

Mathematical Theory Of Space-Time

Chun-Xuan. Jiang

P. O. Box 3924, Beijing 100854, P. R. China

jcxxx@163.com

Abstract

Using space-time ring we establish the mathematical theory of space-time . Using two methods we deduce the new gravitational formula. Tardyonic rotating motion produces the centrifugal force ,but tachyonic rotating motion produces the centripetal force, that is gravity. Using it we establish the expansion theory of the universe and suggest the new universe model. We prove that in the universe there are no dark matter and no dark energy. New gravitational formula changes all that. Multiverse and gravitational waves do not exist.

Keywords: new gravitational formula, expansion theory of universe, new universe model.

PACS:04.90.+e,98.80.-k.

1. Mathematical Theory of Space-Time

In the Universe there are two matters: (1) observable subluminal matter called tardyon(locality) and (2) unobservable superluminal matter called tachyon(non-locality) which coexist in motion. Tachyon can be converted into tardyon, and *vice versa*. Tardyonic rotating motion produces the centrifugal force, but tachyonic rotating motion produces the centripetal force, that is gravity. Using tardyonic and tachyonic coexistence principle we deduce the new gravitational formula,

For establishing the mathematical theory of space-time we first define space-time ring [1,10]

$$Z = \begin{pmatrix} ct & x \\ x & ct \end{pmatrix} = ct + jx, \quad (1)$$

where x and t are the tardyonic space and time coordinates, c is light velocity in vacuum,

$$j = \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}.$$

(1) can be written as Euler form

$$Z = ct_0 e^{j\theta} = ct_0 (\text{ch } \theta + j \text{sh } \theta), \quad (2)$$

where ct_0 is the tardyonic invariance, θ tardyonic hyperbolic angle.

From (1) and (2) we have

$$ct = ct_0 \text{ch } \theta, \quad x = ct_0 \text{sh } \theta \quad (3)$$

$$ct_0 = \sqrt{(ct)^2 - x^2}. \quad (4)$$

From (3) we have

$$\theta = \text{th}^{-1} \frac{x}{ct} = \text{th}^{-1} \frac{u}{c}. \quad (5)$$

where $c \geq u$ is the tardyonic velocity.

Using the morphism $j: z \rightarrow jz$, we have

$$jz = \bar{x} + jct\bar{t} = \bar{x}_0 e^{j\bar{\theta}} = \bar{x}_0 (\text{ch } \bar{\theta} + j \text{sh } \bar{\theta}), \quad (6)$$

where \bar{x} and \bar{t} are the tachyonic space and time coordinates, \bar{x}_0 is tachyonic invariance, $\bar{\theta}$ tachyonic hyperbolical angle.

From (6) we have

$$\bar{x} = \bar{x}_0 \text{ch } \bar{\theta}, \quad ct\bar{t} = \bar{x}_0 \text{sh } \bar{\theta}. \quad (7)$$

$$\bar{x}_0 = \sqrt{(\bar{x})^2 - (ct\bar{t})^2}. \quad (8)$$

From (7) we have

$$\bar{\theta} = \text{th}^{-1} \frac{ct\bar{t}}{\bar{x}} = \text{th}^{-1} \frac{c}{\bar{u}}. \quad (9)$$

where $\bar{u} \geq c$ is the tachyonic velocity.

