Gravity Accelerates the Universe

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Abstract Space waves. Mass (matter) changes the wavelengths of space waves. Gravity is the difference of wavelengths of space waves caused by masses. This definition of space-matter theory uncovers a new characteristic of gravity; gravity accelerates the Universe. Note space-matter has been worked out to describe the force of thought. The new definition of gravity is a new and important additional result of space-matter theory.

Keywords: space-matter, wave of time, wave of space, gravity, accelerating Universe, double-slit experiment

1. SPACE-MATTER MODEL

The Space-Matter Theory[1] is new theory. In this model space waves. Mass (and every matter) changes the wavelength of space waves. In the case of mass: the bigger (the faster) the mass, the longer the wavelength and the smaller the frequency of the space wave will be. This is in harmony with the theory of relativity, see Reference 1. Note space-matter is not a special version of space-time, in the space-matter time is not a dimension, but a physical phenomenon, that is, time has speed, for example.

Time comes into existence when space and matter meet; and whenever space and matter meet, the result is time. Time is a co-production of matter and space. In our life time is the space waves caused by masses.

2. PITCH OF SPACE-MATTER MODEL

Matter causes waves in space. Solely through the use of space waves, we can express spatial distance, time and energy. Why? Because space waves have the shortest wavelength, the fastest speed, and the smallest energy expressed in our terms.

- Every spatial distance can be expressed using the wavelength of space waves.
  In our physics terms: This is the shortest unit of distance.
- Every unit of time can be expressed using the periodicity of space wave.
  In our physics terms: This is the shortest unit of time.
- Every amount of action (energy) can be expressed using the value of the action of space wave.
  In our physics terms: This is the smallest unit of energy.

See the calculated values using a simple two-dimensional cosine model as space wave in Reference 1.

3. GRAVITY AS SPACE WAVES

The space-matter model allows us to discern new features of gravity. The main part of the gravity in space-matter model is the existence of gravitational waves. LIGO detected gravitational waves, they exist. According to space-matter theory gravity is the difference of the wavelengths of space waves. The velocity of gravity is irrelevant from this viewpoint. The following model works in both cases: if $\mathrm{v}_{\mathrm{gravity}} = \mathrm{c}$ or $\mathrm{v}_{\mathrm{gravity}} >> \mathrm{c}$.

3.1. Speed of gravity is disputable

The velocity of gravity does not change the working method of gravity in the space-matter model. This is not true in the space-time model. In the space-time model, no particles (whether actual or hypothetical) can move faster than light cp. Standard Model of Physics[2]. According to this concept even (a wave of) gravity, which travels in the fabric of space, has c velocity.

$$v_{gravity} = c \tag{1}$$

In 1974 Hulse and Taylor[3, 4] proposed measuring the gravitational wave to find Eq. (1). They were awarded the Nobel Prize with this measuring[5], but the question remained open. In 2013 scientists in China were supposed to measure the same value[6]. The question is still open, since the measurements was made by light, so the scientists may have measured the speed of light. There are physicists who state gravity must be much faster than light. For example Flandern states: $v_{gravity} \geq 2 \times 10^{10} c$. This value is based on laboratory, solar system, and astrophysical experiments[7].

The first measurement of gravitational waves were made by LIGO. Space waves. Fact.

What about the velocity of gravity (space waves)? The physicists of LIGO work within the space-time model, so they accept Eq. (1) as fact. Based upon it, LIGO's scientists are supposed to have measured the gravitational waves of two black holes that collided. Their theory is known: the event took place 1.3 billion years ago[8]. But there is a fact: the Fermi space telescope detected a burst of gamma rays 0.4 seconds later after the measurement of LIGO. In my opinion, LIGO did not measure the gravitational effect of two black holes that merged, but gravity's effect caused by the electromagnetic energy[9, 10]. Physicists at LIGO certainly refuse this interpretation[11].

From the perspective of the space-matter model, what LIGO's measurement precisely demonstrates is that everything, even light (electromagnetic energy), alters space (and time) waves. What is more, everything has time. This is exactly what the space-matter model propounds.

4. GRAVITY AS DIFFERENCE OF WAVELENGTHS OF SPACE WAVES CAUSED BY MASSES

The gravity is when space pushes masses:

$$\sum \vec{F}_{space} \neq 0, \tag{2}$$

where $\vec{F}_{space}$ are vectors of the force (action) of space waves from the viewpoint of mass. Mass moves the direction of the resultant vector (except in special cases not detailed here).

