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How does Universal Gravitation Arise

By Huawang Li

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Experiment 3: Under constant temperature and vacuum conditions, the temperature of an object is related to its mass. The greater its mass the higher its temperature.

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HOWDOESUNIVERSALGRAVITATIONARISE

Strictly as per the compliance and regulations of:

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I. Introduction

Physics is the cornerstone of human civilization. In recent years, the development of physics is in a state of stagnation. Facing many new physical experimental phenomena, physicists are hard to justify themselves. Where did it go wrong? To find out the answer, we must start with the most elementary particles that make up matter. Determine the correct properties of them so that we can find the roots of matter.

There are a lot of colorful interstellar clouds [2] suspended in the vast universe, which seem to be set off by a kind of gas, just like the clouds set off by the air. Will there be such a kind of gas? In an electron cyclotron [3], would a speeding electron be slowed down by the resistance of gas in the vacuum? Will the propagation of light be transmitted through gas like air-borne sound? Will gravitation be from the buoyancy of gas, just like the buoyancy of air to an object? The atmospheric pressure generated by the air can squeeze two objects together, but people don't feel the presence of atmospheric pressure. Then will the nucleus be squeezed together by high pressure gas? Is the Brownian motion of the electron around the nucleus [4] caused by this gas pressure? Is the cosmic background radiation 2.735K [5] the microwave generated by this gas? Under normal temperature and pressure, the average mass of air molecules is 29g/mol, and the average kinetic energy of an air molecule is 6.02×10^{-21}J, then will the Planck constant $h=6.626\times10^{-34}$ [6] be the average kinetic energy of this gas particle in a vacuum? At normal temperature and pressure, the average velocity of air molecules is 500m/s, the speed of sound is 340m/s, and the speed of light is 2.99792458×10^{8} m/s [7]. Will the average rate of this gas particle in a vacuum be $v=\sqrt{2}c=4.24\times10^{8}$ m/s or not?

There are indications that our space is full of gas like air, and the particles that make up this gas we name it Yizi. The difference between Yizi and Ether is that Yizi has mass and kinetic energy, and its average kinetic energy is Planck's constant. The movement of Yizi obeys the law of conservation of energy and momentum. Three physical experiments will be introduced here to prove the existence of Yizi.

II. The Essence of Force

Force is a macroscopic concept. The amount of change in the momentum of a group of particles per unit time is the amount of force generated by this group of particles. Let's look at an experiment. Making small balls as particle models, hold the cup with balls 5cm above the scale, pour one ball onto the scale pan, the pointer will swing once. And then at the same height pour 100 or more continuously and quickly, as shown in Fig.1, the pointer will swing around a position. This phenomenon shows that a large number of balls hitting the pan produces a constant and uniform pressure on the scale. The more balls collide during a certain period, the greater the pressure on the pan. If pour the balls from a higher position above the pan, we can observe the pointer indicates a greater pressure. This result shows that the greater the momentum of the balls, the greater the pressure on the scale pan. This is the description of the concept of force in Chinese junior high school physics textbook. However, when physicists face the universal gravitation, electromagnetic force, weak interaction force, and strong interaction force, they completely forget the essential concept of force. These forces are all caused by the change of momentum due to particle collision. This is also the essence of force (the grand unified theory) [8].

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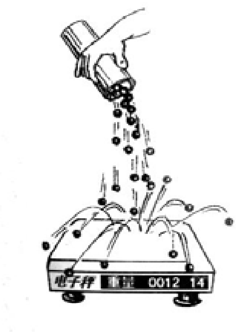

Fig. 1: The small balls slip onto the electronic scale

III. The Cause of Gravitation

The universe is full of Yizi gas, and all the planets suspend in it. The volatile Yizi gas rippled in space, forming the cosmic background temperature of 2.736K. However, the center temperature of each planet is very high, far higher than the background temperature of the universe, which makes the energy of Yizi gas near it, especially high. The farther away from the planet, the lower the energy of Yizi gas. Where the energy of Yizi gas is high, the density of it is low, that is to say, the number of Yizi per unit volume is few, as showing in Fig.2.

