,

$L = l\ m\ l_{yy}$

$T = t\ n\ t_{yy} = t\ n\ \gamma\ l_{yy}^{3/2}$

$V = v\ (m/n)(l_{yy}/t_{yy}) = v\ m\ n^{-1}\ \gamma^{-1}\ l_{yy}^{-1/2}$

$A = a\ (m/n^2)(l_{yy}/t_{yy}^2) = a\ m\ n^{-2}\ \gamma^{-2}\ l_{yy}^{-2}$

Therefore,

$L = l\ m\ l_{yy}$

$T = t\ n\ \gamma\ l_{yy}^{3/2}$

$V = v\ m\ n^{-1}\ \gamma^{-1}\ l_{yy}^{-1/2}$

$A = a\ m\ n^{-2}\ \gamma^{-2}\ l_{yy}^{-2}$

Also, wavelength is a property of photon (object) and light speed is a property of light traveling (event), therefore,

$\lambda = \lambda_0\ m\ l_{yy}$

$C = c\ m\ n^{-1}\ \gamma^{-1}\ l_{yy}^{-1/2}$

All these quantities represented by l_{yy} are called "Wu's Spacetime Quantities". Accordingly, the correlations between the properties of an object or event and the local gravitational field and aging of the universe can be realized based on Wu's Spacetime Shrinkage Theory.

Fig.1 shows the properties of various corresponding identical objects and events under subatomic equilibrium at different gravitational field and aging of the universe with the correlations between Wu's Spacetime Shrinkage Theory, Principle of Equilibrium, Principle of Parallelism and Principle of Correspondence. Fig. 1 provides a road map for Wu's Spacetime Transformation, and it is called "Wu's Spacetime Transformation Diagram".

As a result, Wu's Spacetime Transformation can be used in explanation of all the properties of an object or event affected by gravitational field and aging of the universe such as Cosmological Redshift, Gravitational Redshift, Time Dilation, Light Deflection, Perihilion Precession of Mercury, etc. Furthermore, it can be used in the derivation of Wu's Spacetime Field Equation in comparison to Einstein's Field Equation.

