Majorana's Experiments and a New Equation for Gravity

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By Robert de Hilster, 2008

Abstract

This paper describes the two experiments by Quirino Majorana and then uses the new equation for gravity to match the results. This new equation for gravity is described in detail in the paper titled "A New Equation for Gravity", see the Reference Section. The theory, the postulates, the derivation of the equation, and finally the data that validates the equation. This paper adds more data points to further validate the equation.

Sr. Majorana is noted as an excellant experimental physicist, but ran into trouble with his theory. This paper uses the results of the these experiments to show that the theory behind the new equation for gravity is a better theory. The new equation for gravity can predict the loss of force measured in the two experiments while Newton's equation does not.

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Premise

To prove the validity of the new equation requires that an experiment be done. After reading what Sr. Majorana went through to get his results, it is quite obvious, that to do the same with any other experiment, will take a lot of time and resources. Since he has done the work, and is highly regarded for it, one only has to have a new equation, and apply it to the configuration, and get results that match the measured values. This paper uses the this new equation to make a prediction, calculate the values, and then compare to Majorana's measured results.

How the Experiments were Done

Majorana placed a lead ball weighing 1.274 Kg on a balance and had the balance properly set. Then he surrounded the ball with a large mass. In his first experiment he used a cylinder of mercury with a mass of 104 Kg. In his second experiment he use a lead cube of 9603 Kg. In both experiments the ball moved up which indicated to him that there was a loss of mass.

H. N. Russell determined that, if mass was reduced, then the tides would vary widely and planets would have great deflections in their orbits. And,of course, this does not happen. Russell conceded that the experiemnt was well done, but needed another explanation.

What Really Happened

Somehow the loss of mass seems odd. A lead ball that measures 1.2 Kg on earth, will measure 0.2 Kg when on the moon. Has it lost mass? There was no lead added to or subtracted from the lead ball. But the **environment** surrounding the lead ball is different. With this different environment, it is generally understood that the gravitational acceleration on the moon is 6 times lower than that on earth. So it is 'g' that is reduced, not the mass.

Consider the equation:

(1) $$W = m * g$$

Since the test ball moved up, the force, W, on the ball is reduced, and since the mass is constant, then it must be the value of g that is reduced.

Russell's Criticism is Valid

Majorana starts his theory with the idea that placing a screen around the lead ball would reduce the value of g. But then he proceeds to calulate the loss of mass due to self-screening or self-absorption. But if mass is constant, then Majorana's theory is wrong and H. N. Russell's criticism is valid. Russell suggests that since the experiment was done very carefully, it needs another explanation.

The new equation for gravity and the theory behind it is being proposed as the other explanation.

The Theoretical Predictions

Newton's Prediction

Can Newton's Equation predict the results that Majorana got with his two experiemts? Newton's equation is:

(7) $$F = GM_1M_2/R^2$$

With the ball above the lead cube

Two equations would be used, one from the lead ball to the earth (W) and one from the ball to the cube (F). The total force would be the sum of the two or W + F. There is no predicted loss of a small force due to both the earth and the lead cube.

With the ball at the center of the lead cube

Two equations would be used, one from the lead ball to the earth (W) and one from the ball to the cube (F). However the lead cube surrounds the ball and the net force of F would equal zero. So the predicted force would be W and still there is no predicted small force.

With the ball below the lead cube

This time the two equations subtract and would have the form W - F. It seems that Newton's equation connot predict Majorana's results.

Majorana's Predictions

Majorana's First Experiment

Majorana developed an equation for mass reduction that showed that it was somewhat less than the real mass. The result can be stated in the same terms as used in his second experiment, i. e. W - f.

Majorana's Second Experiment

Majorana's prediction for his second experiment is clealy stated the book titled "Pushing Gravity", found on page 243. The chart is reproduced here.

Chart 1, Theoretical Prediction of Force

Hypothesis	Above	Below
Majorana	W+F-f	W-F
Le Sage	W+f	W-F-f

Majorana defines these terms as:

W is the intial weight, in terms of force on the lead ball

F is the force caused by the lead cube

f is some incremental force caused by the earth.

The Prediction of the New Equation for Gravity

The theory behind the new equaiton is described in detail in the paper titled "A New Equation for Gravity", presented at the NPA conference in 2009. However, the postulates are reproduced here in case you have not read the paper.

1. **Postulate 1 – A Particle:** with mass and velocity, that imposes itself on an object from all directions. The source of the particle is not known.
2. **Postulate 2 – Reduction Rate:** As the particle passes through an object, a small number of them do not pass through. The reduction rate is the percent of particles reduced per distance traveled through the object. Initially the reduction rate is assumed to be linear.
3. **Postulate 3 – Pushing Force:** When the particle interacts with the object, and having mass and velocity, it imparts a pushing force on the object causing it to move in the direction that the particle was moving.
4. **Postulate 4 – Reduction Factor:** The reduction rate is proportional to the density of the object that it passes through. Hence the it is equal to the Reduction Factor(RF) times the density of the object.