Among bodies experiencing gravity, the frequency of space waves decreases. That is, the space “pressure” between the bodies decreases. Gravity arises, because the portions of space with higher force (action) shift the masses. If on one side of a mass the space wave has f_{s1} frequency, and on the opposite side of this mass the space wave has f_{s2} frequency and $f_{s1} < f_{s2}$, then the mass goes into the direction of f_{s1}. The greater f_{s2} frequency - the greater force (action) of space - moves the mass forward, see FIG.1.

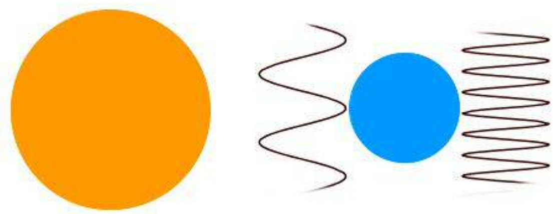

FIG. 1. Space wave model of gravity (model, not proportional). Big (yellow) and small (blue) masses and space waves. Gravity is when space waves push. Or, even more clearly, though less scientifically, "You'll get such a slap, you'll go flying!" If the blue planet gets four slaps from the right and one from the left, it will move left.

5. SPACE WAVES CONNEC GRAVITY AND QUANTUM MECHANICS

Young performed the first two-slit experiment[12] ever. In 1801 he found that light paints an interference pattern on the observing screen.

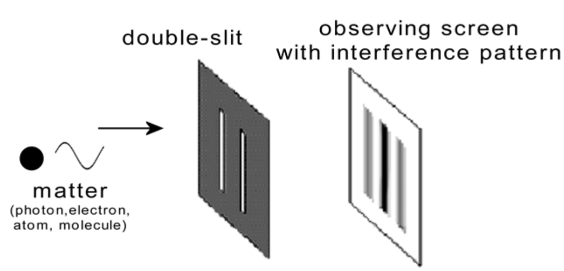

FIG.2. Double-slit experiment, model, not proportional.

Light reaches the screen at discrete points (that is as a particle), but an interference pattern appears on the observing screen using single photons, that is light waves. See FIG.2. Each photon seems to interfere with itself. Jönsonn gave a new meaning to the double-slit experiment; in 1961 he performed the double-spit experiment with electrons[13]. Electrons have masses, that is (small) matter with and without mass produces the interference. In 1974 Merli, Missiroli, and Pozzi[14] [15] in their experiment used single electrons, showing that each electron interferes with itself. There are also molecules that are able to interfere themselves[16].

How can we explain that light (electron, atom, molecule) interferes with itself? There are more known interpretations I won't cite here.

In the space-matter model the interpretation of this phenomenon is the simplest ever: space waves. The waves of space interfere with themselves. The matter is floating on these space waves. The interference doesn't come into being in matter's wave but in the space waves. Saying this, the double-split experiment shows, that mass and photon generates space waves, that is, photon has its own time.

On the other hand this is the bridge between the quantum mechanics and the general theory of relativity, if we accept that the space-matter includes space-time.

4. GRAVITY INFLATES THE UNIVERSE

Gravity is the sum of different forces of space waves. The moving mass changes the wavelengths of space waves.

$$\frac{d}{dt}v = l\frac{d}{dt}\lambda, \quad (3)$$

where l is a proportionality factor.

The longer wavelengths of space waves occur at a higher acceleration of mass. The accelerating mass makes the wavelength of the space wave longer, and the longer space waves accelerate the mass. This is why the gravity force is accelerating.

The acceleration itself of the Universe is able to inflate the Universe, since the wavelengths of the space wave are constantly growing.

5. DENSITY OF SPACE WAVE

The mass decreases the energy of the space wave and increases the wavelength of the space wave. Lots of mass set up this effect causing very long waves. Space regions can be depleted, where the density of the space wave is very small. Space wavelengths with different amounts of masses and their densities:

$$\lambda_{less\ mass} < \lambda_{more\ mass}\ , \tag{4}$$

$$h_{space} / \lambda_{less\ mass} > h_{space} / \lambda_{more\ mass}\ . \tag{5}$$

The densities are different. Existing space needs a minimum density.

$$h_{space} / \lambda > D_{sp}\ . \tag{6}$$

D_{sp} is the value where space stops existing as space. If the actual density approaches this density,

$$D_{space-act} \approx D_{sp}\ , \tag{7}$$

then the space wave is "too" long. In this case there are two possibilities. The masses connected with this space region are not able to accelerate at all. We don't know regions like this in the Universe. The second opportunity is that space disappears as space. The disappearing space creates mass. This script won't work so simply, since the newly-created mass increases further the wavelength of other space waves and doesn't give a solution for *space* to "live through as space".