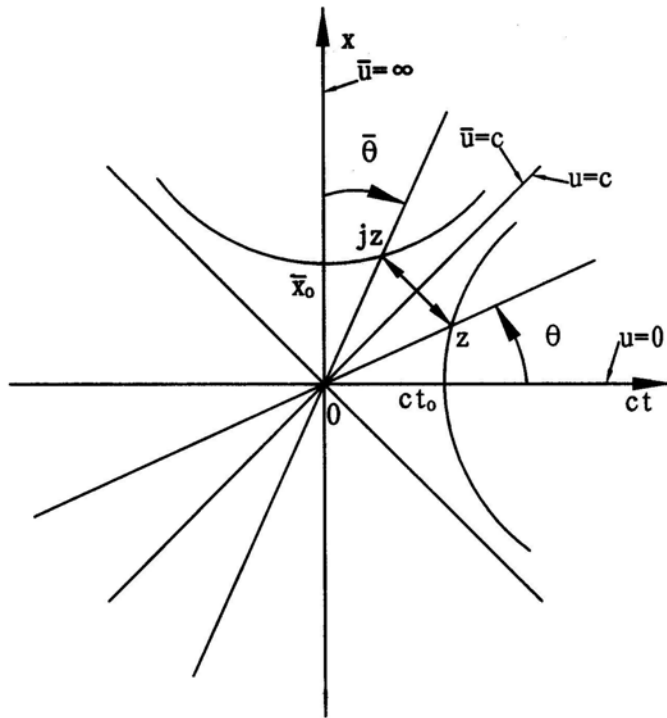


Fig. 1. Mathematical theory of space-time

Figure 1 shows the formulas (1)-(9). $j: z \rightarrow jz$ is that tardyon can be converted into tachyon, but $j: jz \rightarrow z$ is that tachyon can be converted into tardyon. $u = 0 \rightarrow u = c$ is the positive acceleration, but $\bar{u} = \infty \rightarrow \bar{u} = c$ is the negative acceleration, which coexist. At the ct -axis $u=0$ and $x=0$ we define the tardyonic rest time t . At the x -axis we define the tachyonic rest space

$$\bar{X}_0 = \lim_{\substack{\bar{u} \rightarrow \infty \\ t \rightarrow 0}} \bar{u}t = \text{constant}. \quad (10)$$

Since at rest the tachyonic rest time $t = 0$ and $\bar{u} = \infty$, we prove that tachyon is unobservable. Fig.1 and (10) are mathematical theory of space-time, which are the foundations of physics and cosmology. Using it we prove that dark matter, dark energy, gravitational waves, black holes, quantum entanglement and quantum computers do not exist. From Fig.1 we deduce new gravitational formula.

2.New Gravitational Formula:
$$\bar{F} = -\frac{mc^2}{R}$$

Assume $\theta = \bar{\theta}$, from (5) and (9) we get the tardyonic and tachyonic coexistence principle [1-4,10]

$$u\bar{u} = c^2. \quad (11)$$

Using the analytical method we deduce the new gravitational formula. Differentiating (11) by the time, we get

$$\frac{d\bar{u}}{dt} = -\left(\frac{c}{u}\right)^2 \frac{du}{dt}. \quad (12)$$

$\frac{du}{dt}$ and $\frac{d\bar{u}}{dt}$ can coexist in motion, but their directions are opposite.

We study the tardyonic and tachyonic rotating motions. In 1673 Huygens discovered that the tardyonic rotation produces centripetal acceleration

$$\frac{du}{dt} = \frac{u^2}{R}, \quad (13)$$

where R is rotating radius.

Substituting (13) into (12) we have the tachyonic centrifugal acceleration

$$\frac{d\bar{u}}{dt} = -\frac{c^2}{R}. \quad (14)$$

(13) and (14) have the same form. From (13) we get the tardyonic centrifugal force

$$F = \frac{Mu^2}{R}, \quad (15)$$

where M is the inertial mass.

From (14) we get the tachyonic centripetal force, that is gravity

$$\bar{F} = -\frac{mc^2}{R}, \quad (16)$$

where m is the gravitational mass converted into by tachyonic mass \bar{m} .

(15) and (16) have the same form. (16) is the new gravitational formula.

Using the geometrical method we deduce the new gravitational formula..

Figure 2 shows that the rotation ω of body A emits tachyon mass \bar{m} , which forms the tachyon and gravitation field and gives the body B revolutions u and \bar{u} .