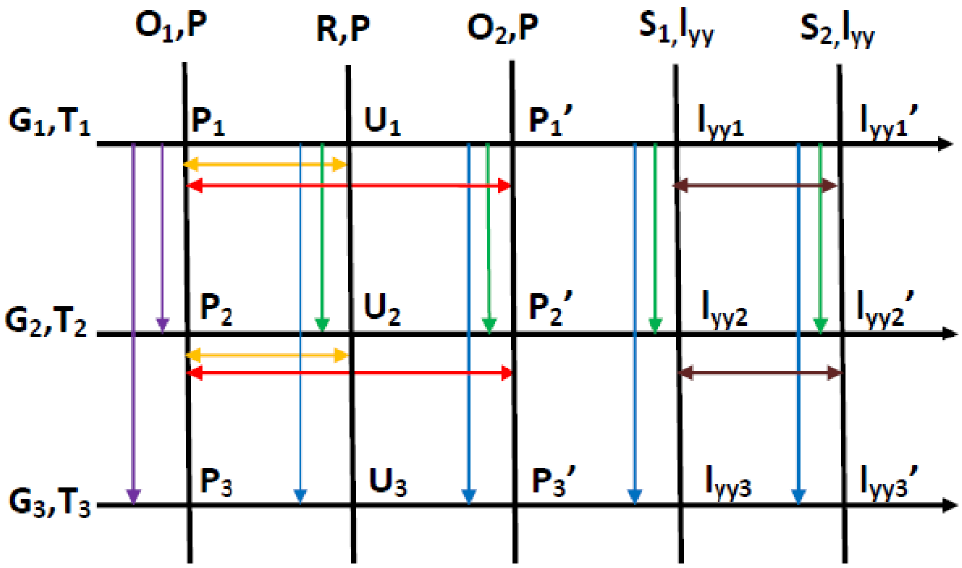

Fig. 1 Wu's Spacetime Transformation Diagram shows the effects of gravitational field and aging of the universe on objects and events under thermodynamic equilibrium and subatomic equilibrium, including Principle of Equilibrium that all properties have fixed quantities (P_i, U_i, l_{yyi}), Principle of Correspondence P = mU (Yellow Lines), Principle of Parallelism P = nP' (Red, Yellow, Brown Lines), Wu's Spacetime Shrinkage Theory (Purple, Green, Blue Lines) (G = gravitational field, T = aging of the universe, O = object or event, R = reference, S = subatomic particle, P = property and l_{yy} = Wu's Unit Length).

XIII. Wu's Spacetime Field Equations

According to Newton's Law of Universal Gravitation and Newton's Second Law of Motion, the remote gravitational force F generated between a target object m and a parent object M at a distance R can move the target object toward to the parent object at acceleration A as follows:

$$F = G\,m\,M/R^2$$

$$F = m\,A$$

Therefore,

$$A = GM/R^2$$

Where A is the acceleration of an object, G is Newton's gravitational constant, M is the mass of the star (parent object), R is the distance between the object and the star. This equation is called "Field Equation" (gravitational field $F_g = GM/R^2$).

Furthermore, according to Wu's Spacetime Transformation, the acceleration of an object or event can be transformed to Wu's Unit Length of a reference subatomic particle at the same location and time (same gravitational field and aging of the universe) as follows:

$$A = a\,m\,n^{-2}\,\gamma^{-2}\,l_{yy}^{-2}$$

Where A is the acceleration of an object or event, a is the amount of normal unit acceleration, γ is the Wu's Spacetime constant, m is the reference-dependent real number constant of normal unit length, n is the reference-dependent real number constant of normal unit time, and l_{yy} is Wu's Unit Length of the reference subatomic particle at the same location and time (same gravitational field and aging of the universe).

In addition, according to Wu's Spacetime Transformation, the Absolute Light Speed of a photon emitted from a light source can be transformed to Wu's Unit Length of a reference subatomic particle at the same location and time (same gravitational field and aging of the universe) as follows:

$$C = c\ m\ n^{-1}\ \gamma^{-1}\ l_{yy}^{-1/2}$$

Where C is the Absolute Light Speed of a photon, c is the amount of normal unit velocity of the photon (3 x 10^8), γ is the Wu's Spacetime constant, m is the reference-dependent constant of normal unit length, n is the reference-dependent constant of normal unit time, and l_{yy} is Wu's Unit Length of the reference subatomic particle at the same location and time (same gravitational field and aging of the universe).

Because

$$A = GM/R^2$$

$$A = a\ m\ n^{-2}\ \gamma^{-2}\ l_{yy}^{-2}$$

$$C = c\ m\ n^{-1}\ \gamma^{-1}\ l_{yy}^{-1/2}$$

Also,

$C^{-4} = c^{-4}\ m^{-4}\ n^4\ \gamma^4\ l_{yy}^2$

Given

$\sigma = m^{-1}\ n^2$

$\delta = m^3 n^{-2} c^4$

Where c is the amount of normal unit velocity of photon (3 x 10^8), m is the reference-dependent constant of normal unit length, n is the reference-dependent constant of normal unit time. They are all real number constants, no matter gravitational field and aging of the universe. Consequently, σ and δ are also real number constants no matter of gravitational field and aging of the universe.

Therefore,

$$a = \sigma\ \gamma^2\ l_{yy}^2\ (GM/R^2)$$

$$a = \delta\ \gamma^{-2}\ C^{-4}\ (GM/R^2)$$

Where a is the amount of normal unit acceleration, σ and δ are reference-dependent real number constants associated with the reference subatomic particle, γ is Wu's Spacetime constant, G is Newton's gravitational constant, l_{yy} is Wu's Unit Length of a reference subatomic particle, C is the Absolute Light Speed at the same location and time (same gravitational field and aging of the universe) and c is the amount of normal unit velocity of the photon (a real number constant 3 x 10^8), R is the distance of a point in space from a star (parent object) of mass M, also γ, G, C and l_{yy} are dependent on the same gravitational field and aging of the universe. These are named "Wu's Spacetime Field Equations" [18].

