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# What Are the Truths of Gravity and General Relativity

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***[Abstract]***
*It is proposed that graviton is composed of Wu's Pairs, a Yangton and Yington circulating particle pairs with build-in attractive Force of Creation (Building Blocks of the universe). Gravitational force is generated by string force between two gravitons and the propagation of gravitational force is explained by graviton radiation and contact interaction. In addition, the dimension and duration of an object or event can change with the local gravitational field due to the bombardment of gravitons and aging of the universe in compliance with CMB radiation. Because of the same intrinsic structures, the amount of unit quantity in a corresponding identical objects or events should remain unchanged no matter of gravitational field and aging of the universe. Furthermore, Principle of Equilibrium, Principle of Parallelism and Principle of Correspondence are used to explain the correlations between the quantities of the same properties of different objects and events. Einstein's Spacetime and Field Equation were compared to Wu's Spacetime and Wu's Spacetime Field Equation. In fact, Einstein's Spacetime is nothing but the property of an object or event likes acceleration which can reflect the local gravitational field and aging of the universe. Finally, Wu's Spacetime Graviton Concentration Field Equation is derived which can serve as the Backbone of Quantum Field Theory, Quantum Gravity Theory and Unified Field Theory.*

***[Keywords]***
*Yangton and Yington, Wu's Pairs, Graviton, Gravitational Force, Graviton Radiation and Contact Interaction, Space, Time, Subatomic Equilibrium, Corresponding Identical Object, Wu's Spacetime Shrinkage Theory, Principle of Equilibrium, Principle of Correspondence, Principle of Parallelism, Cosmological Redshift, Gravitational Redshift, Perihelion precession of Mercury, Deflection of Light, General Relativity, Spacetime, Einstein's Field Equation, Wu's Spacetime Field Equation.*

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## I. Introduction

Gravity has been a mystery in entire human's history, even decades after the declarations of Newton's Law of Universal Gravitation and Einstein's General Relativity. Newton developed a quantitative formula to calculate the gravitational force, yet without explained how gravity is generated and how it propagates. Einstein on the other hand, claimed that both space and time can change with speed and acceleration, also spacetime is a solution of Einstein's Field Equation. Even more, Einstein believed that matter and energy are nothing but a distortion of space and time.

In contrast, according to Yangton and Yington Theory, Wu's Pairs, a pair of Yangton and Yington circulating particles, are proposed as the building blocks of the universe. Also, the dimension (space) and duration (time) of an object or event can change with its local gravitational field and aging of the universe. In this paper, some important issues regarding gravity and general relativity will be discussed in details based on Wu's Pairs and Yangton and Yington Theory. They are:

- What is graviton?
- What is gravitational force?
- How does gravitational force propagate?
- How does gravity affect the properties of object and event?
- What is Einstein's Spacetime?
- What is Einstein's Field Equation?

It is the purpose of this paper that the truths of gravity and general relativity can finally be comprehended.

## II. Graviton and Gravitational Force

A. Yangton and Yington Theory

Yangton and Yington Theory [1] is a hypothetical theory based on a pair of super fine Antimatter particles (named "Yangton and Yington") with an inter-attractive force named ("Force of Creation") [1] forming a permanent circulating particle pair (named "Wu's Pair") [1] that is proposed as the fundamental building blocks of the universe. It explains the formation of all the substances in the universe and the correlations between space, time, energy and matter. Therefore, it is believed that Yangton and Yington Theory is a theory of everything.

B. Subatomic Particles

Subatomic particles [2] are the components of atoms, such as neutrons, protons, electrons, photon, etc. Based on Standard Model [2], there are two types of subatomic particles: (1) Elementary Subatomic Particles such as quarks, electrons, neutrinos, gluons, photon, bosons, etc, and (2) Composite Subatomic Particles which are composed of Elementary Subatomic Particles, such as protons, neutrons, etc. In addition, there are Four Basic Forces: Gravitational Force, Electromagnetic Force, Weak Force and Strong Force that are used to combine the subatomic particles together to form all matters in the universe. However, there is no evidence in Standard Model if exist a Building Block (God's Particle) that can produce all subatomic particles and matters in the universe with a unified force that can combine all Four Basic Forces.

In contrast, according to Yangton and Yington Theory and Five Principles of the Universe [3], Wu's Pairs are the Building Blocks (God's Particles) of the universe and String Structures are composed of Wu's Pairs with String Forces. Also, all subatomic particles are composed of String Structures with String Forces and Four Basic Forces [4]. Furthermore, all string force and Four Basic Forces are induced from Force of Creation which is in compliance with Unified Field Theory [5].

C. String Theory, String Force and String Structures

In order to bring general relativity [6] and quantum field theory [7] together, physicists suggested that all matters must have a linear structure with 10 dimensions like Calabi-Yau manifold (Fig. 1). This is known as "String Theory" [8].

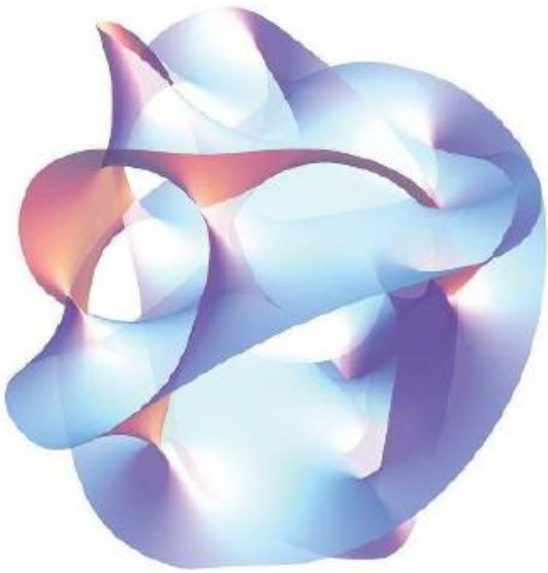

Fig. 1 A cross section of a quintic Calabi-Yau manifold.

Could String Theory be true? The answer is yes and only if all the subatomic particles have a linear structure. Physicists have absolutely no idea what the structures of quarks and photon are, even with their state-of-the-art LHC [9]. However, based on the Yangton and Yington Theory, that all subatomic particles should have a string structure is not only very possible, but also quite obvious.

Wu's Pair is a pair of Yangton and Yington Antimatter particles circulating in an orbit held by the inter-attractive Force of Creation between the two particles. When two Wu's Pairs come together with the same circulation direction (both spin up or spin down), they stack up on each other at a locked-in position, where Yangton of the first Wu's Pair is lined up to the Yington of the second one due to the attraction between Yangton and Yington particles. This induced force between the two Wu's Pairs in the same circulation direction is called "String Force". (There are zero net interactions between two adjacent Wu's Pairs in opposite circulation directions because of the cancellations of attraction and repulsion forces between Yangtons and Yingtons). By repeating the stack up processes, strings, rings and other related structures made of Wu's Pairs called "String Structures" can be formed (Fig. 2) [2], which comply very well with the "String Theory".

Furthermore, similar to the double helix DNA which forms all lives on earth, the String Structures made of Yangton and Yington particles also have a double helix structure which can build all matters in the universe.

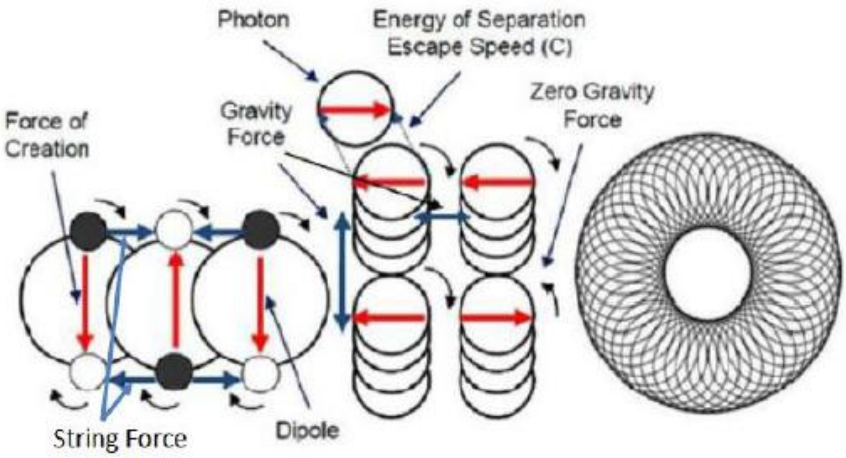


Fig. 2 Wu's Pairs stack up in a preferred direction by string force to form string and ring structures.

D. Standard Model

Standard Model is a group of subatomic particles which is derived from a mathematical model based on Quantum Field Theory and Yang Mills Theory. In contrast, Wu's Pairs a physical model are proposed as the building blocks of all subatomic particles based on the Yangton and Yington Theory.

Subatomic particles are very much smaller than atoms. There are two types of subatomic particles: elementary particles, which according to current theories are not made of other particles, and composite particles which are made of elementary particles. Particle physics and nuclear physics study these particles and how they interact.

The elementary particles of the Standard Model (Fig. 3) include:

- Six flavors of quarks: up, down, bottom, top, strange, and charm.
- Six types of leptons: electron, electron neutrino, muon, muon neutrino, tau, tau neutrino.
- Twelve Gauge Bosons (force carriers): the photon of electromagnetism, the three W and Z Bosons of the weak force, and the eight gluons of the strong force.
- The Higgs Boson.

Various extensions of the Standard Model predict the existence of an elementary Graviton particle and many other elementary particles.

Composite subatomic particles such as protons or atomic nuclei are bound states of two or more elementary particles. For example, a proton is made of two up quarks and one down quark, a neutron is made of two down quarks and one up quark, while the atomic nucleus of Helium-4 is composed of two protons and two neutrons.

