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EXPERIMENT ON GRAVITATIONAL INTERACTION

VASILE M. CRISTOIU
393 Atomistilor Str., Magurele,
Ilfov, RO-077125, Romania
E-mail: cristoiuvasile@yahoo.com

Abstract

The hypothesis of the author claims that with the formation of the astral objects, in their atomic structure a specific movement develops named by the author "gravitational vibration". The experiment which is to be presented modifies the natural gravitational vibration by rotating the test objects. The main idea is that the gravitational vibration of the objects changes (large lead balls of a Cavendish balance, or other objects), the gravitational interaction of the Cavendish experiment will inevitably change too. The gravitational interaction is measured with the Cavendish balance by using objects with natural gravitational vibration, then the gravitational interaction will be measured using the same objects but with the gravitational vibration modified in rotation, leaving all the experiment parameters unchanged. At the end, the results are compared. The results obtained confirm the hypothesis. Theoretically, the gravitational constant G from the Newton law is considered a fundamental physical constant with the standard value of $6.672.10^{-11}$ Nm^2/kg^2. The experiment shows that G has a relative value depending on the gravitational vibration of the objects and the environment where the objects are placed.

Key Words : *Gravity, Gravitational interaction.*

1. Introduction

In Mathematical Principles of Natural Philosophy, Newton said: However I'm not saying that gravity is essential to the objects. Through inherent force I understand only inertial force. The inertial force is invariable. Moving away from Earth, gravity is shrinking. I, the author of this experiment, fully identify myself with Newton's thinking and I developed a personal concept about gravity, fundamentally different from all other theories. This concept includes a hypothetical mechanism which offers another kind of explanation for the common cause of inertia, gravity and centrifugal force.

According to this concept, negative acceleration to which are subjected atoms when they pass from one level to a lower level of a fluid disk - towards the center of rotation of a spherical celestial body in progress - is taken by the structure of atoms. The gravitational mechanism which I'm talking about assumes that this state of acceleration which is initially found in the structure of the proton/electron of the hydrogen atom - named by the author gravitational vibration GV - is memorized by atom through its structure of rotational system with central body. GV is found then in all species of atoms. I say that the weight of the particles of matter that make up a celestial body, relative to the center of rotation (mass) of that celestial body, represent the actual weight, the absolute weight, in agreement with the ideas that sustains that all bodies are heavy by themselves. In the same way I explain the weight of the celestial bodies in relation to the common center of gravity, as are the Earth and the Moon. Those celestial bodies were born from the same body - a disk of matter whose center of rotation it became finally their common center of gravity. It is true that all objects situated on a celestial body have a tendency to common corpus. This "attraction" between the objects should not be confused with the weight I talked about. In my interpretation this "attraction" is only gravitational interaction (gravitational influence) and it is caused by the fact that all the bodies already have a relative weight to the center of rotation (mass) of the celestial body they belong to. In any object on Earth (or anywhere else) which is subject to a rotary motion relative to the center of rotation in the exterior of the object, is born a GV that closely linked to the centrifugal effect. Evidently, the object is continually thrown away from the center of rotation but if it is forced to keep a fixed distance relative to this center into the object, GV will appear.

The reinterpretation of the Cavendish experiment by means of GV links the result of the experiment to the amplitude and orientation of GV.

In other words, value of the gravitational constant G of the Newton's law depends on GV of the place from space where is performed the experiment (For example: on other planet, on the Moon or in the interplanetary space). But, theoretically, G is considered a fundamental physical constant with the standard value of $6.672.10^{-11}$ Nm^2/kg^2. Therefore, anywhere in the Universe where the Cavendish experiment will be performed, the result would be identical to that obtained on Earth. I believe that G has a relative value depending on the GV of the objects and the environment where the objects are placed. I will demonstrate this truth through the experiment which I will present.