6. DEPLETED SPACE AND BANACH-TARSKI PARADOX (BTP)

Laczkovich[17] has solved the circle-squaring problem. Taking this, there can be a possible decomposition between particles independent of their shapes. So, the BTP or a similar operation can work between space and matter. Along the second script there is a possible solution if space uses the BTP or a similar operation. Let's see one single space wave with small density. Let's see it as a three dimensional space particle. Using the BTP, the space particle goes to finitely many pieces. These pieces will be reassembled into two space particles. One space particle is measurable from the viewpoint of space. This is a space particle. The other space particle is immeasurable from the viewpoint of space. This particle is mass.

$$particle_{sp1} \equiv\ particle_{sp1} \cup\ particle_{sp2}\ , \tag{8}$$

where $particle_{sp1}$ is space, $particle_{sp2}$ is immeasurable space particle, that is mass.

$$particle_{sp2} = particle_{m1}, \tag{9}$$

The next step is:

$$particle_{m1} \equiv particle_{m1} \cup particle_{m2}, \tag{10}$$

where $particle_{m1}$ is measurable mass, $particle_{m2}$ is immeasurable mass, that is space. Eq. (6) creates a space particle with original wavelength but with a higher density.

$$particle_{sp1} \cup particle_{m2} \equiv particle_{sp1}, \tag{11}$$

The new mass $particle_{m1}$ makes the wavelength of space waves longer which is able to increase, since it is not depleted.

$$D_{space-act} >> D_{sp}, \tag{12}$$

Interesting question, how Eq. (11) can change our time. Our time unit has been longer, since the wavelength of space wave has increased. But the space wave itself has changed, too. In general we may say that masses use the space wave as time that are dependent on them, that are created by them and other masses. The new mass $particle_{m1}$ creates a new space wave; this space wave will be its time. Saying this, $particle_{m1}$ is not a "normal mass" because it uses a different time wave. It will be a special particle with large mass and with different time[A]. See FIG.3.

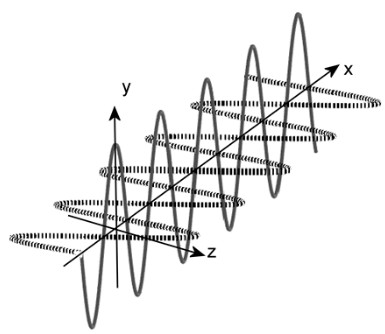

FIG. 3. A possible model of time waves of mass and $particle_{m1}$ (dark matter). The time wave of $particle_{m1}$ cannot be pictured in the cosine model of space-matter (see Reference 1). To display it, we need the z-axis, too. The two time waves are in different planes (x, y) and (x, z), where x, y, z are spatial distances. Mass and $particle_{m1}$ (dark matter) are different since their time waves are different. The dotted cosine function never appears as time for the mass since this function has no y=1 value. More details on time waves in Reference 1.

[A] And maybe with a different space that doesn't exist from the viewpoint of "normal" masses.

If the space waves are not (or no more) depleted, new *particle*$_{m1}$ doesn't come into being. This is the case in galaxies, clusters and super clusters, where the *particles*$_{m1}$ have made the poise. The gravity of *particle*$_{m1}$ acts as any gravity force. Increasing the gravity, *particles*$_{m1}$ help hold together the galaxies and clusters. In the cosmic void, where the space is permanently depleted, the creating of the *particle*$_{m1}$ continues. *Particle*$_{m1}$ makes the wavelength of the space wave longer, that is, the cosmic void will grow. The Universe grows. This is the second factor that also increases the Universe, and it is still gravity.

7. GRAVITY ACCELERATES THE UNIVERSE

Lemaitre[18] and Hubble[19] gave the first theoretical and observational evidences for the expansion of the Universe. The Hubble Law shows that the recessional speed of an object (galaxy) depends on the distance between Earth and the object (galaxy). The Hubble constant has been researched since 1927. The measurements are more and more precise; the show is on to refine its value.

Perlmutter, Riess and Schmidt[20, 21] found observational evidence for an accelerating Universe in 1998. The Universe expands at an increasing rate, that is, the velocity at which a distant galaxy is receding from the observer is continuously increasing with time.

Using the new definition of gravity described above, we can give a working explanation, where gravity itself occurs as (a significant portion of) the accelerating Universe.

Gravity makes the wavelength of space waves longer. *Particles*$_{m1}$ give an extra increase to wavelengths of space waves. If the creating of *particles*$_{m1}$ is permanent in voids, it occurs that the acceleration of the Universe will accelerate. This will accelerate the creation of *particle*$_{m1}$. Saying this, and supposing that the *particle*$_{m1}$ is a kind of dark matter, (a part of) dark energy is created by the dark matter which are connected in this case. In other words, the gravity of the Universe creates the accelerating Universe (or at least a part of it).

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