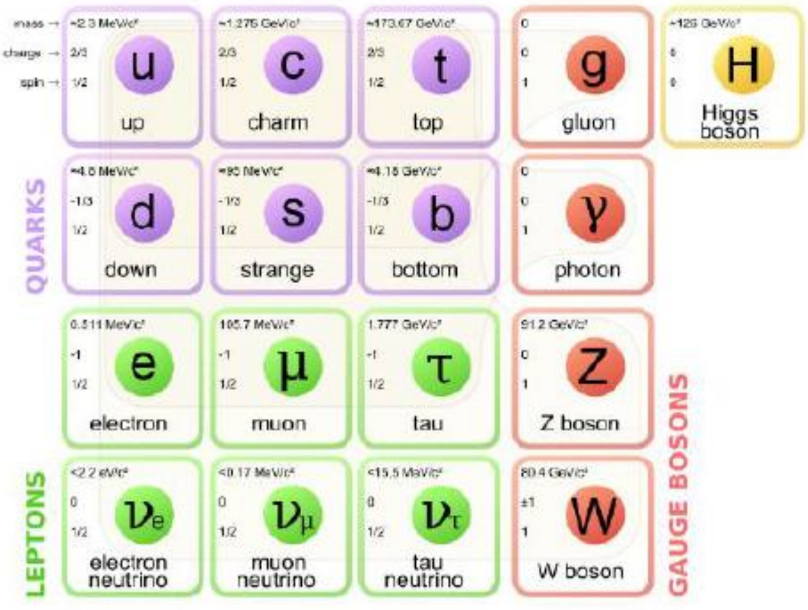


Fig. 3 The elementary particles of the Standard Model.

E. Standard Model and Wu's Pairs

According to Yangton and Yington Theory, all elementary subatomic particles including quarks, leptons, Gauge Bosons, gluons, photon, Higgs Boson and Graviton are composed of Wu's Pairs. They have strings, rings and other related structures (Fig. 4) named String Structures that are glued together by the string force between two adjacent Wu's Pairs (Fig. 3). Composite subatomic particles are made of elementary subatomic particles, which are glued together by four basic forces including gravitational force, electromagnetic force, weak force and strong force that are induced from Force of Creation subject to the subatomic structures and their interactions.

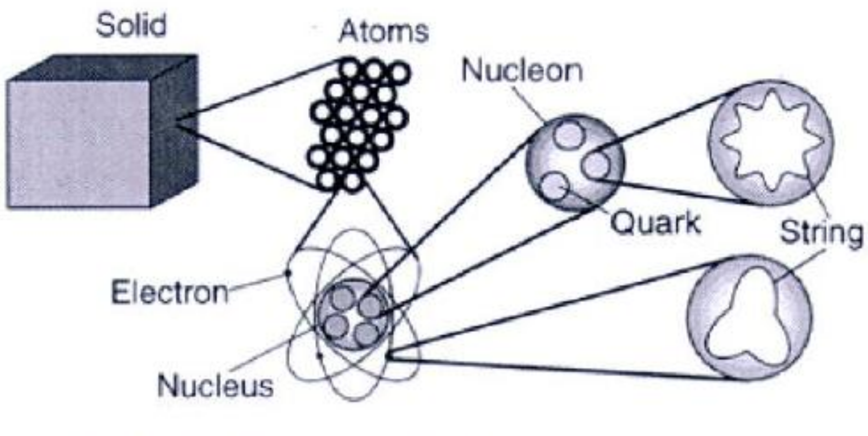


Fig. 4 Subatomic particles made of string structures.

F. Graviton and Gravitational Force

Wu's Pairs can be used to form elementary subatomic particles with string structures in a variety of shapes. When two string structures come together in the same circulation direction, they can attract each other at the ends of the strings by locking the Yangton of one string to the Yington of the other string (this is known as String Force). Otherwise, there is no interaction if they are in the opposite circulation directions. However, when two string structures come together side by side, no matter the circulation directions, they can adjust themselves to attract each other as the Yangtons of one string contact the Yingtons of the other string during each cycle of the circulations. This attractive only force is known as "Gravitational Force" (Fig. 5)and the string structures that produce the gravitational force are called "Gravitons".

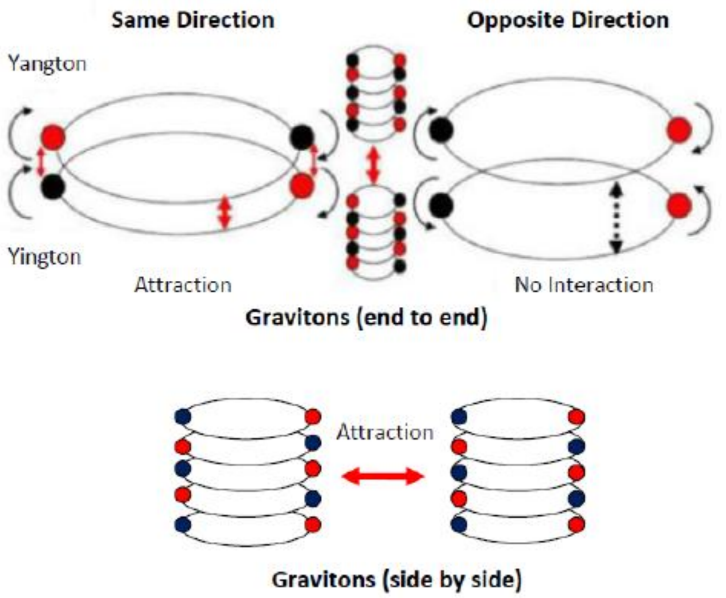


Fig. 5 Gravitational force between two graviton particles

## III. Propagation of Gravitational Force

A. Graviton Radiation and Contact Interaction

Newton's Law of Universal Gravitation [10] only describes the phenomenon of the gravitational force without explaining what the process is and how it works. Particle Radiation and Contact Interaction Theory [11] is proposed to explain the mechanism and the propagation of the gravitational force.

According to Yangton and Yington Theory, gravitational force can be generated between two gravitons with side by side contact (Fig. 5). Because of this reason, for two distance objects, graviton particles escaped from the parent object traveling to the target object can make side by side contacts such that propagation of gravitational force can be fulfilled and Newton's Law of Universal Gravitation can be realized. This is called "Graviton Radiation and Contact Interaction Theory".

Like a photon emitted from a heat source by absorbing thermal energy to overcome the string force, graviton can also be emitted from an object by absorbing thermal energy to overcome the gravitational force. It is obvious that the flux of the gravitons (I), the amount of the gravitons emitted from the parent object reaching the target object per unit area per unit time, should be proportional to the mass of the parent object ($m_1$), and also inversely proportional to the square of the distance (r) between parent object and target object. Therefore,

$$I \propto m_1/r^2$$

Furthermore, the total gravitational force (F) generated from side by side contact between the gravitons emitted from the parent object to the target object and the gravitons on the target object should be proportional to both the flux of the gravitons (I) emitted from the parent object to the target object and the total amount of the gravitons on the target object which is proportional to the mass of the target object ($m_2$). Therefore,

$$F \propto (m_1/r^2)\, m_2$$

In addition, because of the random angels from 0° to 90° between the emitted gravitons from the parent object and the gravitons on the target (Fig. 6) [11], an average 50% of the full contact interactions can be generated.

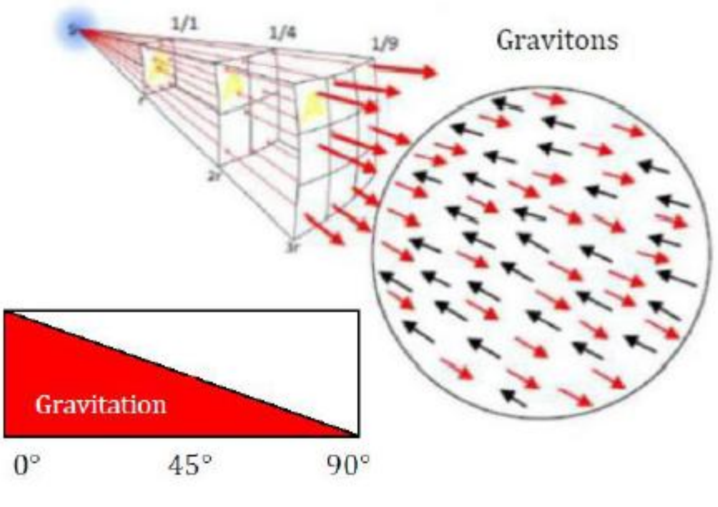


Fig. 6 Gravitational force caused by Graviton Radiation and Contact Interaction.

As a result, Newton's Law of Universal Gravitation (Fig. 7) can be derived as follows:

$$\mathbf{F} = G\,(m_1 m_2/r^2)\,\mathbf{S}$$

Where **F** is the gravitational force, G is the gravitational constant $6.674\times10^{11}$ N $m^2$ $kg^{-2}$, $m_1$ is the mass of parent object and $m_2$ is the mass of target object, r is the distance between $m_1$ and $m_2$ and **S** is the unit vector with direction from $m_2$ to $m_1$.

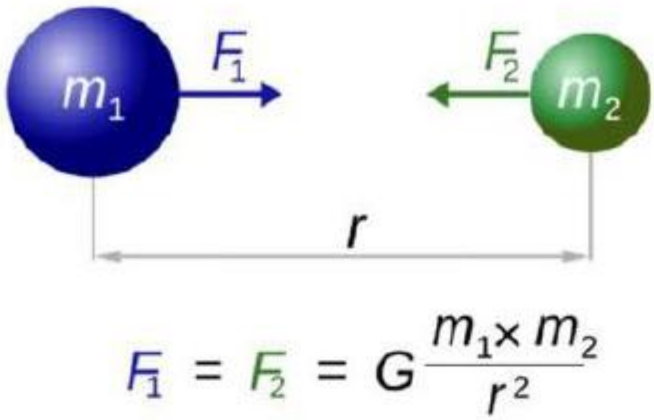


Fig. 7 Gravitational force between two objects.

B. Gravitational Field and Concentration of Graviton Vectors

Gravitational field by definition is the total gravitational forces generated from all the objects in the universe applied onto a unit mass (for example 1 Kg) at a point in space. According to Particle Radiation and Contact Interaction Theory, gravitational field is proportional to the summation of the graviton fluxes emitted from all the parent objects in the universe onto a unit mass at a point in space. Therefore,

$$\mathbf{F_g} = \sum G\,(m/r^2)\,\mathbf{S}$$

Where $\mathbf{F_g}$ is the gravitational field, G is the gravitational constant $6.674\times10^{11}$ N $m^2$ $kg^{-2}$, m is the mass of a parent object, r is the distance from the parent object to the point and **S** is the unit vector with direction from the point to the parent object.