2. Description of the Experiment

2.1 About Experiment

According to Newton's law, the attraction between two objects depends only on the mass of the objects and the inverse of the distance between them - $1/R^2$ - considering the mass of the object concentrated in the centre of its mass. If instead of those two big balls of lead of a Cavendish Gravitational Balance - CGB, we will put two rings of lead, the result of the experiment should be the same as when the rings are rotating and not rotating. We have in view that all the requirements imposed by experiment are met and disruptive factors are eliminated.

2.2 Measuring the Gravitational Constant G

The instrument of measurement used is the Cavendish Gravitational Balance. With its help G can be measured with two methods:

A. Displacement method

B. Acceleration method.

We believe the theory and the steps of measurement are known and we will not insist upon them, but some clarifications are needed:

1. All the measurements were made by method A. A relative error of $2\% \cdots 3\%$ is good enough for the experiments that follow.

2. All the measurements were made with air damping.

3. The maximum displacement S was determined in the following two ways:

(a) By selecting three consecutive end points of the light dot and then using the usual relations of calculation we find the equilibrium positions.

(b) Leaving the pendulum to swing amortized until the its oscillations are so small that the position of equilibrium can be appreciated as being the arithmetic mean between two consecutive final positions.

In the same way we determined the centre of free oscillation of the pendulum, CO (when on CGB are not test objects). Looking at the Fig. 1 we will understand the measurement technique.

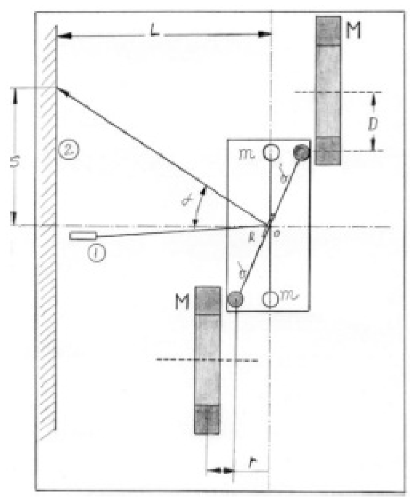

Figure 1 : Measurement Principle

2.3.Measuring the Gravitational Constant Using Test Objects Under the Form of Rings

2.3.1 Installation

Specifies mechanical structure.

- Protection against mechanical noise produced by moving parts.
- Cavendish Gravitational Balance CGB

-Two rings of lead (experimental bodies), outer dia. 22cm, inner dia. 12cm, height 4.5cm, 12.8 kg each

- Electrical motor, $12V_{DC}$, 3,000 rpm
- Mechanical reducer 1/20

- Transmission system. Lead rings with synchronous rotation
- Miniature laser(diode) with adjustable mechanical support
- Stopwatch (1/100)
- Screen and support material
- Graded scale, 1.5m, 1mm/div
- Balance, 2000g, 1 g resolution
- Power supply, 12 V_{DC} / 5A

-Accumulator 12V / 10A

- Computer
- Video camera recorders

-The mechanical devices of rotation rings in the distant position

-The mechanical devices for adjusting CGB on the verticalrings.

2.3.2 About the experiment with rings (test objects)

The rings of lead cannot be moved from one side to another of the CGB. The rings have two fixed positions relative to CGB, "near" and "distant" (Fig.2). In this case for maximum displacement S we have two values:

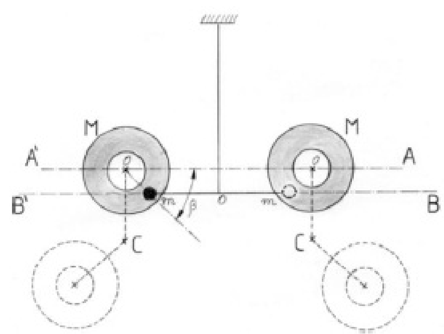

Figure 2 : Replacing large balls of lead with rings of lead.

1. The maximum displacement without rotation which corresponds to the equilibriumposition denoted D_M.
2. The maximum displacement with rotation which corresponds to the equilibrium position denoted D_{MR}. The gravitational constant G will be:

$$G = \frac{\pi^2 r^2 dS}{MT^2 L}, \tag{1}$$

where M is the mass of each large ball (or ring), L is the projection distance, T is the period of torsion balance, r is the distance between the large ball (rings) and small balls and d is the length of the balance arm.