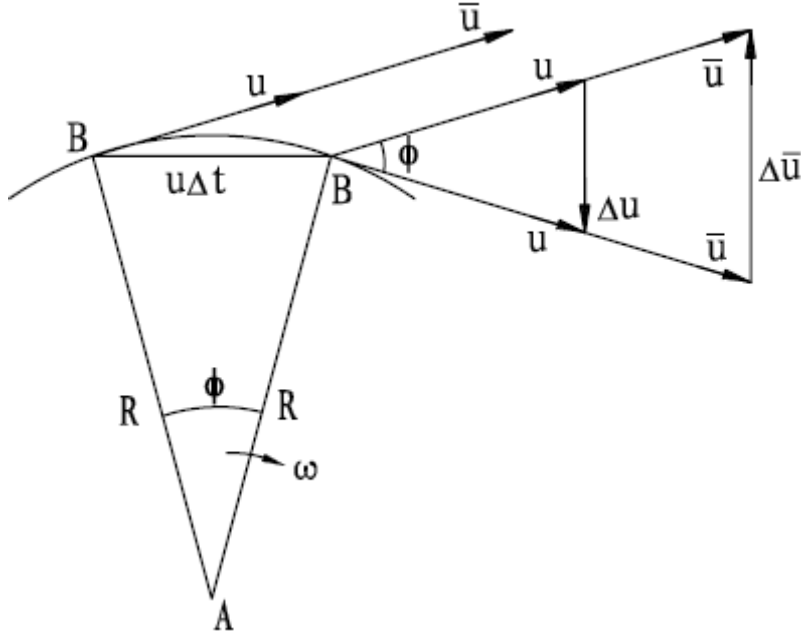


Fig.2. On body B the $\frac{du}{dt}$ and $\frac{d\bar{u}}{dt}$ coexistence

From Fig. 2 .it follows

$$\frac{u\Delta t}{R} = \frac{\Delta u}{u} . \quad (17)$$

From (17) it follows the tardyon centripetal acceleration on the body B [2-4],

$$\frac{du}{dt} = \lim_{\substack{\Delta t \rightarrow 0 \\ \Delta u \rightarrow 0}} \frac{\Delta u}{\Delta t} = \frac{u^2}{R} . \quad (18)$$

From Fig. 2. it follows

$$\frac{u\Delta t}{R} = -\frac{\Delta \bar{u}}{\bar{u}} . \quad (19)$$

From (19) and (11) it follows the tachyon centrifugal acceleration on the body B [2-4],

$$\frac{d\bar{u}}{dt} = \lim_{\substack{\Delta \bar{u} \rightarrow 0 \\ \Delta t \rightarrow 0}} \frac{\Delta \bar{u}}{\Delta t} = -\frac{u\bar{u}}{R} = -\frac{c^2}{R} . \quad (20)$$

On body B the $\frac{du}{dt}$ and $\frac{d\bar{u}}{dt}$ coexistence.

From (18) it follows the tardyon centrifugal force on body B [2-4],

$$F = \frac{M_B u^2}{R}, \quad (21)$$

where M_B is body B mass.

From (20) it follows the tachyon centripetal force on body B , that is gravity [2-4,10],

$$\bar{F} = -\frac{mc^2}{R}, \quad (22)$$

where m is the gravitation mass converted into by tachyon mass \bar{m} which is unobservable, but m is observable.

(22) is the new gravitational formula. In 1976[2] this simple thought made a deep impression on me. It impelled me to establish the new gravitational theory. On body B the F and \bar{F} coexistence.