Since the graviton flux from each parent object to the point is constant, therefore the concentration of graviton vectors (graviton with direction) emitted from each parent object at the point is also constant. And they are proportional to each other.

$$c \infty m/r^2$$

Because

$$\mathbf{F_g} = \sum G\,(m/r^2)\,\mathbf{S}$$

Therefore,

$$\mathbf{F_g} = \sum K\, c\, \mathbf{S}$$

Where $\mathbf{F_g}$ is the gravitational field, K is the concentration constant, c is the concentration of the graviton vectors and **S** is the unit vector with direction from the point to the parent object.

As a result, gravitational field represents not only the flux of graviton vectors, but also the concentration of graviton vectors at a point in space.

Similar to gravitational field, the electrical field is defined as the electrical force applied from all charged particles in the universe onto a single positive charge at a point in space. Therefore, electrical field also represents not only the flux of electron (positron) vectors, but also the concentration of electron (positron) vectors at a point in space.

Furthermore, because both gravitational and electrical fields can be considered as the fluxes of graviton and electron vectors, and to be derived from "Particle Radiation and Contact Interaction Theory", also with a linear relationship to the concentrations of graviton vectors and electron vectors respectively, therefore, Particle Radiation and Contact Interaction Theory can be considered as the foundations of Quantum Field Theory, Quantum Gravity Theory and Unified Field Theory.

C. Gravitational Wave

Gravitational waves [12] are proposed as "ripples" in space-time that propagate like waves, traveling outward from the source caused by some of the most violent and energetic processes in the universe. Albert Einstein predicted the existence of gravitational waves in 1916 in his general theory of relativity [13]. Einstein's mathematics show that massive accelerating objects would disrupt space-time in such a way that "waves" of distorted space would radiate from the source. Furthermore, these "ripples" would travel at the speed of light through the universe, carrying with them information about their cataclysmic origins, as well as invaluable clues to the nature of gravity itself. By contrast, gravitational waves cannot exist in Newton's theory of gravitation, since Newton's theory postulates that physical interactions propagate at infinite speed. Potential sources of detectable gravitational waves include binary star systems composed of white dwarfs, neutron stars, stellar cores (supernovae) or Black Holes. On February 11, 2016, the LIGO Scientific Collaboration and Virgo Collaboration teams announced that they had made the first observation of gravitational waves, originating from a pair of merging black holes using the Advanced LIGO detectors [14].

Based on Particle Radiation and Contact Interaction Theory, gravitational force can be propagated by graviton radiation. Graviton is a very tiny particle which can easily penetrate most objects except extremely massive objects such as mega stars or black holes. In fact, Gravitational Waves are the fluctuation of the total gravitational forces carried by gravitons emitted from two rotating mega stars or merging black holes. Like the brightness (Fig. 8) caused by two circulating stars, Gravitational Waves are generated due to one mega star or black hole blocking (or deflecting) the graviton radiation of another mega star or black hole during circulation, such that a fluctuation of gravitational force can be detected in line of sight by earth observers. However, the fluctuation of gravitational force is very small. Only mega stars or black holes can block the graviton radiations from the other mega stars or Black Holes. Therefore, the Gravitational Waves are hard to detect except those caused by a rotating binary stars or merging black holes.

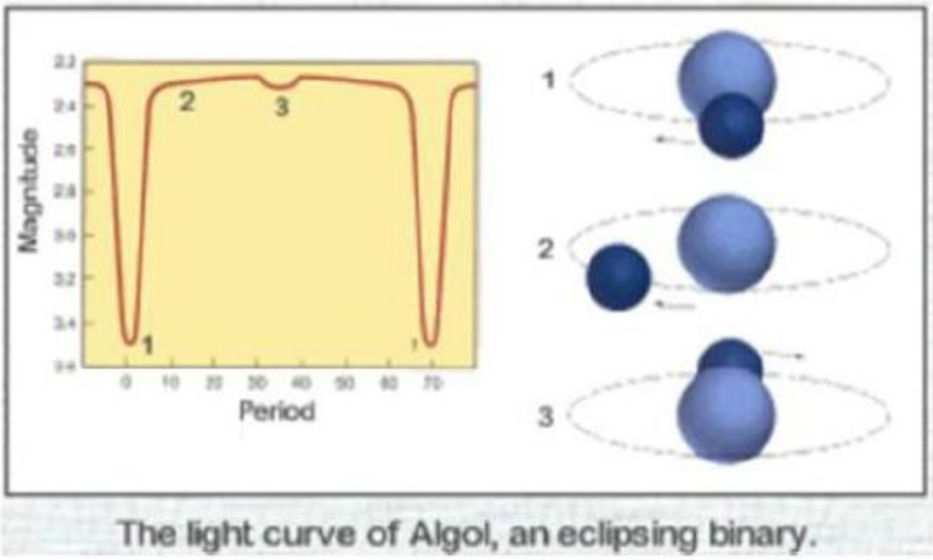


Fig. 8 The brightness of the eclipsing "Algol" binary system.

## IV. The Effects of Gravitational Field on Objects and Events

A. Thermodynamic Equilibrium and Subatomic Equilibrium

The properties of an object or event are dependent on two equilibriums: (1) Thermodynamic Equilibrium, in which the object or event reaches a fixed atomic and subatomic structures at a fixed temperature and pressure through the interactions between atoms and subatomic particles, and (2) Subatomic Equilibrium, in which Wu's Pairs in subatomic particles reach a fixed Wu's Unit Length and Wu's Unit Time at a fixed gravitational field and aging of the universe through the interactions between gravitons and Wu's Pairs and the aging process build-in Wu's Pairs.

The biggest mystery of modern physics is that "Dimension" and "Duration" of an object or event (not "Space" and "Time" themselves) can change with the local gravitational field and aging of the universe to achieve Subatomic Equilibrium. This process is attained by the bombardment of gravitons complying with gravitational field in accordance to Graviton Radiation and Contact Interaction Theory, and the shrinkage of Wu's Pairs due to aging of the universe in compliance with Cosmic Microwave Background Radiation (CMB) [15].

Most people don't know the differences of "Space" and "Time" with respect to "Dimension" and "Duration". Even Einstein was confused of space and time with dimension and duration. It is why Special Relativity [6] is based on a wrong postulation that light speed is constant. Also, General Relativity [6] is derived from a wrong theory that space and time are driven by acceleration instead of gravitational field. Even more, Einstein created a magic word "Spacetime" trying to correlate space and time together, which in fact is nothing but a property (such as potential energy) of the object or event reflecting the local gravitational field and aging of the universe.

B. Corresponding Identical Object or Event

Under thermodynamic equilibrium, 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, while each object or event is in subatomic equilibrium with its local gravitational field and aging of universe, the intrinsic atomic and subatomic structures of the object or event remain unchanged, except Wu's Unit Lengths and Wu's Unit Times (or quantum energy states) dependent on the location and time (or local gravitational field and aging of the universe). This is called "Corresponding Identical Transformation" and these objects or events are called "Corresponding Identical Object or Event" (Fig. 1) [16]. Because of the same intrinsic atomic and subatomic structures, the properties of a corresponding identical object or event are only 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 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 $H_\alpha$) in the star, which is different from that of the photon generated from the same light source ($H_\alpha$) 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 and thus it is not a corresponding identical object or event. This "quenching effect" is the reason that causes Cosmological Redshift [17] and Gravitational Redshift [18].

A corresponding identical object or event can be the photon emitted from an electron in the covalent bond of a compound or the photon emitted from an electron in the conduction band of a semiconductor. A typical example can be found in $H_2$ absorption spectrum where each characteristic line in the spectrum represents the wavelength of a photon emitted from a specific light source such as $H_\alpha$. The wavelength is a property of the photon and the photon emitted from $H_\alpha$ is a corresponding identical object or event.

C. Wu's Spacetime Shrinkage Theory

An object or event at a location and time of large gravitational field or early aging of the universe has larger Wu's Unit Lengths (diameters of Wu's Pairs) and Wu's Unit Times (periods of Wu's Pairs), also bigger dimension and duration than that of the corresponding identical object or event on the present earth. These are called "Gravity Affected Wu's Spacetime Shrinkage Theory" and "Aging Affected Wu's Spacetime Shrinkage Theory", or together called "Wu's Spacetime Shrinkage Theory" [19].

Large gravitational field can cause heavy graviton bombardment in accordance to Graviton Radiation and Contact Interaction Theory, which results in slow Yangton and Yington circulation speed and large Wu's Unit Length (diameter) and Wu's Unit Time (period) of Wu's Pairs in the corresponding identical object or event. On the other hand, in early aging of the universe, Wu's Pairs have large Wu's Unit Length and Wu's Unit Time in compliance with Cosmic Microwave Background Radiation (CMB). Because of the same intrinsic atomic and subatomic structures, a corresponding identical object or event should also have bigger dimension (space) and duration (time) at large gravitational field and early aging of the universe.

D. Three Principles of Subatomic Equilibrium

According to Yangton and Yington Theory, all objects and events in the universe are composed of Wu's Pairs which obeys Wu's Spacetime Equation ($t_{yy} = \gamma\ l_{yy}^{3/2}$) [19]. In addition, their properties such as space (dimension), time (duration), velocity and acceleration in subatomic equilibrium with the local gravitational field and aging of the universe, shall conform the three principles of subatomic equilibrium: Principle of Equilibrium, Principle of Correspondence and Principle of Parallelism [16].

- Principle of Equilibrium – As an object or event under thermodynamic equilibrium at a fixed temperature and pressure, and also in subatomic equilibrium at a fixed gravitational field and aging of the universe at a location and time, all the properties of the object or event should attain fixed quantities.
- Principle of Parallelism – 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 between the quantities of the same property of the two objects or events remains constant, no matter gravitational field and aging of the universe.
- Principle of Correspondence – 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.

Based on the Three Principles of Subatomic Equilibrium, a variety of correlations between the properties of a corresponding identical object or event and the Wu's Unit Length $l_{yy}$ of a reference corresponding identical subatomic particle can be derived.