Wu's Spacetime Field Equation represents the correlation between the amount of normal unit acceleration "a" and Wu's Unit Length l_{yy} of a reference subatomic particle at the same location and time (same gravitational field and aging of the universe), which reflects the distribution of energy and momentum of matter. Instead of σ and Wu's Unit Length l_{yy} of the reference subatomic particle (associated with the reference subatomic particle), δ and Absolute Light Speed C at the same location and time are used, which are dependent only on the location and time (gravitational field and aging of the universe) no matter the reference subatomic particles.

Acceleration and Wu's Spacetime Field Equation of an object or event can be formulated with Wu's Spacetime Transformation Diagram (Fig. 2) [1] and represented by Wu's Unit Length l_{yy} of a reference subatomic particle and the Absolute Light Speed C at the same location and time (same gravitational field and aging of the universe) as follows:

$$A = a\ m\ n^{-2}\ \gamma^{-2}\ l_{yy}^{-2}$$

$$a = \delta\, \gamma^{-2}\, C^{-4}\, (GM/R^2)$$

Where A is the acceleration of an object or event, a is the amount of normal unit acceleration, m is the reference-dependent constant of normal unit length, n is the reference-dependent constant of normal unit time, δ is a real number constant, γ is Wu's Spacetime constant, l_{yy} is Wu's Unit Length of the reference subatomic particle at a location and time, and C is the Absolute Light Speed at the same location and time (same gravitational field and aging of the universe).

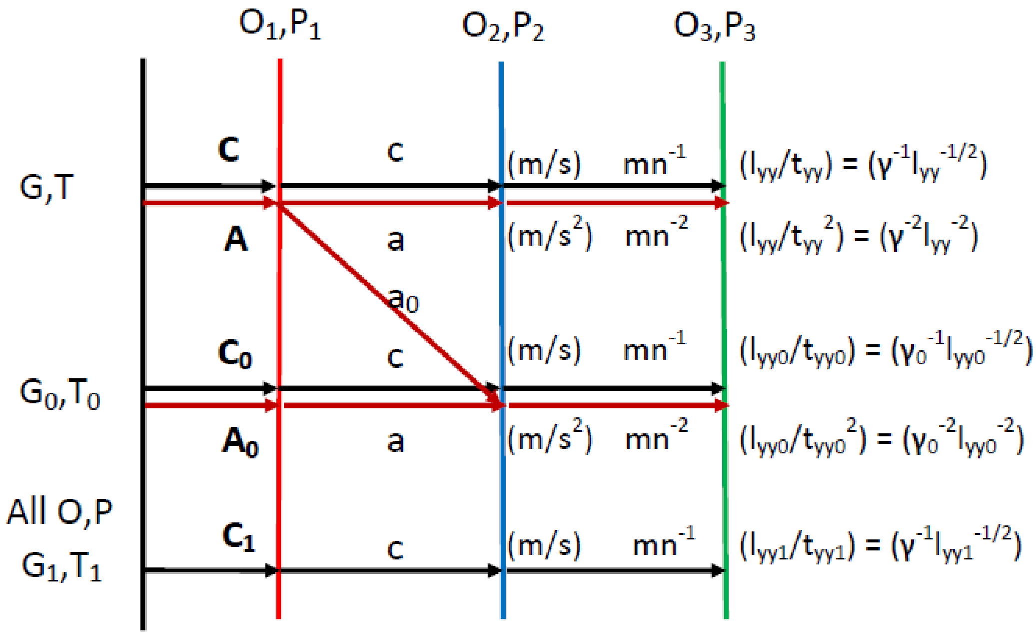

Fig. 2 Wu's Spacetime Transformation Diagram shows the correlations and transformations between the properties of different corresponding identical objects or events (O, P) at the same subatomic equilibrium state (G,T) and that at different equilibrium states (G, T). (G = gravitational field, T = aging of the universe, O = object or event, P = property, A = acceleration, C = Absolute Light Speed).