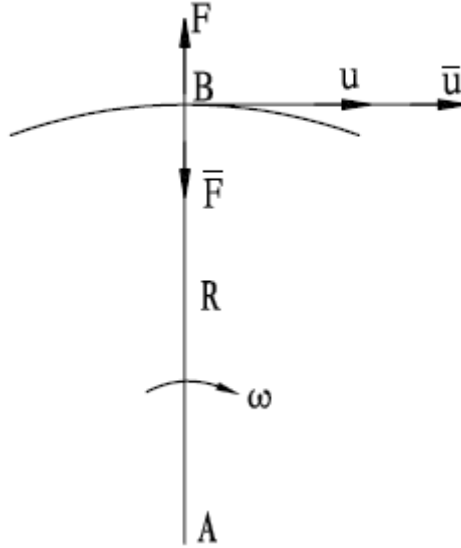


Fig.3. On body B the F and \bar{F} coexistence

From Fig. 3, it follows

$$F + \bar{F} = 0. \quad (23)$$

From (21), (22) and (23) it follows

$$\frac{m}{M_B} = \frac{u^2}{c^2}. \quad (24)$$

Body B increases mass m and centrifugal force is greater than gravitation force, then body B expands outward. Dark matter which causes cosmic attraction is wrong.

From (22) it follows Newtonian gravitation formula. The m is proportional to body A mass

M_A , in (24) m is proportional to M_B , is inversely proportional to the distance R between

body A and body B . It follows

$$m = k \frac{M_A M_B}{R}, \quad (25)$$

where k is constant

Substituting (25) into (22) it follows the Newtonian gravitation formula [2-4,10]

$$\bar{F} = -G \frac{M_A M_B}{R^2}, \quad (26)$$

where $G = kc^2 = 6.673 \times 10^{-8} \text{ cm}^3 / \text{g} \cdot \text{sec}^2$ is gravitation constant.

Now we study the freely falling body. Tachyonic mass \bar{m} can be converted into tardyonic mass m , which acts on the freely falling body and produces the gravitational force

$$\bar{F} = -\frac{mc^2}{R}, \quad (27)$$

where R is the Earth radius.

We have the equation of motion

$$\frac{mc^2}{R} = Mg, \quad (28)$$

where g is gravitational acceleration, M is mass of freely falling body.

From (28) it follows the gravitational coefficient

$$\eta = \frac{m}{M} = \frac{Rg}{c^2} = 6.9 \times 10^{-10}. \quad (29)$$

Eötvös experiment $\eta \sim 5 \cdot 10^{-9}$ and Dicke experiment $\eta \sim 10^{-11}$. Since the gravitational mass m can be transformed into the rest mass in freely falling body, we prove that the freely falling bodies fall with the same acceleration.

3. The expansion theory of the universe

Using new gravitational formula we study the expansion theory of the Universe[10]. Figure 4 shows a expansion model of the Universe. The rotation ω_1 of body A emits tachyonic flow, which forms the tachyonic field. Tachyonic mass \bar{m} acts on body B , which produces its rotation ω_2 , revolution u and gravitational force

$$\bar{F}_1 = -\frac{mc^2}{R}, \quad (30)$$

where R denotes the distance between body A and body B , m is gravitational mass converted into by tachyonic mass \bar{m} which is unobservable but m is observable.

The rotation of the body B around body A produces the centrifugal force

$$F_1 = \frac{M_B u^2}{R}, \quad (31)$$

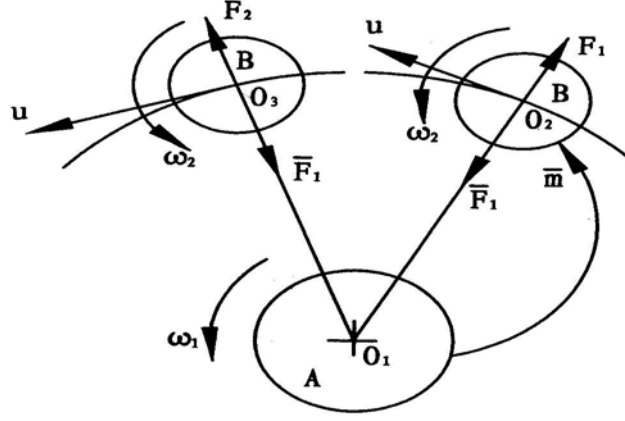


Fig. 4. A expansion model of the Universe

where M_B is the inertial mass of body B , u is the orbital velocity of body B .
At the O_2 point we assume