## V. Gravity Effects on Dimension

The length (dimension) of an object measured by the normal unit length of a reference normal object, also Wu's Unit Length of a reference subatomic particle can be represented as follows:

$$L = l\ l_s$$

Because

$l_s = m\ l_{yy}$

Therefore,

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

Where L is the length of the object, "l" is the amount of normal unit length, $I_s$ is the normal unit length of a reference normal object, m is the ratio between the normal unit length of a reference normal object and Wu's Unit Length of a reference subatomic particle (abbreviated as the ratio of normal unit length), $l_{yy}$ is Wu's Unit Length of the reference subatomic particle.

According to Principle of Correspondence and Principle of Parallelism, for a corresponding identical object moving from one location to another location or taking place in two locations under thermodynamic equilibrium and local subatomic equilibrium, l is a constant, m is reference-dependent constant. Therefore, the length of the corresponding identical object (L) is proportional to Wu's Unit Length ($l_{yy}$) of the reference corresponding identical subatomic particle at the same location and time (gravitational field and aging of the universe).

$$L \propto l_{yy}$$

As a result, according to Wu's Spacetime Shrinkage Theory, for a corresponding identical object at high gravitational field or in early universe, because Wu's Unit Length ($l_{yy}$) of Wu's Pair of the reference corresponding identical subatomic particle is bigger at the same location and time (same gravitational field and aging of the universe), therefore the length of the corresponding identical object (L) is bigger.

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 $H_\alpha$) in the star, which is different from that of the photon generated from the same light source ($H_\alpha$) 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 the present earth and thus it is not a corresponding identical object or event. This "quenching effect" is the reason that causes Cosmological Redshift and Gravitational Redshift.

A. Cosmological Redshift

According to Aging Affected Wu's Spacetime Shrinkage Theory, when the universe was young, in compliance with CMB, the circulation orbit (2r) of Wu's Pairs of an object or event was bigger than that on the present earth. Since $V^2r = K$ and K is always a constant [19], therefore the circulation speed (V) of Wu's Pairs was slower, and the circulation period ($T = 2\pi r/V$) of Wu's Pairs was bigger. In other words, when the universe was young, both Wu's Unit Length ($l_{yy} = 2r$) and Wu's Unit Time ($t_{yy} = T$) of the object or event were bigger, which makes the dimension (length) longer, duration (time) larger, and velocity ($V \propto l_{yy}^{-1/2}$) smaller compared to the corresponding identical object or event on the present earth.

As a consequence, a photon emitted from a light source in a star more than 5 billion years ago (5 billion light years away) has slower speed ($C \propto l_{yy}^{-1/2}$), lower frequency ($\nu \propto l_{yy}^{-3/2}$) and longer wavelength ($\lambda \propto l_{yy}$) than that of the corresponding identical light source on the present earth. As this photon quenched onto earth, because of the larger wavelength, redshift can be observed. This phenomenon is called "Cosmological Redshift" [17].

Furthermore, according to Wu's Spacetime Shrinkage Theory due to aging of the universe, Wu's Spacetime Reverse Expansion Theory [20] can be derived to explain Hubble's Law and expansion of the universe without Dark Energy.

B. Gravitational Redshift

Similarly, according to Gravity Affected Wu's Spacetime Shrinkage Theory, at a massive star, the circulation speed (V) of Wu's Pairs of an object or event becomes slower due to the heavy bombardment of gravitons complying with the large gravitational field according to Graviton Radiation and Contact interaction Theory. Since $V^2r = K$ and K is always a constant [41], therefore the size of the circulation orbit (2r) of Wu's Pairs is bigger and the circulation period ($T = 2\pi r/V$) of Wu's Pairs is also bigger.

In other words, when the gravitational field is big, both Wu's Unit Length ($l_{yy} = 2r$) and Wu's Unit Time ($t_{yy} = T$) of the object or event are bigger, which makes the dimension (length) longer, duration (time) larger, and velocity ($V \propto l_{yy}^{-1/2}$) smaller compared to the corresponding identical object or event on the present earth.

As a consequence, a photon emitted from a massive star has slower speed ($C \propto l_{yy}^{-1/2}$), lower frequency ($\nu \propto l_{yy}^{-3/2}$) and longer wavelength ($\lambda \propto l_{yy}$) than that of the corresponding identical light source on the present earth. As this photon quenched onto earth, because of the larger wavelength, redshift can be observed. This phenomenon is called "Gravitational Redshift" [18].

C. Spectrum Redshift

In addition to the single beam Redshift, spectrum Redshift can be interpreted by Principle of Parallelism in which the correlation between the quantities of the same property of two different corresponding identical objects or events at the same location and time remains unchanged, no matter gravitational field and aging of the universe.

Assuming in the $H_2$ absorption spectrum:

1. Two different locations and times: Ancient Star and Present Earth (or two gravitational fields and aging of the universe.
2. Two different corresponding identical light sources: $H_\alpha$ and $H_\beta$ two different corresponding identical light sources in $H_2$ absorption spectrum.
3. Two different corresponding identical objects or events (photons): $H_\alpha$ emits photon #1 with wavelength $\lambda_{1i}$ and $H_\beta$ emits photon #2 with wavelength $\lambda_{2i}$ from the ancient star; and $H_\alpha$ emits photon #1 with wavelength $\lambda_{1f}$ and $H_\beta$ emits photon #2 with wavelength $\lambda_{2f}$ on the present earth respectively.

Because of Principle of Parallelism,

$$\lambda_{1i} = \alpha\ \lambda_{2i}$$
$$\lambda_{1f} = \alpha\ \lambda_{2f}$$

Where $\alpha$ is a constant.

Therefore,

$$(\lambda_{1i} - \lambda_{1f})/\lambda_{1f} = (\lambda_{2i} - \lambda_{2f})/\lambda_{2f}$$

Therefore, the same redshift can be found across $H_2$ absorption spectrum. In other words, all characteristic lines in the spectrum of redshift moves proportionally toward the longer wavelengths (red side), and the redshift maintains the same value no matter the wavelengths. As a result, redshift is dependent on the gravitational fields and aging of the universe, no matter of the photons from different light sources [21].

## VI. Gravity Effects on Duration

The time (duration) of an event measured by the normal unit time of a reference normal event, also Wu's Unit Time of a reference subatomic particle can be represented as follows:

$$T = t\ t_s$$

Because

$t_s = n\ t_{yy}$

Therefore,

$$T = t\ n\ t_{yy}$$

Where T is the time of the event, "t" is the amount of normal unit time, $t_s$ is the normal unit time of a reference normal event. n is the ratio between the normal unit time of a reference normal event and Wu's Unit Length of a reference subatomic particle (abbreviated as "the ratio of normal unit time"), $t_{yy}$ is Wu's Unit Time of the reference subatomic particle.

Also because of Wu's Spacetime Equation,

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

Where $\gamma$ is Wu's Spacetime constant.

Therefore,

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

Where T is the time of the event, "t" is the amount of normal unit time, n is the ratio of normal unit time, $\gamma$ is Wu's Spacetime constant and, $l_{yy}$ is Wu's Unit Length of the reference subatomic particle.

According to Principle of Correspondence and Principle of Parallelism, for a corresponding identical event moving from one location to another location or taking place in two locations under thermodynamic equilibrium and local subatomic equilibrium, t is a constant, n is reference-dependent constant, $\gamma$ is Wu's Spacetime constant. Therefore, the time of the corresponding identical event (T) is proportional to 3/2 order of Wu's Unit Length ($l_{yy}^{3/2}$) of the reference corresponding identical subatomic particle at the same location and time (gravitational field and aging of the universe).

$$T \propto l_{yy}^{3/2}$$

As a result, according to Wu's Spacetime Shrinkage Theory, for a corresponding identical event at high gravitational field or in early universe, because Wu's Unit Length ($l_{yy}$) of Wu's Pair of the reference corresponding identical subatomic particle is bigger at the same location and time (same gravitational field and aging of the universe), therefore the time of the corresponding identical event (T) is bigger.

## VII. Gravity Effects on Velocity

The velocity of an object or event measured by the normal unit length and normal unit time of a reference normal object or event, also Wu's Unit Length and Wu's Unit Time of a reference subatomic particle can be represented as follows:

$$V = v\,(l_s/t_s)$$

Because
$l_s = m\ l_{yy}$
$t_s = n\ t_{yy}$
Therefore,

$$V = v\,(m/n)(l_{yy}/t_{yy})$$

Also, because of Wu's Spacetime Equation,
$t_{yy} = \gamma l_{yy}^{3/2}$
$l_{yy}/t_{yy} = \gamma^{-1}\ l_{yy}^{-1/2}$
Therefore,

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

Where V is the velocity, "v" is the amount of normal unit velocity, $I_s$ is the normal unit length and $t_s$ is the normal unit time of a reference normal object or event, $\gamma$ is the Wu's Spacetime constant, m is the ratio of normal unit length, n is the ratio of normal unit time. $l_{yy}$ is Wu's Unit Length of the reference subatomic particle.

According to Principle of Correspondence and Principle of Parallelism, for a corresponding identical object or event moving from one location to another location or taking place in two locations under thermodynamic equilibrium and local subatomic equilibrium, v is a constant, m and n are reference-dependent constants. Therefore, the velocity of the corresponding identical object or event (V) is proportional to the inverse square root of Wu's Unit Length ($l_{yy}^{-1/2}$) of the reference corresponding identical subatomic particle at the same location and time (gravitational field and aging of the universe).

$$V \propto l_{yy}^{-1/2}$$

As a result, according to Wu's Spacetime Shrinkage Theory, for a corresponding identical object or event at high gravitational field or in early universe, because Wu's Unit Length ($l_{yy}$) of Wu's Pair of the reference corresponding identical subatomic particle is bigger at the same location and time (same gravitational field and aging of the universe), therefore the velocity of the corresponding identical object or event is slower. This correlation can be used to interpret "Perihelion Precession of Mercury" [22] and Defection of Light [22].

A. Perihelion Precession of Mercury

A long-standing problem in the study of the Solar System was that the orbit of Mercury did not behave as required by Newton's equations. In fact, it is found that the point of closest approach (Perihelion) of Mercury to the sun does not always occur at the same place but that it slowly moves around the sun (Fig. 9). This rotation of the orbit is called a "Perihelion Precession" [23].