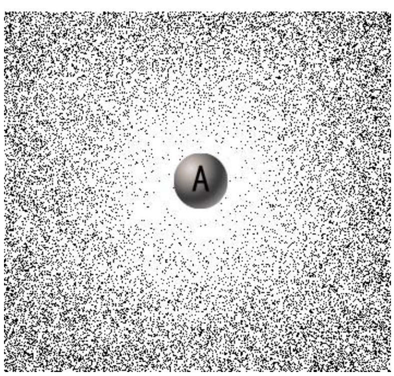

Fig. 2: Distribution of Yizi gas around planet A

Where the energy of Yizi gas is low, its density is high, and the number of Yizi gas per unit volume is large. The density of Yizi gas increases with the elevation, and it creates a top-down buoyancy. The amount of buoyancy an object receives depends only on the volume of the elementary particles that make up the object to displace the Yizi gas. If the quality of basic particle density is same, then the buoyancy produced by Yizi gas is related to the mass of the elementary particles that make up the object. This is why both a feather and a iron ball fall at the same time in a free-fall experiment.

On earth, the gravitational force of one object on another is not always positive, sometimes negative, meaning that one object repels another. When the temperature of object B is lower than the ambient temperature, the distribution of Yizi around it showing in Fig.3: the kinetic energy of Yizi around object B is small, and the density is high, and then object B has a repulsive effect on the object at ambient temperature.

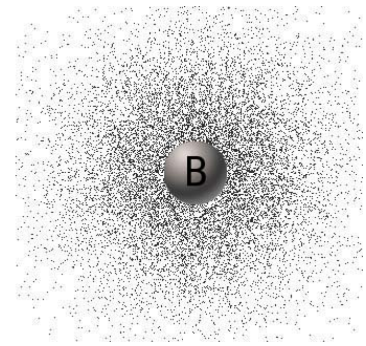

Fig. 3: The distribution of Yizi gas around object B when the temperature of object B is lower than the ambient temperature

You may ask, does the earth's gravity decreases in freezing winter? The earth's center temperature is very high, and its radius is 6400 kilometers. The sun can only change the earth's surface temperature about 10 meters deep. Temperature below 10 meters are generated by the earth itself, and it is relatively constant, so freezing is not enough to change the gravity of the earth.

Gravity can only exert a force within a certain distance. When an object is too far away from a planet, space where it is located will have the same density of Yizi gas as the cosmic background temperature, and the force on the object will become zero.

Someone asked, if the temperature had such an effect on gravity, the rocket would have been so hot that it would have been impossible to control it. Right? When two objects attract each other, each changes the density of the Yizi gas around it, and creates a gravitational field, the corresponding constant acceleration of gravity, such as the surface of the earth's gravitational acceleration $g=9.8m/second^2$, and the gravitational acceleration constant produced by the rocket probably be only 10^{-9}-$10^{-8}m/second^2$, negligible, that is to say, the contribution of earth and rocket to the magnitude of gravitation is not the same. The earth generates an active gravitational field.

Although the density of Yizi gas around the stars increases with the altitude, however in unit time, in any given radial direction of the planet, Yizi passes through a unit area. The number of Yizi diffuses from the inside of the unit area to the outside is equal to the number from the outside to the inside, both are n. Let Yizi's outer-to-inner diffusion velocity be V_1, V_2, V_3, ... V_n, the inner-to-outer diffusion velocity be V_1', V_2', V_3', ... V_n', the average velocity of Yizi outer-to-inner diffusion be $\overline{V}$, and the average velocity of Yizi inner-to-outer diffusion be $\overline{V}'$. Then

$$\overline{V} = \frac{V_1 + V_2 + V_3 + ...+ V_n}{n} \quad (1)$$

$$\overline{V'} = \frac{V'_1 + V'_2 + V'_3 + ...+ V'_n}{n} \quad (2)$$

Let ΔV be the velocity variance of Yizi outer-to-inner diffusion, and $\Delta V'$ be the velocity variance of Yizi inner-to-outer diffusion.

$$\Delta V = \frac{(V_1 - \overline{V})^2 + (V_2 - \overline{V})^2 + (V_3 - \overline{V})^2 + ...+ (V_n - \overline{V})^2}{n} \quad (3)$$

$$\Delta V' = \frac{(V'_1 - \overline{V'})^2 + (V'_2 - \overline{V'})^2 + (V'_3 - \overline{V'})^2 + ...+ (V'_n - \overline{V'})^2}{n} \quad (4)$$