$$F_1 + \bar{F}_1 = 0. \quad (32)$$

From (32) it follows that the coexistence of the gravitational force and centrifugal force.
From (30)-(32) it follows the gravitational coefficient

$$\eta = \frac{m}{M_B} = \left(\frac{u}{c}\right)^2. \quad (33)$$

At the O_3 point the tachyonic mass \bar{m} can be converted into the rest mass m in body B , it follows

$$F_2 = \frac{M_B u^2}{R} + \frac{m u^2}{R}. \quad (34)$$

Since $F_2 + \bar{F}_1 > 0$, centrifugal force F_2 is greater than gravitational force \bar{F}_1 , then the body B expands outwards and its mass increases. This is a expansion mechanism of the Universe.
From (31,32,34) we have

$$F_2 + \bar{F}_1 = \frac{m u^2}{R} = M_B g_e. \quad (35)$$

From (35) we obtain the expansion acceleration

$$g_e = \frac{m u^2}{M_B R}. \quad (36)$$

Substituting (33) in (36) we obtain

$$g_e = \frac{u^4}{c^2 R}. \quad (37)$$

If body A is the Earth, then body B is the Moon; if body A is the Sun, then body B is the

Earth; ... It can explain our accelerating universe. In the universe there are no dark matter and no dark energy. This simple thought made a deep impression on me. It impelled me to establish a expansion theory of the universe .Dark energy responsible cosmic repulsion is wrong.

If the body A is the Sun and body B is the planet. We calculate the gravitational coefficients η as shown in table 1.

Table 1: Values of the gravitational coefficients η

Planet	u (km/sec)	$\eta(10^{-10})$
Mercury	47.89	255.2
Venus	35.03	136.5
Earth	29.79	98.7
Mars	24.13	64.8
Jupiter	13.06	19.0
Saturn	9.64	10.3
Uranus	6.81	5.2
Neptune	5.43	3.3
Pluto	4.74	2.5

The gravitational field of the solar system is the origin of the planet mass. From it the planet acquire mass.

4. The new universe model

From the tachyonic theory we suggest the new universe model. The universe has no beginning and no end. The universe is infinite, but it has a center consisting of the tachyonic matter which is strong gravitational field (SGF), which governs motion of the whole universe. Therefore the whole universe is stable and harmonious. ... In the sun there is a center consisting of the tachyonic matter with SGF, which governs motion of the solar system. It is stable and harmonious. In the earth there is a center consisting of the tachyonic matter with SGF, which governs motion of the earth and the moon. It is stable and harmonious. In the moon there is a center consisting of the tachyonic matter with SGF, which governs motion of the moon.It is stable and harmonious. In atomic nucleus there is a center consisting of the tachyonic matter with SGF, which governs motion of the nucleus. Therefore atomic nuclei are stable and harmonious. The tachyonic theory governs the amazing harmony of the whole universe from the smallest to the largest scales. New gravitational formula changes all that. In the Universe there are no dark matter, no dark energy and no gravitational waves. Multiverse, inflation and primordial gravitational waves do not exist [5-7].

5. Conclusion

In summary. We deduce tardyonic and tachyonic coexistence principle. Using it we deduce the centrifugal formula and new gravitational formula We establish the expansion theory of the universe without dark energy and suggest the new universe model which is amazing harmony. The new gravitational formula is foundations of particle physics and cosmology. We prove that in the universe no dark matter, no dark energy, no gravitational waves and no quantum gravity. .