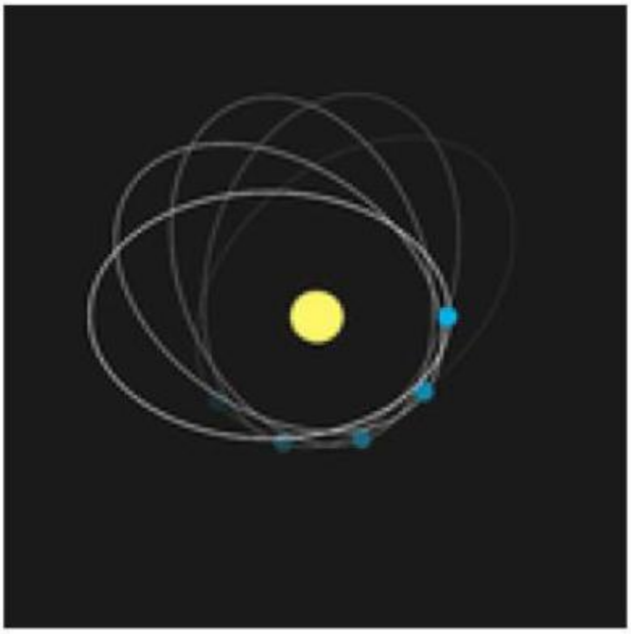

Fig. 9 Artist's version of the precession of Mercury's orbit.

As seen from Earth the precession of Mercury's orbit is measured to be 5600 seconds of arc per century (one second of arc=1/3600 degrees). Newton's equations, taking into account all the effects from the other planets (as well as a very slight deformation of the sun due to its rotation) and the fact that the Earth is not an inertial frame of reference, predicts a precession of 5557 seconds of arc per century. There is a discrepancy of 43 seconds of arc per century.

This discrepancy cannot be accounted for using Newton's formalism. Many ad-hoc fixes were devised (such as assuming there was a certain amount of dust between the Sun and Mercury) but none were consistent with other observations. In contrast, Einstein was able to predict, without any adjustments whatsoever, that the orbit of Mercury should precess by an extra 43 seconds of arc per century.

In a curved spacetime a planet does not orbit the Sun in a static elliptical orbit, as in Newton's theory. Rather, the orbit is obliged to precess because of the curvature of spacetime. When Einstein calculated the magnitude of this effect for Mercury he got precisely the previously unexplained 43". He correctly took the view that this was an important confirmation of his general relativity theory.

Perihelion Precession of Mercury can also be interpreted by Yangton and Yington Theory [80]. Because Mercury circulating around the sun is a corresponding identical event, therefore, the velocity “V” is proportional to $l_{yy}^{-1/2}$. When Mercury moves close to the sun, gravitational field becomes extremely large which makes Wu’s Unit Length $l_{yy}$ of the reference subatomic particle on Mercury much bigger and V much smaller based on “Gravity Affected Wu’s Spacetime Shrinkage Theory” resulting from heavy graviton bombardment complying with the large gravitational field of the sun based on Graviton Radiation and Contact Interaction Theory.

B. Gravity Effects on Photon

According to Principle of Correspondence and Principle of Parallelism, a photon as a corresponding identical object or event emitted from a light source at a location and time (gravitational field and aging of the universe) can be represented as:

$$\lambda = l\, m\, l_{yy}$$
$$\lambda \propto l_{yy}$$

Where λ is the wavelength of a photon, “l” is the constant amount of normal unit length, m is the ratio of normal unit length and a reference-dependent constant, and $l_{yy}$ is Wu’s Unit Length of a reference corresponding identical subatomic particle at the same location and time (same gravitational field and aging of the universe).

According to “Aging Affected Wu’s Spacetime Shrinkage Theory”, photon emitted from the same light source in an ancient star has larger Wu’s Unit Length and Wu’s Unit Time than that on the present earth. Therefore, the wavelength of the photon emitted from the ancient star is larger than that on the present earth. This explains “Cosmological Redshift” [24].

Similarly, based on “Gravity Affected Wu’s Spacetime Shrinkage Theory”, the wavelength of the photon emitted from a massive star is also larger than that on the present earth. This explains “Gravitational Redshift” [24].

Furthermore, the velocity of photon can be represented as:

$$C = c\, m\, n^{-1}\, \gamma^{-1}\, l_{yy}^{-1/2}$$
$$c = 3 \times 10^{8}$$
$$C \propto l_{yy}^{-1/2}$$

Where C is the Absolute Light Speed of photon emitted from a light source at a location and time (gravitational field and aging of the universe), “c” is the amount of normal unit velocity which is a constant $3 \times 10^8$, γ is the Wu’s Spacetime constant, m is the reference-dependent constant of normal unit length and n is the reference-dependent constant of normal unit time, $l_{yy}$ is Wu’s Unit Length of a reference corresponding identical subatomic particle.

Because of the constant ejection force in the photon emission process, regardless of the frequency, a photon escaped from the light source should always have a constant Absolute Light Speed observed from the light source ($3 \times 10^8$ m/s on earth). In fact, Absolute Light Speed is dependent on the gravitational field and aging of the universe at the light source, and “c” is a constant ($c = 3 \times 10^8$) for all photons no matter of the frequency and the location and time (gravitational field and aging of the universe).

In addition, the frequency of photon can be represented as:

$$\nu = d\, n^{-1} t_{yy}^{-1} = d\, n^{-1}\, \gamma^{-1}\, l_{yy}^{-3/2}$$
$$\nu \propto l_{yy}^{-3/2}$$

Where ν is the frequency of the photon, d is the amount of normal unit frequency, n is the ratio of normal unit time and a reference-dependent constant associated with the reference corresponding identical subatomic particle, γ is Wu’s Spacetime constant, and $l_{yy}$ is Wu’s Unit Length of a reference corresponding identical subatomic particle.

As a result, when the universe grows older, for a photon (as a corresponding identical object or event) such as the one emitted from light source $H_\alpha$, because Wu's Unit Length $l_{yy}$ of the reference corresponding identical subatomic particle becomes smaller, the wavelength ($\lambda \propto l_{yy}$) becomes smaller, the light speed ($C \propto l_{yy}^{-1/2}$) becomes faster and the frequency ($\nu \propto l_{yy}^{-3/2}$) of the photon becomes bigger. Similarly, at a high gravitational field, the wavelength ($\lambda \propto l_{yy}$) becomes larger, the light speed ($C \propto l_{yy}^{-1/2}$) becomes slower and the frequency ($\nu \propto l_{yy}^{-3/2}$) of the photon becomes smaller.

Furthermore, both Wu's Unit Length $l_{yy}$ and Wu's Unit Time $t_{yy}$ of a reference corresponding identical subatomic particle are proportional to Absolute Light Speed C of a photon (no matter the frequency) at the same location and time (gravitational field and aging of the universe).

Because

$$C \propto l_{yy}^{-1/2}$$
$$t_{yy} \propto l_{yy}^{3/2}$$

Therefore,

$$l_{yy} \propto 1/C^2$$
$$t_{yy} \propto 1/C^3$$

Where $l_{yy}$ is Wu's Unit Length and $t_{yy}$ is Wu's Unit Time of a reference corresponding identical subatomic particle, C is the Absolute Light Speed of a photon at the same location and time (gravitational field and aging of the universe) no matter the frequency.

Photon is a free Wu's Particle traveling in space. Without sufficient collisions with other particles in the traveling path at a less gravitational field environment, its original wavelength, momentum and energy generated from the light source could be completely preserved. In other words, doesn't like the photon generated on the present earth, a photon emitted from an ancient star is not in subatomic equilibrium with the gravitational field and aging of the universe on the present earth. Its original wavelength generated from the light source can be revealed in the $H_2$ absorption spectrum observed on earth. As a result, photon can be considered as a marker or DNA of its light source which can be used for the explanation of Cosmological Redshift also the derivation of Hubble's Law.

C. Deflection of Light

The first observation of light deflection was performed by Arthur Eddington and his collaborators during the total solar eclipse of May 29, 1919 [25] when the stars near the Sun (at that time in the constellation Taurus) could be observed. Starlight that passes close to the sun before reaching us gets deflected (Fig. 10). This starlight will thus reach us from a slightly different direction than when the sun is in some different region of the sky. Accordingly, the star's position in the night sky is shifted slightly.

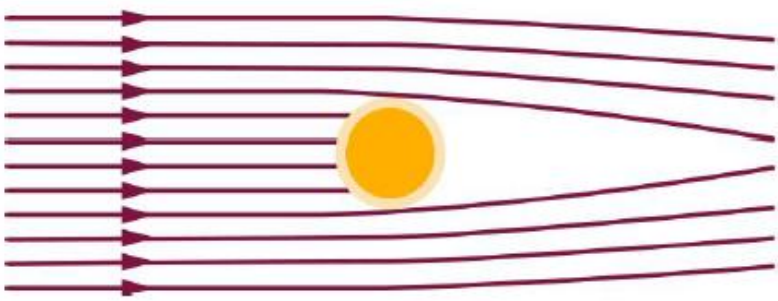

Fig. 10 Light deflection in the gravitational field of the sun.

In the early 20th century, Einstein successfully explained this phenomenon by his general relativity theory. He claimed that because space-time is highly curved around heavy mass, light rays can thus be deflected when passing by.

One important application of the light deflection effect is "Gravitational Lensing", in which two or more images of one far-away object can be observed (Fig. 11).

Masses acting as gravitational lenses have now become a standard tool of astronomy. They allow astronomers to infer the masses of cosmic objects, and the structure and size scale of the universe (with some caveats). Through their magnifying effect, gravitational lenses have also been used to observe the properties of very distant galaxies and quasars, as well as to search for planets around distant stars.

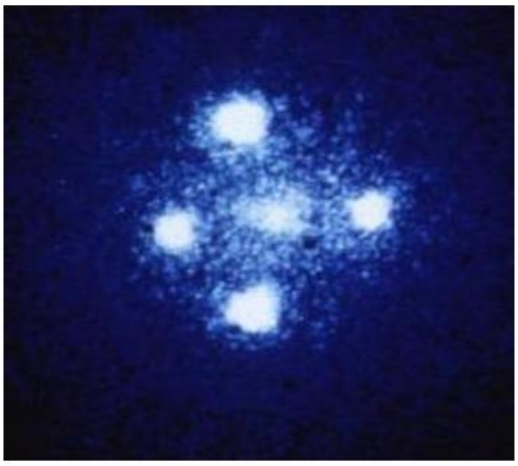

**Fig. 11** Gravitational lenses generate an Einstein cross, image of the Hubble Space Telescope © NASA/ESA/STScI.

Light deflection can also be explained by Yangton and Yington Theory. Since photon emitted from a light source, such as $H_\alpha$ on a star, is considered as a corresponding identical object or event, according to Principle of Correspondence and Principle of Parallelism, the Absolute Light Speed C can thus be represented as [19]:

$$C = c\, m\, n^{-1}\, \gamma^{-1}\, l_{yy}^{-1/2}$$
$$c = 3 \times 10^{8}$$
$$C \propto l_{yy}^{-1/2}$$

Where $l_{yy}$ is the Wu's Unit Length of the reference corresponding identical subatomic particle (or the wavelength of the photon itself).