As illustrated in Fig. 2, according to Wu's Spacetime Transformation, the acceleration A of an object or event at a distance R from the star (parent object) can be transformed and represented by Wu's Unit Length l_{yy0} of the reference subatomic particle on earth. Also, the Absolute Light Speed C_0 of a photon on earth can be represented by Wu's Unit Length l_{yy0} of the reference subatomic particle on earth as follows:

$$A = a_0\, m\, n^{-2}\, \gamma^{-2}\, l_{yy0}^{-2}$$

$$C_0 = c\, m\, n^{-1}\, \gamma^{-1}\, l_{yy0}^{-1/2}$$

Given

$\delta = m^3 n^{-2} c^4$

Therefore, Wu's Spacetime Field Equation observed on earth can be represented as follows:

$$a_0 = \delta\, \gamma^{-2}\, C_0^{-4}\, (GM/R^2)$$

Where a_0 is the amount of normal unit acceleration measured on earth, M is the mass of the star (parent object), R is the distance from the star, G is gravitational constant, m is the reference-dependent constant of normal unit length, n is the reference-dependent constant of normal unit time, δ is a real number constant, γ is Wu's Spacetime constant and C_0 is the Absolute Light Speed ($3x10^8$ m/s) on earth.

XIV. Wu's Spacetime Field Equations versus Einstein's Field Equations

Einstein's Field Equation represents the correlation between acceleration and the derivative of potential energy (the distribution of energy and matter). Einstein's Field Equation gives a solution "Einstein's Spacetime" (potential energy, a property function of the object or event) to each distribution of energy and matter, which is a four dimensional space-time continuum originated from a nonlinear geometry system (geodesics) and transformed to a Normal Spacetime System on earth. The derivative of Spacetime (potential energy) to distance reflects the curvature of the potential energy and the corresponding acceleration, as well as the distribution of matter, energy and momentum of the parent objects in space.

In contrast, Wu's Field Equation represents the correlation between acceleration and gravitational field. Wu's Field Equation gives a solution, a property function (amount of normal unit acceleration a_0) to each distribution of energy and matter, in a Normal Spacetime System on earth.

$$a_0 = \delta\, \gamma^{-2} C_0^{-4} (GM/R^2)$$

$$R_{\mu\nu} - \frac{1}{2} R\, g_{\mu\nu} + \Lambda\, g_{\mu\nu} = \frac{8\pi G}{c^4} T_{\mu\nu}$$

Because the same terms GC_0^{-4} and G/C^4 (C in Einstein's Field Equation is the Absolute Light Speed on earth $C = C_0$) appeared in both equations, Einstein's Field Equation and Wu's Spacetime Field Equation are considered equivalent. However, there is no gravitational force in Einstein's Field Equation. Acceleration is derived from the curvature of space-time continuum, which reflects the distribution of matter and energy in the universe. On the other hand, in Wu's Spacetime Field Equation, matter does exist, as is the gravitational field. Also, the acceleration is caused by the gravitational field. More specifically, Einstein's Field Equation is Energy and Acceleration correlated field equation, and Wu's Spacetime Field Equation is Acceleration and Gravity correlated Field Equation.

Furthermore, Einstein's Field Equation applies Geodesic Transformation between Geodesics System and Cartesian System. In contrast, Wu's Spacetime Field Equation applies Wu's Spacetime Transformation between two Cartesian Systems from Normal Spacetime System to Wu's Spacetime System.