We observe that G is proportional to S - all other parameters have fixed values. So, it is enough to compare between them the values obtained from the two measurements, one for maximum displacement without rotation D_M and the other for the maximum displacement with rotation D_{MR} and to express the result as a percentage and then to say the same thing about G. We must keep in mind that D_M and D_{MR} are related to CO.

In the same conditions, without modifying something, we obtained two remarkably different values for the maximum displacement:

1. D_M - when the rings do not rotate.
2. D_{MR} - after the rings were rotated enough time for the pendulum to arrive in the equilibrium position.

Note :

- The rotation speed of the rings: 150 rpm
- The distance from the centre of the ring to the small ball of the pendulum: 9 cm
- VG acquired by rotation is like the centrifugal effect - is radial dispensed, uniformly on the circumference of the rings (considering the rings are homogeneous and perfectly executed). By summing the acquired VG and the natural VG oriented on the vertical of site toward the centre of rotation of Earth, we expect a resultant which differs from one point to another on the circumference of the rings through the amplitude and orientation. The resultant GV will have minimum values in the upper part of the ring and maximum values at the bottom. The difference between "up" and "down" is reflected in measurements. As the rings are placed in relation to the pendulum, when the rings are rotated, the gravitational interaction must drop. In the Table 1 I present some results.

Having in view the previous specification, the ratio G/G_0 (in percentage) becomes equivalent with the ratio D_{MR}/D_M (also in percentage). G is the value measured with the rings in rotation while G_0 is the standard value (the value measured with the rings in non-rotation).

The graphs in Fig. 3 and Fig. 4 correspond to the measurements from point 6. In Fig. 3 we can be observed that the pendulum is looking for the equilibrium position under the forces when the rings don't rotate and are face to face with the pendulum. The equilibrium position is D_M.

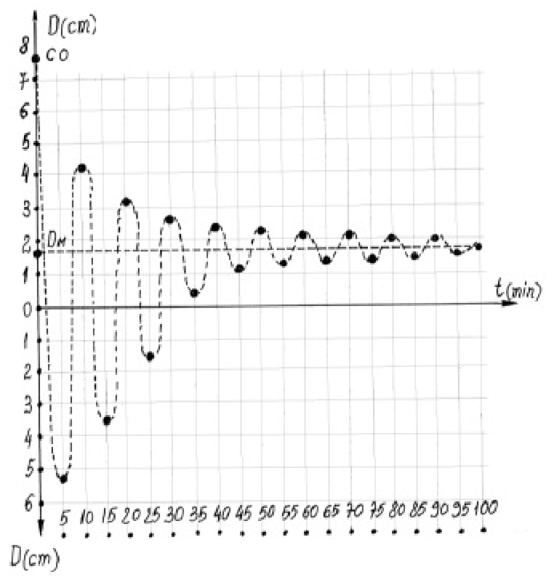

Figure 3 : The equilibrium position when the rings don't rotate.

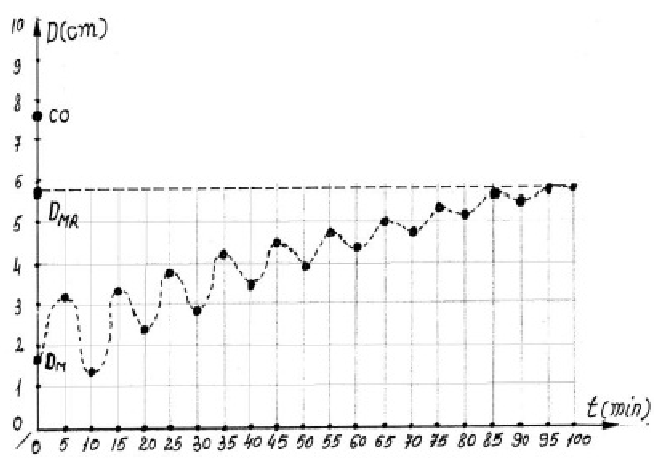

Figure 4 : The equilibrium position when the rings are rotating.