The irregularity of a star decreases as the radius increases. The closer to the star, the greater the unevenness of the motion rate of Yizi is. So the unevenness of the motion rate that diffuses from the inside to outside is greater than that from the outside to inside, ie

$$\Delta V' > \Delta V \quad (5)$$

Expand Equation 3 and Equation 4:

$$\Delta V = \frac{V_1^2 + V_2^2 + V_3^2 + ...+ V_n^2}{n} - \frac{2\overline{V}(V_1 + V_2 + V_3 + ...+ V_n)}{n} + \overline{V}^2 \quad (6)$$

$$\Delta V' = \frac{V_1'^2 + V_2'^2 + V_3'^2 + ...+ V_n'^2}{n} - \frac{2\overline{V'}(V'_1 + V'_2 + V'_3 + ...+ V'_n)}{n} + \overline{V'}^2 \quad (7)$$

Substituting Equation 1 and 2 into Equation 6 and 7, respectively:

$$\Delta V = \frac{1}{n}(V_1^2 + V_2^2 + V_3^2 + ...+ V_n^2) - \overline{V}^2 \quad (8)$$

$$\Delta V' = \frac{1}{n}(V'^2_1 + V'^2_2 + V'^2_3 + ...+ V'^2_n) - \overline{V}'^2 \quad (9)$$

Substituting Equation 8 and 9 into Equation 5 respectively

$$\frac{1}{n}(V_1^2 + V_2^2 + V_3^2 + ...+ V_n^2) - \overline{V}^2 < \frac{1}{n}(V'^2_1 + V'^2_2 + V'^2_3 + ...+ V'^2_n) - \overline{V}'^2 \quad (10)$$

According to the law of conservation of energy,

$$\frac{1}{2}M_Y V_1^2 + \frac{1}{2}M_Y V_2^2 + \frac{1}{2}M_Y V_3^2 + ...+ \frac{1}{2}M_Y V_n^2 = \frac{1}{2}M_Y V_1'^2 + \frac{1}{2}M_Y V_2'^2 + \frac{1}{2}M_Y V_3'^2 + ...+ \frac{1}{2}M_Y V_n'^2$$

i.e.

$$V_1^2 + V_2^2 + V_3^2 + ...+ V_n^2 = V'^2_1 + V'^2_2 + V'^2_3 + ...+ V'^2_n \quad (11)$$

Substituting Equation 11 into 10 gives: $\overline{V} > \overline{V}'$ i.e.

$$\frac{V_1 + V_2 + V_3 + ...+ V_n}{n} > \frac{V'_1 + V'_2 + V'_3 + ...+ V'_n}{n} \quad (12)$$

multiplying both sides of Equation 12 with $M_Y n$, we obtain

$$V_1 M_Y + V_2 M_Y + V_3 M_Y + ...+ V_n M_Y > V'_1 M_Y + V'_2 M_Y + V'_3 M_Y + ...+ V'_n M_Y \quad (13)$$

Since force is a change in momentum per unit time, the force exerted by Yizi on this unit area:

$$F = V_1 M_Y + V_2 M_Y + V_3 M_Y + ...+ V_n M_Y - (V'_1 M_Y + V'_2 M_Y + V'_3 M_Y + ...+ V'_n M_Y) \quad (14)$$

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IV. The Light and Heat of the Sun is not Generated by Fusion

a) Our universe is a mixture of protons, electrons, and Yizi. Most protons and electrons suspend in Yizi gas in different material forms, as shown in Fig.4.When a single proton suspends in Yizi gas since the volume of the proton is much larger than Yizi, a proton collides with a large number of Yizi around it at the same time. The cooperative force of Yizi on the proton tends to be balanced, the kinetic energy of the proton is very small, and the temperature tends to zero (cosmic background temperature). At the same moment, the number of collisions of protons, in a certain line, in opposite two directions is n_1 and n_2 respectively, and set up $n=|n_1-n_2|$, then the momentum of a proton tends to be equal to that of n Yizi:

$$M_{proton} \times v_{proton} \approx n \times m_{Yizi} \times V_{Yizi} \qquad (1)$$

Because n_1 and n_2 tend to be the same, so the value of n is small,

And because $M_{proton} \gg n \times m_{Yizi}$

So: $$v_{proton} \ll V_{Yizi} \qquad (2)$$

From (1)×(2), we get:

$$M_{proton} \times v_{proton} \times v_{proton} \ll n \times m_{Yizi} \times V_{Yizi} \times V_{Yizi}$$

That is, $$\frac{1}{2} \times M_{proton} \times v_{proton}^2 \ll \frac{1}{2} \times n \times m_{Yizi} \times V_{Yizi}^2 \qquad (3)$$