XV. Wu-Einstein Field Equation

A similar equation to Einstein's Field Equation can be derived from Wu's Spacetime Transformation to reflect the correlation between Spacetime, Acceleration and Potential Energy as follows:
Because the potential energy E and the attractive force applied on an object or event (mass m) can be represented as follows:

$$dE = F\, dR$$
$$F = mA$$

Therefore,

$$dE/dR = mA$$

Given
$E = E_0\, m$
Therefore,

$$dE_0/dR = A$$

Where E_0 is the potential energy of a unit mass (1Kg).
Based on Wu's Spacetime Transformation, acceleration of the object or event observed at the same location and time (same gravitational field and aging of the universe) can be obtaied as follows:

$$A = a\, m^{-3} n^2 \gamma^2 c^{-4} C^4$$

Furthermore, based on Wu's Spacetime Transformation between two locations and times (two gravitational field and aging of the universe), the acceleration of the object or event observed on earth can also be achieved as follows:

$$A = a_0\, m^{-3} n^2 \gamma^2 c^{-4} C_0^4$$

Therefore,

$$a_0 = m^3n^{-2}\gamma^{-2}c^4C_0^{-4}\,(dE_0/dR)$$

Where a_0 is the amount of normal unit acceleration observed on earth, m is the reference-dependent constant of normal unit length, n is the reference-dependent constant of normal unit time, γ is the Wu's Spacetime constant, c is the amount of normal unit velocity of light speed (3×10^8) and C_0 is Absolute Light Speed on earth.

Given

$\delta = m^3n^{-2}c^4$

Therefore,

$$a_0 = \delta\, \gamma^{-2}\, C_0^{-4}\,(dE_0/dR)$$

Also,

$$a_0 = \delta\, \gamma^{-2}\, C_0^{-4}\, G(dE_0/GdR)$$

Where a_0 is the amount of normal unit acceleration on earth, E_0 is Potential Energy of a unit mass, δ is a constant of the reference subatomic object or event, γ is Wu's Spacetime constant, C_0 is Absolute Light Speed on earth, G is gravitational constant, E_0 is the potential energy and R is the distance from the star. This equation is named "Wu-Einstein Field Equation" (revised from [19]).

Compare Wu-Einstein Spacetime Field Equation to Einstein's Field Equation,

$$a_0 = \delta\, \gamma^{-2}\, C_0^{-4}\, G(dE_0/GdR)$$

$$R_{\mu\nu} - \frac{1}{2} R\, g_{\mu\nu} + \Lambda\, g_{\mu\nu} = \frac{8\pi G}{c^4} T_{\mu\nu}$$

The left hand side of Einstein Field Equation is equivalent to a_0 the amount of normal unit acceleration on earth. The right hand side of Einstein Field Equation is equivalent to $\delta\, \gamma^{-2}\, C_0^{-4}\, G(dE_0/GdR)$, which is related to mass, energy and momentum of the object or event. A common term C_0^{-4} G can be found in both equations.

XVI. Conclusion

Under both thermal equilibrium and subatomic equilibrium, all objects and events are corresponding identical objects and events. Based on Principle of Equilibrium, Principle of Parallelism and Principle of Correspondence, as well as Wu's Spacetime Equation $t_{yy} = \gamma l_{yy}^{3/2}$, all quantities of the properties of an object or event can be transformed to Wu's Unit Length of a reference subatomic particle at the same location and time (same gravitational field and aging of the universe). These transformations are called "Wu's Spacetime Transformation". Furthermore, the correlations between the quantities of the properties of the corresponding identical object or event at different gravitational field and aging of the universe can be realized based on Wu's Spacetime Shrinkage Theory. As a result, in accompany with Wu's Spacetime Shrinkage Theory, Wu's Spacetime Transformation can be used to interpret the changes of the properties of an object or event affected by gravitational field and aging of the universe, such as Cosmological Redshift, Gravitational Redshift, Time Dilation, Light Deflection, Perihilion Precession of Mercury, etc. In addition, Wu's Spacetime Transformation can be used to derive Wu's Spacetime Field Equation which correlates acceleration and gravity compared to Einstein's Field Equation which correlates Energy and acceleration.

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