In Fig. 4 we see what happens with the pendulum when the rings are rotating. Without changing any parameter of the (2.1), only due to the rotation the rings, the pendulum is looking for another position of equilibrium. It goes from D_M and finds another equilibrium position in D_{MR} corresponding to the GV acquired by rotation of the rings. Furthermore, with the rings in this position but without rotation, we see that the pendulum swings relative to a centre of mobile oscillation that move slowly from D_{MR} to D_M, stopping finally in D_M.

The graph in Fig. 5 expresses this displacement. This graph was made considering measurements at point 1 and expresses in fact the loss of GV acquired by rotation.

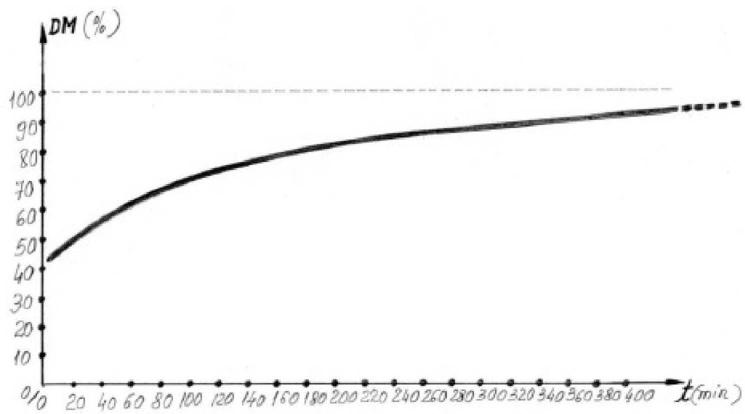

Figure 5 : The loss of GV acquired by rotation.

3. Measurement of G Using Test Objects Without Rotation

3.1 Installation

- Rotary table with adjustable angular velocity: 0 to 300 rpm
- Gravitational Cavendish Balance
- Support for the various sample bodies
- Miniature laser (diode) with adjustable support
- Graded scale 1.5 m, 1 mm / div
- Computer

-Two lead rings similar of point 3.3.1., outer dia. 19 cm, inner dia. 9 cm, height 4.5 cm.

- Stopwatch (1 / 100)

- Screen on support material
- Balance 2,000 g / 1g resolution
- Various annexes

3.2 The Measurement of G with Various Test Objects having GV Modified by Rotation

These measurements come to support the following statement: In any body - solid, liquid or gaseous - wherever they are, subjected to a rotary movement relative to a centre of rotation outside the body, a GV is created which depends on the rotation parameters. The GV acquired is composed with natural GV (GV that has the object relative to the centre of rotation of the celestial body which it is part of). The amplitude of the resultant is always greater than the amplitude of the natural GV. Exemplification: Two lead balls with mass 1.5 kg each were subjected to rotation with the following parameters: rotation speed 156 rpm, distance from balls at centre of rotation 19 cm, time of rotation 120 min.

Obtained results depending on the time elapsed from stopping rotation until the start measurements are shown in Table 2.

D_M before being subjected to rotation 3.1 cm - corresponds to the standard value of the gravitational constant. In the same conditions test objects of wood, glass, stone, ceramics and water were subjected to rotation and the results are similar.

Important observations:

1. CGB and the test objects must have the same temperature. A small difference of a few degrees will determine “rejection” instead of “attraction”.

2. If the large balls of lead will be subject to rotation in a relatively short time, (100-200s) the result will be the same as at point 1: “rejection” in place “attraction”.

3.3. The Measurement of G with Test Objects having GV Modified by Influence

These measurements come to support the following statement:

If we put an object with natural GV in the proximity of another object with GV modified by rotation (with greater amplitude) there will be a transfer of GV from the second to the first, having the natural tendency of homogenization. This process is like the heat transfer between objects. Exemplification:

1. I put water in two identical glass jars of 0.5 kg each (jar and water)

2. These test objects have determined a $D_M = 1.92$ cm, maximum displacement suitable for standard value of G.

3. Two rings of lead (outer dia. 19 cm, inner dia. 9 cm, height 4.5 cm) has been rotated in relation to a rotation centre of the outer with the following parameters: rotation speed 234 rpm, distance from glass jar at centre of rotation 20 cm, time of rotation 180 min.