When a photon travels close by a massive star, because of the heavy graviton bombardment caused by the large gravitational field, Wu's Unit Length $l_{yy}$ of the reference corresponding identical subatomic particle becomes very large. Consequently, the wavelength of the corresponding identical photon becomes bigger ($\lambda \propto l_{yy}$) and Absolute Light Speed becomes smaller ($C \propto l_{yy}^{-1/2}$). As a result, photon speed decreases and light beam bends toward the star in order to maintain the coherency [80]. This phenomenon is known as "Deflection of Light".

## VIII. Gravity Effects on Acceleration

The acceleration of an object or event measured by the normal unit length and normal unit time of a reference normal object or event, also Wu's Unit Length and Wu's Unit Time of a reference subatomic particle can be represented as follows:

$$A = a\, (l_s/t_s^{2})$$

Because

$l_s = m l_{yy}$

$t_s = n t_{yy}$

Therefore,

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

Also, because of Wu's Spacetime Equation,

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

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

Therefore,

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

Where A is the acceleration, a is the amount of normal unit acceleration, $I_s$ is the normal unit length and $t_s$ is the normal unit time of a reference normal object or event, $\gamma$ is the Wu's Spacetime constant, m is the ratio of normal unit length, n is the ratio of normal unit time, $l_{yy}$ is Wu's Unit Length of the reference subatomic particle.
For the acceleration of a corresponding identical object or event, the amount of normal unit acceleration "a" is a constant, both m and n are reference-dependent constants. Therefore, the acceleration of the corresponding identical object or event (A) is proportional to the inverse square of Wu's Unit Length ($l_{yy}^{-2}$) of the reference corresponding identical subatomic particle at the same location and time (gravitational field and aging of the universe).

$$A \propto l_{yy}^{-2}$$

As a result, according to Wu's Spacetime Shrinkage Theory, for a corresponding identical object or event at high gravitational field or in ancient universe, because Wu's Unit Length ($l_{yy}$) of Wu's Pair of the reference corresponding identical subatomic particle is bigger at the same location and time (same gravitational field and aging of the universe), therefore the acceleration of the corresponding identical object or event (A) is slower.
The correlations of velocity and acceleration of a corresponding identical object or event with respect 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) can be used to explain many physical phenomena such as Deflection of Light [22], Perihelion Precession of Mercury [22], Cosmological Redshift [19], Gravitational Redshift [19], Hubble's Law [26], Einstein's General Relativity [27], Spacetime [28]and Field Equations [28].

## IX. Same Object or Event Observed at Different Locations and Times

For the same object or event observed at different reference points, the quantity of the property is the same, but the amount of the unit quantity and the unit quantity are different subject to the measurement method.

A. Length

The length L of an object can be measured by the normal unit length (such as meter) of a reference normal object at a location and time (gravitational field and aging of the universe).

$$L = l\, l_s$$

Where L is the length of an object, l is the amount of normal unit length and $l_s$ is the normal unit length of the reference normal object at a location and time (gravitational field and aging of the universe).

And

$$l_s = m\, l_{yy}$$

Where m is the ratio of normal unit length, $l_s$ is the normal unit length of the reference normal object and $l_{yy}$ is Wu's Unit Length of the reference subatomic particle at a location and time (gravitational field and aging of the universe).

Therefore,

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

For the same object, L is constant, l is the amount of normal unit length of a reference normal object, and m is a reference-dependent constant. Therefore,

$$l \propto l_{yy}^{-1}$$

When an object on a massive star is measured by a reference corresponding identical subatomic particle on earth, because of the smaller $l_{yy0}$ on earth, a bigger amount of normal unit length $l_0$ can be observed on earth than that on the star [27].

B. Time

The time T of an event can be measured by the normal unit time (such as second) of a reference normal event at a location and time (gravitational field and aging of the universe).

$$T = t\, t_s$$

Where T is the time of an event, t is the amount of normal unit time and $t_s$ is the normal unit time of the reference normal event at a location and time (gravitational field and aging of the universe).

And

$t_s = n\, t_{yy}$

Where n is the ratio of normal unit time, $t_s$ is the normal unit time of the reference normal event and $t_{yy}$ is Wu's Unit Time of the reference subatomic particle at a location and time (gravitational field and aging of the universe).

Therefore,

$T = t\ n\ t_{yy}$

Also because of Wu's Spacetime Equation [19],

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

Where $\gamma$ is Wu's Spacetime constant.

Therefore,

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

For the same event, T is constant, t is the amount of normal unit time of a reference normal event, $\gamma$ is Wu's Spacetime constant and n is a reference-dependent constant. Therefore,

$$t \propto l_{yy}^{-3/2}$$

When an event on a massive star is measured by a reference corresponding identical subatomic particle on earth, because of the smaller $l_{yy0}$ on earth, a bigger amount of normal unit time $t_0$ can be observed on earth than that on the star [27].

C. Velocity

The velocity V of an object or event can be measured by the normal unit velocity (such as m/s) of a reference normal object or event at a location and time (gravitational field and aging of the universe).

$$V = v\ (l_s/t_s)$$

Where V is the velocity of an object or event, v is the amount of normal unit velocity and $l_s/t_s$ is the normal unit velocity of the reference normal object or event at a location and time (gravitational field and aging of the universe).

Because

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

Where V is the velocity of an object or event, v is the amount of normal unit velocity of a reference object or event, $\gamma$ is Wu's Spacetime constant, m is the ratio of normal unit length, n is the ratio of normal unit time and $l_{yy}$ is Wu's Unit Length of the reference subatomic particle at a location and time (gravitational field and aging of the universe).

For the same object or event, V is constant, $\gamma$ is Wu's Spacetime constant, m and n are reference-dependent constants. Therefore,

$$v \propto l_{yy}^{1/2}$$

When an object or event on a massive star is measured by a reference corresponding identical subatomic particle on earth, because of the smaller $l_{yy0}$ on earth, a smaller amount of normal unit velocity $v_0$ can be observed on earth than that on the star [27].

D. Acceleration

The acceleration A of an object or event can be measured by the normal unit acceleration (such as $m/s^2$) of reference a normal object or event at a location and time (gravitational field and aging of the universe).

$$A = a\ (l_s/t_s^2)$$

Where A is the acceleration of an object or event, a is the amount of normal unit acceleration and $l_s/t_s^2$ is the normal unit acceleration of the normal object or event at a location and time (gravitational field and aging of the universe).

Because

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

Where A is the acceleration of an object or event, a is the amount of normal unit acceleration of a reference object or event, $\gamma$ is Wu's Spacetime constant, m is the ratio of normal unit length, n is the ratio of normal unit time and $l_{yy}$ is Wu's Unit Length of the reference subatomic particle at a location and time.

For the same object or event, A is constant, $\gamma$ is Wu's Spacetime constant, m and n are reference-dependent constants. Therefore,

$$a \propto l_{yy}^2$$

When an object or event on a massive star is measured by a reference corresponding identical subatomic particle on earth, because of the smaller $l_{yy0}$ on earth, a smaller amount of normal unit acceleration $a_0$ can be observed on earth than that on the star [27].

In conclusion, as a corresponding identical object or event on a massive star under large gravitational field, because of Gravity Affected Wu's Spacetime Shrinkage Theory, its length (dimension) and time (duration) are bigger, but velocity and acceleration are smaller compared to that of the corresponding identical object or event on earth. Consequently, as the same corresponding identical object or event on the massive star measured by the reference corresponding normal object or event on earth, the amount of normal unit length and the amount of normal unit time are bigger, and the amount of normal unit velocity and the amount of normal unit acceleration are smaller. These results agree very well with Einstein's General Relativity.

## X. Wu's Spacetime versus Einstein's Spacetime

A. Wu's Spacetime

Wu's Spacetime [x, y, z, t]($l_{yy}$, $t_{yy}$) [19] is a four dimensional system that is defined by a Cartesian 3D system with Wu's Unit Length $l_{yy}$ (the diameter of Wu's Pairs) and Wu's Unit Time $t_{yy}$ (the period of Wu's Pairs) of a reference subatomic particle dependent on the gravitational field and aging of the universe at the reference point and time. Also, Wu's Unit Length and Wu's Unit Time are correlated to each other by Wu's Spacetime Equation ($t_{yy} = \gamma l_{yy}^{3/2}$) [19].

B. Einstein's Spacetime

Einstein's Spacetime is relative and inextricably interwoven into what has become known as the space-time continuum. Unlike the Normal Spacetime (Cartesian 3D system with normal unit length and normal unit time) and Wu's Spacetime (Cartesian 3D system with Wu's Unit Length and Wu's Unit Time), Einstein's Spacetime is not a reference system. Instead, it is a solution of Einstein's Field Equations, It is a property function derived from a nonlinear geometry system (geodesics) and transformed to a Normal Spacetime System on earth. It is the derivative of potential energy to distance reflecting 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.

According to Principle of Equilibrium, just like space and time, spacetime (potential energy) in Einstein's General Relativity is also a property of the object or event with fixed quantity at a location and time (gravitational field and aging of the universe). Also, in compliance with Wu's Spacetime Shrinkage Theory and Principle of Parallelism, it relates to the local gravitational field in the same way as that of the normal unit acceleration of a reference corresponding identical normal object or event. As a result, Einstein's Spacetime is a replica of the normal unit acceleration of a reference corresponding identical normal object or event. It is an image reflects the local gravitational field and aging of the universe.