At this time, the energy of n Yizi is much larger than the energy of a proton. That is to say, when a single proton suspends in Yizi gas, the momentum of the proton tends to be equal to that of n Yizi, while the kinetic energy of the proton is much less than that of n Yizi, and the temperature of the proton tends to absolute zero, although the energies of Yizi around the proton are very high.

b) And when the multiple protons are separated from the Yizi gas, since there is Yizi gas on one side of the proton and no Yizi gas on the other, that is to say, n1=0, n2=n. The proton's one side collides with n2 Yizi at the same time, and the kinetic energy of n2 Yizi is much greater than that of the individual proton suspends in the gas. As shown in Eq. 3, so the proton will continuously absorb energy from the Yizi gas, so that the kinetic energy of a proton tends to be equal to the kinetic energy of n2 Yizi, and the pressure tends to be equal, as shown in Fig. 5:

Now, $$\frac{1}{2} \times M_{proton} \times v_{proton}^2 \approx \frac{1}{2} \times n \times m_{Yizi} V_{Yizi}^2 \qquad (4)$$

Because of $$v_{proton} \ll V_{Yizi} \qquad (5)$$

So (4)÷(5) get: $$M_{proton} \times v_{proton} \gg n m_{Yizi} \times V_{Yizi} \qquad (6)$$

That is to say, when multiple protons and Yizi gas are completely separate, the kinetic energy of a single proton tends to be equal to that of n Yizi, while the momentum of a single proton is far greater than that of n Yizi.

The greater the mass of the object, the less the Yizi gas that penetrates the interior of the object, and the greater the difference in the Yizi density of the inner and outer parts of the object. More Yizi transfer kinetic energy to the proton, and the temperature of the object is higher. The object absorbs energy in the form of a direct collision and then releases the energy in the form of thermal radiation to form a dynamic equilibrium.

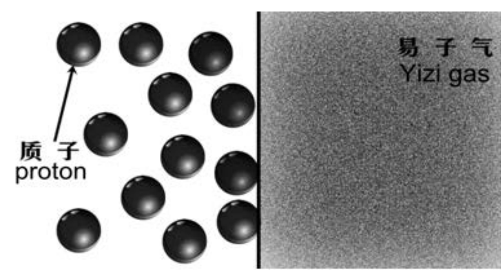

Fig. 5: Proton gas and Yizi gas are distributed separately

V. Three Physical Experiments Prove the Existence of Yizi

a) *Experiment 1: The gravitational interaction between two objects is not only related to the masses of the two objects but also to the ambient temperature at which the two objects are located. The force between the two objects is mutually exclusive when their temperature is lower than the ambient temperature.*

i. Experimental equipment and environment: The vacuum tank, as shown in Fig.6. The inner diameter is 1.8m, and the inner height is 1.8m. It is placed in a constant temperature cave. The gravitational torsion scale (Cavendish torsion scale) is placed on a small table in the vacuum tank, as shown in Fig.7. The light is injected from the outside of the vacuum tank onto the small mirror on the torsion scale and reflected the opposite side on the whiteboard.

Fig.6: Vacuum tank with a torsion scale placed in

Fig.7: A homemade Cavendish torsion scale placed in the vacuum tank

ii. Basic parameters and principles of the experiment:

As shown in Fig.8 and Fig.9:

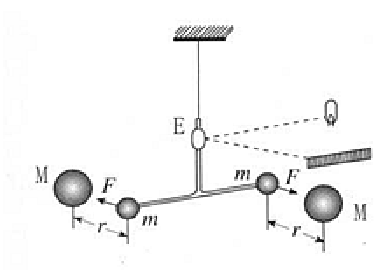

Fig. 8: Working principle diagram of Cavendish torsion balance

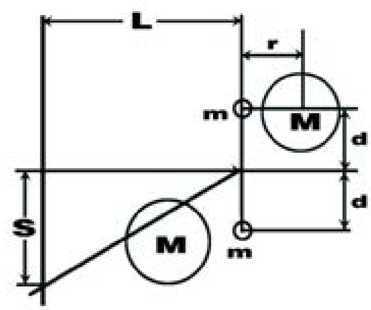

Fig. 9: Vertical dimension of the torsion balance

a. The size of gravity $F = \dfrac{\pi^2 mds}{T^2 L}$,
b. The distance of the reflective plane mirror from the whiteboard L=10.3m
c. The small copper ball mass m=0.575kg, the large lead ball mass M=1.5kg
d. Torsion balance arm length d = 0.15m
e. The free vibration period of the torsion balance is T=214s
f. S is the amount of movement of the scale light spot
g. The distance between the center of mass of the big ball and the small ball is r.