4. After this, I placed in the centre of the rings these two jars with water for 160 min.
5. Then, with these jars with water I measured the maximum displacement.

Obtained results (D_M) depending on the time elapsed after removal of jars of the centres the rings until the start measurements are shown in Table 3.

4. Conclusions

1. The experiment shown reveals a physical quantity discovered by the author which he calls Gravitational Vibration - GV. The gravitational interaction between the objects located on the Earth is due to GV of the objects relative to the centre of rotation (mass) of the Earth.

2. The place of GV is found in the structure of atoms so that any particle of matter is characterized by its own GV which will change at the same time with the modification of the state of acceleration of the particle.

3. The experiment confirms the hypothesis of the author according to which the gravitational constant G from Newton's law can have remarkably different values compared to the standard value accepted. G depends on the VG of the test objects and on the environment in which the objects are located.

4. Experimentally, it is found that an object characterized by a GV with greater amplitude than of the nearby objects, will send them GV through influence, the

natural tendency being the homogenization. This process is similar to the heat transfer between objects. Because of this, CGB requires a relaxation time between measurements (hours) to get the same results in the same conditions.

5. Experimentally it is found that the fluids keep for a longer time the GV acquired by rotation or by influence, compared to the solid objects.

6. Although, the rotation of the test objects is made in a determined plan, there is not a preferred position between the test objects and the pendulum.

Note :

I mentioned in this paperthe "centre of rotation" and not the "centre of mass" of the celestial bodies. For a spherical and homogeneous celestial body these two centres coincide (in an ideal, mathematical case). I preferred the "centre of rotation" to underline the dynamic character of the birth of gravitation simultaneously with the formation of celestial bodies and to include in my expression the history of the birth of celestial bodies with their own rotary motion.

Tables

Table 1 : Some measurement results.

Nr	D_M [cm]	D_{MR} [cm]	D_{MR}/D_M[%]
1	6.3	2.8	44.4
2	5.9	2.6	44.1
3	6.1	2.5	40.1
4	6.8	3.5	51.5
5	6.3	2.1	33.3
6	6.0	1.9	31.7
7	7.2	3.4	47.2
8	6.7	3.3	49.3
9	6.7	3.0	44.8
10[1]	7.2	4.1	56.9
11[1]	7.0	3.9	55.7
12[2]	5.2(7.4)	3.2	61.5

[1] During the measurements from points 10 and 11 the rings do not rotate. First, the rings were rotated in the "distant" position for 120 min ... 150 min and only after

that the rings were placed in the “near” position, but without rotation. In this case the pendulum leaves from equilibrium position CO towards a new equilibrium position which is D_{MR} - the same equilibrium position that the pendulum has when the rings are in the “near” position when it rotates. This means that after having been rotated, the rings keep for a longer time the GV acquired by rotation.

[2] The measurement of point 12 was interrupted for a few minutes then was resumed.

Table 2 : Results depending on the time elapsed from stopping rotation until the start measurements

D_M (after 20 min)	D_M (after 80 min)	D_M (after 130 min)
24.7 cm	7.3 cm	3.4 cm

Table 3 : Results depending on the time elapsed after removal of jars of the centres the rings until the start measurements

D_M (after 20 min)	D_M (after 24 hrs)	D_M (after 50 hrs)
23.58 cm	5.64 cm	2.51 cm

Legends for illustrations

Fig. 1: Measurement principle.

Fig. 2: Replacing large balls of lead with rings of lead.

Fig. 3: The equilibrium position when the rings dont rotate.

Fig. 4: The equilibrium position when the rings are rotating.

Fig. 5: The loss of GV acquired by rotation.

Acknowledgement

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