Where did we come from? Where are we going? What makes up the universe? These questions have occupied mankind for thousands of years. Over the course of history, our view of the world has been changed. Theologians and philosophers, physicists and astronomers have given us very different answers. Where did we come from? We answer this questions this way $\bar{m} \rightarrow m$, tachyons \rightarrow tardyons[1], that is tachyons can be converted into the electrons and positrons which are the basic building-blocks of the elementary particles[8-9].The tachyons are the origin of mass. Where are we going? We answer this question this way $m \rightarrow \bar{m}$, that is the tardyons produce tachyons[1]. The tardyons and tachyons make up the Universe.

Note. In 1976 Jiang found a gravitational formula[2] : $\bar{F} = -\bar{m}c^2/R$, where \bar{m} is the tachyonic mass. In 2004 Jiang studied the Universe expansion and found $\bar{F} = -mc^2/R$, where m is gravitational mass converted into by tachyonic mass \bar{m} [10].

Newtonian gravity formula is based on empirical evidence. He did not explain what is gravity? how it works? In general theory of relativity there is no gravitational formula[11].In modified gravity and modified Einstein gravity there are no gravitational formula[12].There cannot be really gravity theory without gravity formula. A tachyonis instability appears as a field with a negative mass squared which is wrong[12].The tachyons are stable. It has no rest time and no rest mass[1].

References

- [1] Chun-Xuan Jiang, A theory of morphisms between the tardyon and tachyon, physics(Chinese), 4. (1975)119-125.
- [2] Chun-Xuan Jiang, On nature for gravitation, J. Beijing observatory (Chinese), 7(1976)32-38.
- [3] Chun-Xuan Jiang, An approach on the nature of attractive force, Potential science (Chinese), 4(1982)19-20.
- [4] Chun-Xuan Jiang, A unified theory of the gravitational and strong interactions, Hadronic J., 24(2001)629-638.
- [5] P.A.R.Ade et al.(BICEP2 Collaboration), Detection of B-mode polarization at degree angular scales by BICEP2,Phys.Rev.Lett 112,241101(2014).
- [6]S.Dodelson, How much can we learn about the physics of inflation ? Phys.Rev.Lett,112,191301(2014).
- [7] J.Caligiuri and A.Kosowsky, Inflationary tensor perturbations after BICEP2. Phys.Rev.Lett,112,191302(2014).
- [8] Chun-Xuan Jiang, A simple approach to the computation the total number of hadronic

constituents in Santilli model, Hadronic J., 3(1979)256-292.

- [9] Chun-Xuan Jiang, A mathematical model for particle classification, Acta Math.Sci., 8(1988)133-144.
- [10] Chun-Xuan Jiang, New gravitational formula and expansion theory of the universe. In: new studies of space-time theory (Chinese), Dizi press, pp.254-259, 2005.
- [11] A. Einstein, The meaning of relativity, 5th edn, (Princeton university press, Princeton, 1956).
- [12] Austin Joyce, Bhuvanesh Jain, Justin Khoury, Mark Trodden. Beyond the cosmological standard model. Physics Reports 568(2015)1-98.

Acknowledgments

The author thanks professor Walter Lewin for his mails.

(1) From: "Walter H.G. Lewin" <lewin@space.mit.edu>

Date: Sun, 10 Jun 2012 22:22:21-0400(EDT)

Subject: Re: Fwd.

To: 123jiangchunxuan@gmail.com; lewin@mit.edu

Cc: luc@vanocken.be

Publish this in a refereed journal and once it is accepted buy yourself a first class ticket to Stockholm to pick up Nobel prize for physics.

(2) From: "Walter H.G. Lewin" <lewin@space.mit.edu>

Date: Sun, 17 Jun 2012 06:19:37-0400(EDT)

Subject: Re

To: 123jiangchunxuan@gmail.com

Cc: luc@vanocken.be

Dear Jiang

Thank for your email.

I suggest you submit your theory to a refereed journal. If it is accepted, then buy yourself a plane ticket to Stockholm to pick up a Nobel prize.

.....

Greetings.