iii. Matters need attention:

a. When the gravitation torsion scale is placed in a vacuum tank with constant temperature, it does not change the ambient temperature or the temperature of the metal ball, the big metal ball and the small metal ball attract each other, because the temperature of the metal ball is slightly higher than the temperature of the surrounding Yizi gas. The larger the mass of an object in a constant vacuum, the higher its central temperature will be. This will be proved in the following experiment.
b. The vacuum degree of the vacuum tank should be less than 1000Pa. If there is too much residual air, when the ambient temperature changes, the air around the large metal ball and the small metal ball will turn over, affecting the experimental results.
c. There should be no objects around the metal sphere other than the one used to measure gravity. Otherwise the experiment will be complicated and even lead to the opposite result.
d. Not all metals are suitable for gravitational experiments. For example, metal aluminum has a repulsive effect on the metal lead itself, so neutral metals are more suitable for gravitation experiments.
e. Slowly inject ice water or hot water to avoid the obvious Thomson effect and the additional gravity, which will have a great impact on the experiment.

iv. Experiment steps:

a. Remove the two large lead balls from the torsion scale, leaving only two small copper balls on the T-frame of the torsion scale.
b. Vacuum the vacuum tank with a vacuum degree below 1000Pa.
c. It will take 72 hours for the torsion scale to stop swinging in the vacuum. When the torsion scale

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stops swinging, mark the position of the light spot on the white board, and draw a vertical line in red to represent the balance position.

d. Send hot air to the insulating room to do a basic test on the whole experimental system. There is no obvious change in the point of light, so the influence of the system on it can be ignored.

e. Turn off the air conditioner, open the vacuum tank, and put the big ball on the torsion scale. Keep the center distance between the big ball and the small ball about 10cm, then close the tank and vacuum it.

f. After standing in the natural environment without heating or cooling for 72 hours, it was found that the light spot shifted to the direction of attraction by about 0.4-0.5cm, S≈0.0045m.

Gravitation force in the natural state

$$F = \frac{\pi^2 mds}{T^2 L} = \frac{3.14^2 \times 0.575 \times 0.15 \times 0.0045}{214^2 \times 10.3} = 8.11 \times 10^{-9} \text{ Newton.}$$

g. At this time, sent hot air to the insulating room. The temperature inside the room rises by 3 to 4 degrees in 3 minutes, and the temperature inside the vacuum tank rises less than 0.1 degrees. At this time, the temperatures of the big ball and the small ball are lower than the environment in which they are located. The light spot move 3.5cm in the direction in which the big ball and the small ball repel each other. As the temperature in the room increases, the maximum moving distance of the light spot to the repulsive direction is about 15cm, as shown in Fig.10.

Fig. 10: When the external temperature of the vacuum tank rose, the light spot moves in a repulsive direction

The repulsive force F which generated by the light spot moving 15cm:

$$F = \frac{\pi^2 mds}{T^2 L} = \frac{3.14^2 \times 0.575 \times 0.15 \times 0.15}{214^2 \times 10.3} = 2.7 \times 10^{-7} \text{ Newton}$$

This repulsive force is 33 times the gravitational force measured at the natural ambient temperature.

h. Turn off the air conditioner and leave the heat-insulating room alone. After two days, send cold air into it. As the temperature of the room decreases, the gravity between the big ball and the small ball increases, and the light spot moves in the direction of mutual attraction, and the maximum moving distance reaches 17cm. This attractive force is 37 times the gravity measured in the natural environment temperature.

b) Experiment 2: Change the temperature of the big metal ball on the gravitation torsion scale, while the small ball's temperature remains unchanged. Observe the force exerted by the big ball on the small ball (when the temperature of the big ball increases, it will attract the small one; when the temperature of the big ball decreases, it will repel the small one).

i. Laboratory equipment and environment: A constant temperature room built in a cave. A vacuum tank, placed inside the room, with a gravitational torsion scale placed inside it. A hanging wire hangs a T-frame on the torsion scale, and at the two ends of the T-frame, there is a small copper ball respectively, as shown in Fig.11. One of the small copper balls has a large hollow copper ball by its side. The large ball has an inlet and an outlet pipe, which are used to change its temperature by injecting hot water or ice water into it through a miniature water pump, as shown in Fig. 12.