C. Gravity and Distribution Wu's Unit Lengths

According to Wu's Spacetime Shrinkage Theory and Principle of Parallelism, Wu's Unit Length and Wu's Unit Time of a reference corresponding identical subatomic particle can also be used to reflect the local gravitational field and aging of the universe, as well as the spacetime in Einstein's General Relativity, Therefore, a three dimensional coordination matrix composed of the Wu's Unit Cubes of a local reference corresponding identical subatomic particles can be used as a map to reflect the three dimensional distribution of the local gravitational field and aging of the universe, as well as the spacetime of Einstein's General Relativity (Fig. 12)[28]. Because Wu's Unit Length increases with the local gravitational field, under an extreme case, it is obvious that matter is expanded and depleted from the center of the matrix such that a Black Hole made of a hollow structure with a singularity (a high density core) in the center can be expected.

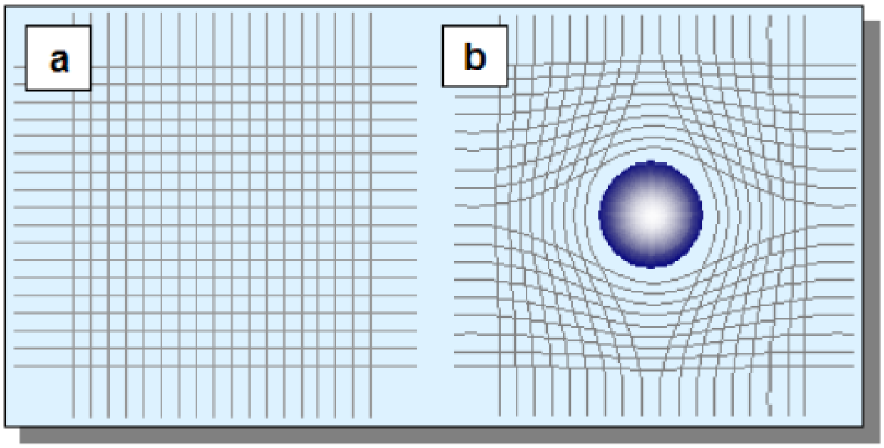


Fig. 12 (a) A coordination matrix in a homogeneous gravitational field (b) The same coordination matrix in an inhomogeneous field with a big massive core in the center.

## XI. Wu's Field Equation versus Einstein's Field Equation

A. Einstein's Field Equations

The Einstein field equations (EFE) may be written in the form:

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

where $R_{\mu\nu}$ is the Ricci curvature tensor, R is the scalar curvature, $g_{\mu\nu}$ is the metric tensor, $\Lambda$ is the cosmological constant, G is Newton's gravitational constant, c is the speed of light in vacuum (a constant), and $T_{\mu\nu}$ is the stress–energy tensor.

The Einstein field equations comprise the set of 10 equations in Albert Einstein's general theory of relativity that describe the fundamental interaction of gravitation as a result of spacetime being curved by mass and energy. First published by Einstein [6] in 1915 as a tensor equation, the EFE relate local spacetime curvature (expressed by the Einstein tensor) with the local energy and momentum within that spacetime (expressed by the stress–energy tensor).

To avoid the universe from collapsing, Einstein added the cosmological constant into the formula to balance the attraction force caused by the gravity. However, after Hubble showed us that the universe is expanding, this term was not longer necessary, because the universe is not static. Einstein later felt that the inclusion of this term was the biggest blunder of his career.

Similar to the way that electromagnetic fields are determined using charges and currents via Maxwell's equations, the EFE are used to determine the spacetime geometry resulting from the presence of mass–energy and linear momentum, that is, they determine the metric tensor of spacetime for a given arrangement of stress–energy in the spacetime. The relationship between the metric tensor and the Einstein tensor allows the EFE to be written as a set of nonlinear partial differential equations when used in this way. The solutions of the EFE are

the components of the metric tensor. The inertial trajectories of particles and radiation (geodesics) in the resulting geometry are then calculated using the geodesic equation.
As well as obeying local energy–momentum conservation, the EFE reduce to Newton's law of gravitation where the gravitational field is weak and velocities are much less than the speed of light [56].
Exact solutions for the EFE can only be found under simplifying assumptions such as symmetry. Special classes of exact solutions are most often studied as they model many gravitational phenomena, such as rotating black holes and the expanding universe. Further simplification is achieved in approximating the actual spacetime as flat spacetime with a small deviation, leading to the linearized EFE. These equations are used to study phenomena such as gravitational waves.
B. Wu's Spacetime Field Equations
According to Newton's Law of Universal Gravitation and Newton's Second Law of Motion, the gravitational force 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 an 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" (because gravitational field $F_g = GM/R^2$).

Furthermore, the acceleration of an object or event can be represented by 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, $\gamma$ is the Wu's Spacetime constant, m is the ratio of normal unit length, n is the ratio 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, the Absolute Light Speed of a photon emitted from a light source at the same location and time (same gravitational field and aging of the universe) as the reference subatomic particle can be represented 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 ($3 \times 10^8$), $\gamma$ is the Wu's Spacetime constant, m is the ratio of normal unit length, n is the ratio of normal unit time, and $l_{yy}$ is Wu's Unit Length of the reference subatomic particle at a location and time (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

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

$\delta = m^3 n^{-2} c^4 = (l_s^3/t_s^2)(t_{yy}^2/l_{yy}^3)c^4 = (l_s^3/t_s^2)\,\gamma^2 c^4$

Where $l_s$ is the normal unit length (meter) and $t_s$ is the unit normal unit time (second) of a reference normal object or event. They are constants at a location and time (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 R is the distance of a point in space from a star (parent object) of mass M, a is the amount of normal unit acceleration, σ is a reference-dependent constant associated with the reference subatomic particle, δ is a constant associated with the location and time (gravitational field and aging of the universe), 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). These are named "Wu's Spacetime Field Equations" [29].

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 particle.

Acceleration and Wu's Spacetime Field Equation of an object or event can be formulated by the System Transformation Diagram (Fig. 13) [29] 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, δ is a constant associated with the location and time (gravitational field and aging of the universe), 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).

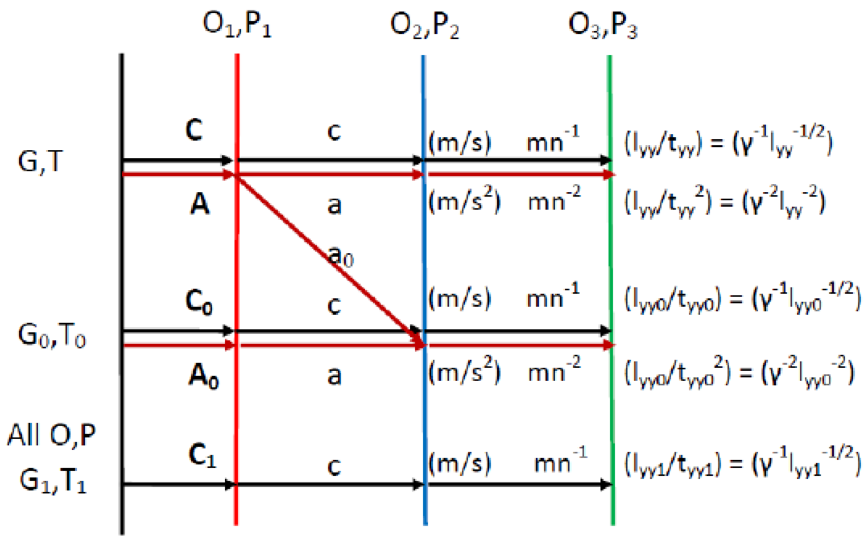


Fig. 13 System Transformation Diagram shows the correlations and transformations between the properties of different equilibrium states (G, T) and corresponding identical objects or events (O, P) (G = gravitational field, T = aging of the universe, O = object or event, P = property, A = acceleration, C = Absolute Light Speed).

As illustrated in Fig. 13, the acceleration A of an object or event (or a point) at a distance R from the star (parent object) measured on earth and the Absolute Light Speed of a photon on earth based on Wu's Unit Length $l_{yy0}$ of the reference subatomic particle and the Absolute Light Speed $C_0$ on earth can be represented as follows:

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

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

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 M is the mass of the star (parent object), R is the distance from the star, G is gravitational constant, A is the acceleration, "$a_0$" is the amount of normal unit acceleration measured on earth, $\delta$ is a constant on earth, $\gamma$ is Wu's Spacetime constant, $C_0$ is the Absolute Light Speed on earth ($3\times10^8$ m/s) and $l_{yy0}$ is Wu's Unit Length of the reference corresponding identical subatomic particle on earth.

As a comparison, for the measurement of the amount of normal unit acceleration "a" of an object or event (or a point) caused by the gravitational field of a star (parent object) of mass M at a distance R, because Wu's Unit Length $l_{yy}$ of a reference subatomic particle on the massive object is much bigger than Wu's Unit Length $l_{yy0}$ of the reference corresponding identical subatomic particle on earth, therefore the amount of normal unit acceleration "a" measured on the massive object is much bigger than "$a_0$"measured on earth.

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

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

Because $l_{yy} > l_{yy0}$

Then $a > a_0$

In other words, Wu's Spacetime Field Equation based on Wu's Unit Length $l_{yy}$ of a reference subatomic particle on a massive object has a deeper slope (bigger amount of normal unit acceleration) than that based on Wu's Unit Length $l_{yy0}$ of the reference corresponding identical subatomic particle on earth (Fig. 14) [28].

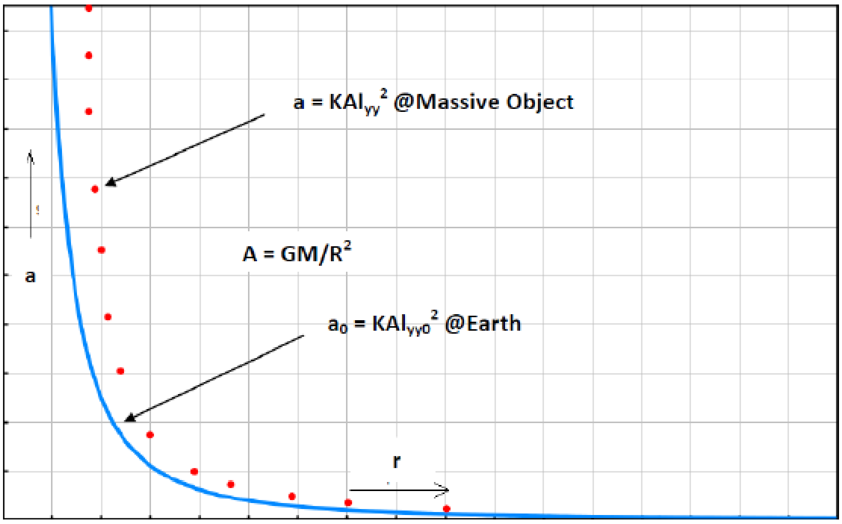


Fig. 14 Comparison between Wu's Spacetime Field Equation measured on earth (blue solid line) and that measured on massive object (red dotted line).