Fig. 11: Top view of gravity balance in the vacuum tank

ii. Matters need attention

a. The vacuum degree of the vacuum tank should be less than 1000Pa. If there is too much residual air, when the ambient temperature changes, the air around the large metal ball and the small metal ball will turn over, affecting the experimental results.

b. There should be no objects around the metal sphere other than the one used to measure gravity, which would complicate or even reverse the experiment.

Fig.12: A small pump and a bucket used to fill in the large hollow copper ball with hot or icy water

c. The large hollow copper ball must be connected with the ground wire to avoid electron transfer and electrostatic attraction inside the hollow copper ball caused by the injection of ice water or hot water.

iii. Experiment steps:

a. Put the big hollow copper ball on the torsion balance, and suspend two small copper balls at each end of the T-frme. Keep these balls centers on the same level, as shown in Fig.13.

Fig. 13: The center of the large hollow copper ball is on the same level as the center of the small copper ball.

Fig.14: The small copper ball below the suspension stops swinging, and the light spot stays on the midline

b. After being placed for a long time, the small copper ball under the suspension wire has stopped swinging, and the light spot stays on the middle line of the white board, as shown in Fig.14.

c. When we inject hot water into the large hollow copper ball, it attracts the small copper ball, and the light spot moves in the direction of attraction.

d. When we inject ice water into the large hollow copper ball, it repels the small copper ball, and the light spot moves in the direction of repelling.

c) *Experiment 3: Under the condition of constant temperature and vacuum, the temperature of an object is related to its mass. The larger the mass of an object, the higher its temperature will be.*

i. Laboratory equipment and environment: a homothermal room built in the cave, a vacuum tank placed in the homothermal room; a vacuum pump, a temperature collector and computer are placed outside the room; a 1000kg copper ball and a 1.2kg copper ball, both are placed in the vacuum tank as shown in Fig.15.

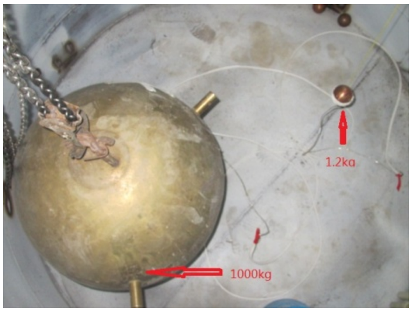

Fig. 15: A 1000kg copper ball and a 1.2kg copper ball suspendin a vacuum tank

ii. Matters need attention:

a. Thermistor [9] is very sensitive, and its temperature measuring error is 0.002 degree, so all- electric lines must be welded, the main circuit must use electrostatic shielding wire, and the joints shall be insulated.

b. Copper balls are used in this experiment mainly because of the high thermal conductivity of copper. The temperature reaches the equilibrium state quickly and its price is moderate. There are three main ways of heat transfer: heat conduction, convection, and heat radiation. Here, to maintain a constant temperature, we place the large and the small copper ball in a vacuum tank, suspend them, and let them balance the temperature mainly in the form of heat radiation. The center of the large and the small copper balls should be on the same horizontal plane, which mainly takes into account the inconsistency of the ambient temperature at different horizontal planes.

c. The current flowing through the thermistor should be as small as possible, otherwise, the current will generate the same amount of heat. The small copper ball will be warmer than the large copper ball because it can't dissipate as much as the large ball. Here the thermistor carries a current of 0.0104 mA.

d. The 24-hour temperature change of the vacuum tank in the homothermal room shall not exceed 0.2 degrees.

iii. Experiment steps:

a. Place the large copper ball and the small copper ball in the vacuum tank and keep their centers at the same level. The thermistor R1 attaches to surface of the large copper ball, and the thermistor R2 attaches to surface of the small copper ball.

b. Close the vacuum tank and evacuate it to a vacuum of -0.1 MPa.

c. Because the copper balls have been placed in the cave for a long time, the heat balance will not take too much time, and 24 hours is enough. After 24 hours, the temperature curve shown in Fig.16 is recorded by the thermistor collector and computer. The red line indicates the temperature change curve of the large copper ball with time. The blue line is the temperature change curve of the small copper ball with time. The average temperature of the large copper ball is about T1=10.13, and the average temperature of the small copper ball is about t1=10.04.

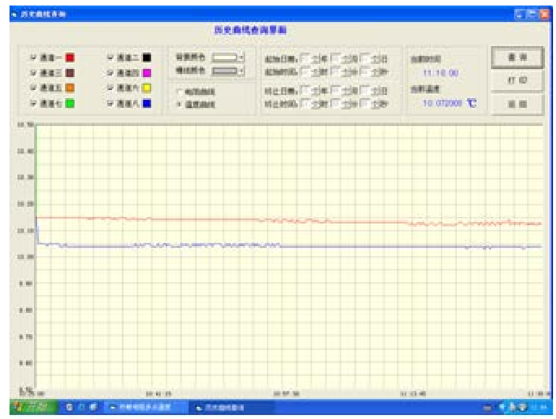

Fig. 16: The temperature curve of the big copper ball and the small copper ball over time. The red line represents the temperature of the big copper ball, and the blue line represents the small copper ball

d. Open the vacuum tank, reverse the two resistances. Attach the resistor R1 to the surface of the small copper ball, and measure its temperature. Attach the resistor R2 to the surface of the large copper ball, and measure its temperature. Close the vacuum tank, vacuum, and check the temperature record after 24 hours.

Fig. 17: The temperature curve of the big copper ball and the small copper ball over time. The blue line

represents the temperature of the big copper ball and the red line represents the small copper ball

e. After 24 hours, query the computer, as shown in Fig.17; the blue curve shows the temperature curve of the large copper ball change with time. The average temperature of the large copper ball is about T2=10.07. The red line is the temperature curve of the small copper ball change with time, and its average temperature is about t2 = 9.97. The average temperature difference between the two balls measured twice.

$$t=\frac{(10.13-10.04)+(10.07-9.97)}{2}=0.095$$

The temperature of the large copper ball of 1000 kg is 0.095 degrees higher than the small copper ball of 1.2 kg.

The two thermistors are swapped for the purpose of eliminating system errors because the temperatures measured by the two thermistors are erroneous at the same temperature.

The above experiments proved that under constant temperature and vacuum conditions, the greater the mass of the object, the higher the temperature of the object, and the greater the gravitational force formed. Gravity can only exert force within a certain distance. When an object is too far away from the planet, the force on the object will become zero when the microwave in the space where the object is located is the same as the microwave intensity generated by the Yizi gas at the cosmic background temperature.

VI. The Physical Properties of Yizi

a) *The trajectory of Yizi movement*

Assume that the Yizi is a rough surface sphere, as shown in Fig.18. In addition to translation, Yizi also has an eccentric rotation motion around the x-axis, the y-axis, and the z-axis. The eccentric rotation makes the movement trajectory of Yizi in each plane to be a circle. The circles in three planes combined into a closed ellipse, so the trajectory of Yizi is a closed ellipse, instead of a straight line. The Yizi has not only high translational speed but also a higher edge velocity when rotating.

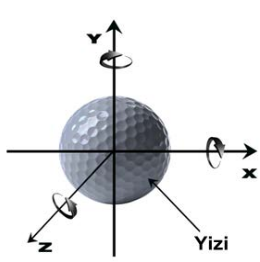

Fig. 18: Yizi model

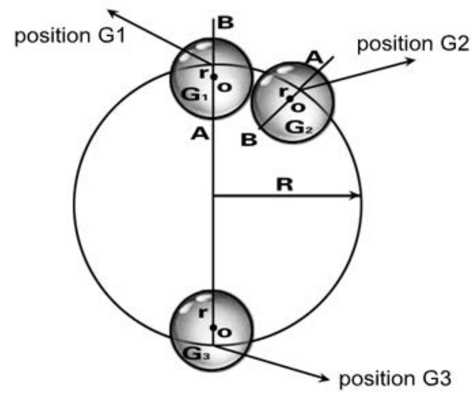

Fig. 19: Plane movement trajectory of Yizi

When Yizi collides with each other, they transfer not only translational momentum, but also angular momentum. The edge collision of Yizi makes it have a very high rotational speed. As shown in Fig.19, suppose that Yizi moves in a circle. When Yizi is in position G1, the angular momentum of A is greater than that of B.The commutator rotates in half a circle and the angular momentum is transferred once, the angular momentum at A is transferred to B, and B transfers angular momentum to A.When Yizi moves to the position G2, it rotates n+1/2 times. At this time, the angular momentum of the A end is converted to B, and the angular momentum of the B end is converted to A. During this conversion between the A end and the B end, the angular momentum of Yizi in the inner side of the large circle R is always greater than the angular momentum outside the large circle. This inner and outer angular momentum difference only changes the direction of motion, but it doesn't affect on the magnitude of the inner and outer angular momentum. The eccentricity r and the radius R of the Yizir's circular motion satisfy the following formula,