As a result, a deeper Space-time continuum, or a larger curvature of potential energy (Fig. 14) can be observed at a location close to the parent object. Fig. 15 shows an imaginary Space-time continuum around earth observed on an orbiting spaceship.

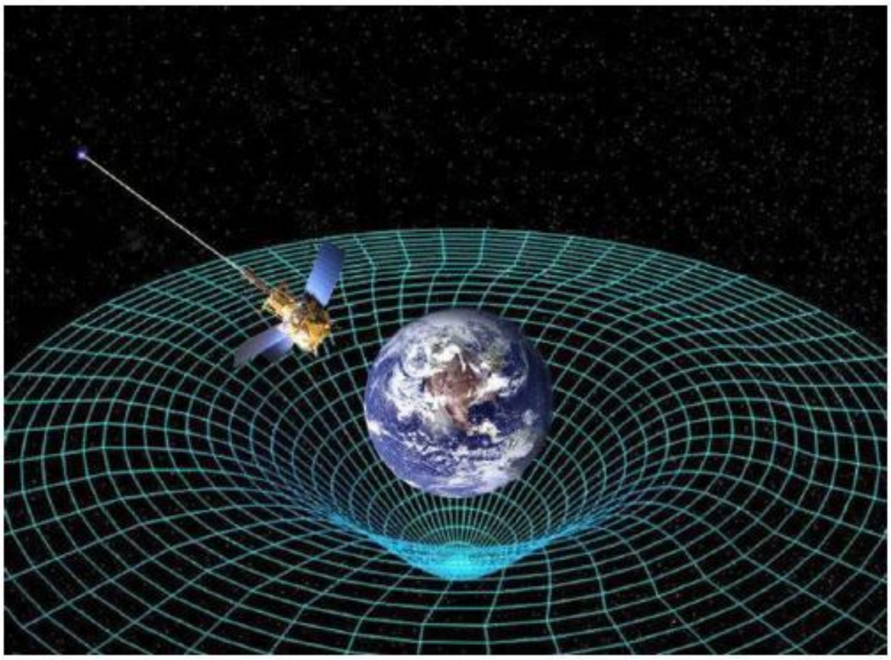

Fig. 15 Earth and its surrounding spacetime continuum.

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

Einstein's Field Equation is based on the correlation between Potential Energy and Acceleration. Einstein's Field Equation has a solution (Einstein's Spacetime) as a four dimensional space-time continuum. It is a property function derived from a nonlinear geometry system (geodesics) and transformed to a Normal

Spacetime System on earth. It is the derivative of potential energy to distance reflecting 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 is based on the correlation between Acceleration and Gravity. Wu's Field Equation represents the amount of normal unit acceleration $a_0$ in a Normal Spacetime System on earth reflecting the gravitational field and aging of the universe.

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

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

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 Spacetime 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.

D. Wu-Einstein Field Equation

Wu's Spacetime Field equation is based on the correlation between Acceleration and Gravity.

$$A = GM/R^2$$

According to Wu's Spacetime Field Equation, for a target object (or a point) at a distance R from a star (parent object) M, the amount of normal unit acceleration a can be represented as follows:

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

Where a is the amount of normal unit acceleration measured at a location and time (gravitational field and aging of the universe), $\delta$ is a constant associated with the location and time (gravitational field and aging of the universe), $\gamma$ is Wu's Spacetime constant, C is Absolute Light Speed at the same location and time, G is gravitational constant, M is the mass of the star (parent target) and R is the distance of the target object (or a point) from the star (parent object).

If the same target object (the point) is measured on earth, then the amount of normal unit acceleration measured on earth $a_0$ can be represented as follows:

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

Where $C_0$ is the Absolute Light Speed on earth.

On the other hand, based on the correlation between Potential Energy and Acceleration, a similar field equation as Wu's Spacetime Field Equation can be developed with Principle of Correspondence and Principle of Parallelism as follows:

Because

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

$(dE/m)/dR = A$

Given

$E_0 = E/m$

Therefore,

$$dE_0/dR = A$$

Furthermore, in Wu's Spacetime Field Theory, the correlation between the amount of normal unit acceleration $a_0$, Wu's unit length of a reference subatomic particle $l_{yy0}$ and Absolute Light Speed $C_0$ on earth can be derived as follows:

$$A = (dv/dt)\, l_s/t_s^2$$

Given

$dv/dt = a$

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

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

Where A is the acceleration, $a_0$ is the amount of normal unit acceleration, $l_s/t_s^2$ is the reference normal unit quantity, m is the ratio of normal unit length and n is the ratio of normal unit time (m and n are reference-dependent constants), $\gamma$ is Wu's Spacetime constant, $l_{yy0}$ is Wu's Unit Length of the reference subatomic particle, and $C_0$ is the Absolute Light Speed on earth. M is the mass of the star (parent target) and R is the distance between the target object (or a point) and the star (parent target).

Accordingly, the correlation between the amount of normal unit derivative $e_0$, Wu's unit length of a reference subatomic particle $l_{yy0}$ and Absolute Light Speed $C_0$ on earth can be derived as follows:

$$dE_0/dR = (de/dr)\, (l_s^2/t_s^2)/l_s$$

$$dE_0/dR = (de/dr)\, (l_s/t_s^2)$$

Given

$de/dr = e_0$

$$dE_0/dR = e_0\, m\, n^{-2}\, \gamma^{-2}\, l_{yy0}^{-2}$$
$$e_0 = \delta\, \gamma^{-2}\, C_0^{-4}\, (dE_0/dR)$$

Because

$A = (dE_0/dR) = GM/R^2$

Therefore,

$$e_0 = \delta\, \gamma^{-2}\, C_0^{-4}\, (GM/R^2)$$

Where $E_0$ is the potential energy, M is the mass of the star (parent object), G is gravitational constant, R is the distance between the target object (or a point) and the star (parent target), $e_0$ is the amount of normal unit derivative of energy to distance, $l_s/t_s^2$ is the reference normal unit quantity, m is the ratio of normal unit length and n is the ratio of normal unit time (m and n are reference-dependent constants), $\gamma$ is Wu's Spacetime constant, $l_{yy0}$ is Wu's Unit Length of the reference subatomic particle, and $C_0$ is the Absolute Light Speed on earth. This is named "Wu–Einstein Field Equation" [30].

Because

$$a_0 = \delta\, \gamma^{-2}\, C_0^{-4}\, (GM/R^2)$$
$$e_0 = \delta\, \gamma^{-2}\, C_0^{-4}\, (GM/R^2)$$

Therefore,

$$a_0 = e_0$$

Furthermore, in comparison of Wu-Einstein Spacetime Field Equation and Einstein's Field Equation,

$$e_0 = \delta\, \gamma^{-2}\, C_0^{-4}\, (GM/R^2)$$

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

The left hand side of Einstein Field Equation is equivalent to $e_0$ which is the derivative of $E_0$ (potential energy) to distance reflecting the curvature of the space-time continuum and the corresponding acceleration. The right hand side of Einstein Field Equation is equivalent to $\delta\, \gamma^{-2}\, C_0^{-4}\, (GM/R^2)$ where both have a term $C_0^{-4}$ G that is related to the mass, energy and momentum of the star and other parent objects.

E. Wu's Spacetime Field Equation versus Quantum Field Theory

Because gravitational field generated by Graviton Radiation and Contact Interaction is proportional to the flux of graviton vectors and also the concentration of graviton vectors. Therefore, similar to Wu's Spacetime Field Equation, A Spacetime Graviton Concentration Field Equation can be derived as follows:

Because

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

Therefore,

$$a = \eta\, \gamma^{-2}\, C^{-4}\, G\, (C_{Graviton})$$

Where a is the amount of normal unit acceleration at a location and time (gravitational field and aging of the universe), $\eta$ is a constant associated with the location and time (gravitational field and aging of the universe), $\gamma$ is Wu's Spacetime constant, G is the gravitational constant, C is Absolute Light Speed at the same location and time (same gravitational field and aging of the universe), and $C_{Graviton}$ is the concentration of gravitons at a distance R from the Star (parent object) of mass M. This is named "Wu's Spacetime Graviton Concentration Field Equation" [19].

Because Wu's Spacetime Field Equation and Wu's Spacetime Graviton Concentration Field Equation can prove the equalities between gravitational field, the amount of normal unit acceleration and the concentration of Gravitons, therefore, they are considered the backbones of Quantum Field Theory, Quantum Gravity Theory and Unified Field Theory.

## XII. Conclusion

It is proposed that graviton is composed of Wu's Pairs, a Yangton and Yington circulating particle pairs with build-in attractive Force of Creation (Building Blocks of the universe). Gravitational force is generated by string force between two gravitons and the propagation of gravitational force is explained by graviton radiation and contact interaction. In addition, the dimension and duration of an object or event can change with the local gravitational field due to the bombardment of gravitons and aging of the universe in compliance with CMB radiation. Because of the same intrinsic structures, the amount of unit quantity in a corresponding identical objects or events should remain unchanged no matter of gravitational field and aging of the universe. Furthermore, Principle of Equilibrium, Principle of Parallelism and Principle of Correspondence are used to explain the correlations between the quantities of the same properties of different objects and events. Einstein's Spacetime and Field Equation were compared to Wu's Spacetime and Wu's Spacetime Field Equation. In fact, Einstein's Spacetime is nothing but the property of an object or event likes acceleration which can reflect the local gravitational field and aging of the universe. Finally, Wu's Spacetime Graviton Concentration Field Equation is derived which can serve as the Backbone of Quantum Field Theory, Quantum Gravity Theory and Unified Field Theory.

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