$$\frac{V^2}{R}=\frac{(2\pi rn)^2}{r}=4\pi^2n^2r$$

where V is the plane motion rate of the Yizi, R is the radius of the circular motion of the Yizi eccentricity point, r is the eccentricity of the Yizi rotation, and n is the number of rotation times of the Yizi revolution.

The same is true for electrons and protons. If the surface is rough and the trajectory is a closed ellipse, it is not surprising that large angles of scattering occur in collisions. There is no straight linear motion in the micro-world. Then why does the macro world have a linear motion? Since the macroscopic objects are composed of many particles, as shown in Fig.20 when the macroscopic object rotates, the particles in the object collide with each other, and the angular momentum in the object is quickly distributed uniformly, so that the object rotates around the centroid.

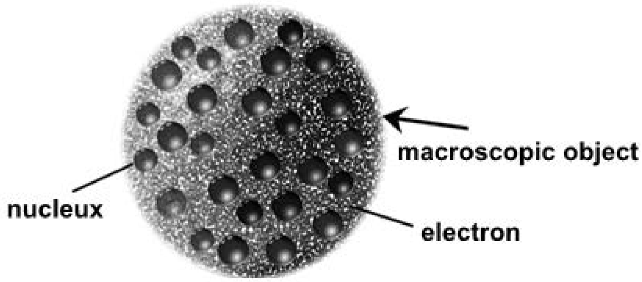

Fig. 20: A macroscopic object composed of proton-electron commutons

b) *Average Speed of Yizi*

Light is transmitted by Yizi gas, just as sound is transmitted by air. The average speed of Yizi's irregular movement in Yizi gas determines the speed of light propagation in Yizi gas. The light will be like a sound, gradually weakening in the spread, and eventually dissipate in Yizi gas. The speed of sound propagation in the air is related to the rate of thermal motion of air molecules. As the temperature increases, the rate of thermal motion of air molecules increases and the speed of sound increases. Light is transmitted by Yizi gas, and a large number of Yizi do irregular movements colliding with each other. Unlike air molecules, air molecules do elastic collisions, while Yizi does hard collisions, and there is no time of relaxation. The opportunity for Yizi to move in all directions is equal. If the direction of movement of Yizi is divided into two directions, the average direction of movement of the Yizi with a tendency to move forward should be 45°angle in the forward direction, as shown in Fig.21, where Vy is the average velocity of Yizi, C is the speed of light, and the average propelled forward velocity $C=\frac{\sqrt{2}}{2}Vy$, is the speed of light. The average speed of Yizi is $Vy=\sqrt{2}c=4.24\times10^{8}$m/sec.

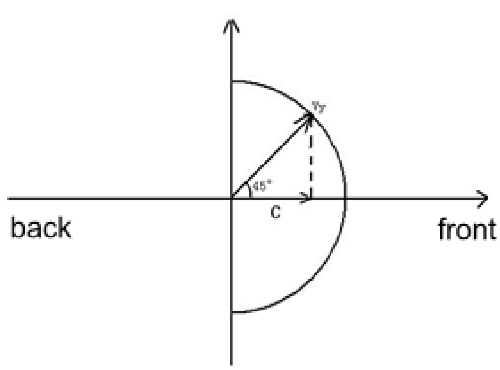

Fig. 21: Schematic diagram of the relationship between the average velocity of commutons and the speed of light

c) *The mass of Yizi*

We know the energy carried by electromagnetic waves $\varepsilon=h\gamma$ [10], where h is the Planck constant and γ is the frequency of the electromagnetic wave. h is the minimum average energy that electromagnetic waves can carry, that is, the average kinetic energy carried by per Yizi, so $h=\frac{1}{2}m_y v_y^2$, where m_y is the mass of the Yizi.

$$m_y=\frac{2h}{v_y{}^2}=\frac{2\times6.626\times10^{-34}}{(4.24\times10^{8})^{2}}\approx7.37\times10^{-51}\text{kg}$$

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