Applying the Equation to Majorana's Experiment

Each experiment or gravitational situation is different and so the equation for them must be individually generated. Figure 1

shows the configuration of the experiments, specifically for the second experiemnt. The lead ball is shown above, below and at the center of the lead cube.

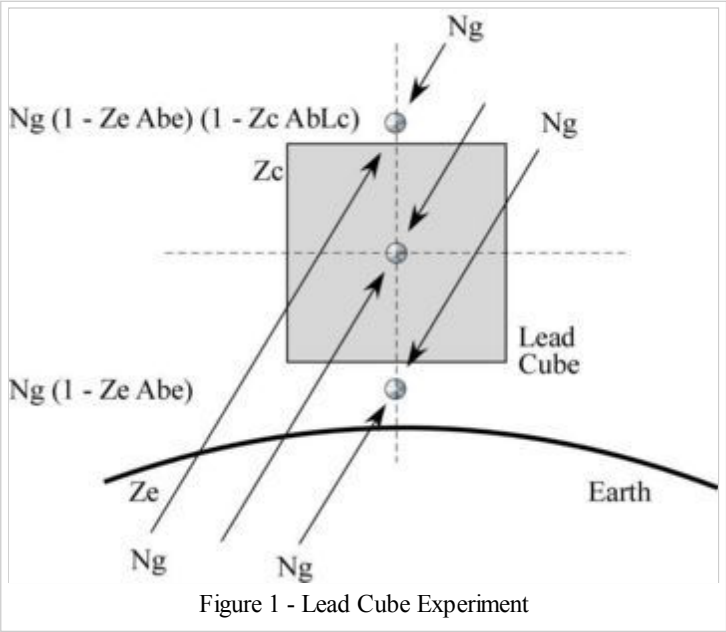

Figure 1 - Lead Cube Experiment

Majorana did three different tests in the second experiemt. They each require a different equation to calualte the force. The three equations are:

The Equation when the ball is Above

(1) $$F_{lb} = \sum_{p=0.2}^{180} \sum_{a=0.5}^{359.5} (N_g - N_g(1 - Z_e R_f D_e)(1 - Z_c R_f D_{Pb}))F_x$$

The Equation when the ball is in the Center

(2) $$F_{lb} = \sum_{p=0.2}^{180} \sum_{a=0.5}^{359.5} N_g(1 - Z_c R_f D_{Pb}) - Ng(1 - Z_e R_f D_e)(1 - Z_c R_f D_{Pb})F_x$$

The Equation when the ball is Below

(3) $$F_{lb} = \sum_{p=0.2}^{180} \sum_{a=0.5}^{359.5} N_g(1 - Z_c R_f D_{Pb}) - Ng(1 - Z_e R_f D_e)F_x$$

In order to keep the equation on one line the term Fx is introduced and is equal to

(4) $$F_x = \sin(a)\sin(p)(Z_{lb} R_f D_{Pb} F_g)$$

The Prediction

Equation 1 and 2 have the property that the particle goes through two objects before hitting the ball. This causes the equation 1 to have the following term :

(5) $$N_{gi} = N_g - N_g(1 - Z_e R_f D_e)(1 - Z_{pbc} R_f D_{pb})$$

This reduces to:

(6) $$N_{gi} = N_g Z_e R_f D_e + N_g Z_{pbc} R_f D_{pb} - N_g Z_e R_f D_e Z_{pbc} R_f D_{pb}$$

The first term indicates the force due to the earth (W), the second is due to the lead cube (F), while the third term indicates that there is a small reduction due to the earth and the cube (f). Therefore the equation has the form of W + F - f, and is shown in chart 1.

Compare the Predictions

Chart 2, Theoretical Prediction of Force

Term	Above	Center	Below
Newton	W+F	W	W-F
Majorana	W+F-f	W-f	W-F
Le Sage	W+F	?	W-F-f
de Hilster	W+F-f	W-f	W-F

It seems odd that the theory behind the new gravity equation is the same as Le Sage, but the prediction is the same a Majorana.

The Calculated Predictions

The Calculated Prediction by Majorana's

Majorana's First Experiment

For his first experiment, Majorana predicted that there would be 1 microgram of loss caused by the mercury cylinder. The mass of the cylinder was 104 Kg.

Majorana's Second Experiment

For the second experiment Majorana used the Newtonian equation to predict that the loss of mass caused by the lead cube would be 217 micro-grams. In addition, the loss of mass at the center of the cube would be 5.4 times greater than with the first experiment that used mercury as a shield.

This leads to a chart with the following values in micro-grams.

Chart 3, Calculated Prediction of Change of Mass

Majorana	Above	Center	Below
1st Experiment	NA	-1	NA
2nd Experiment	<217	-5.4	-217

Note that the values are not the total mass, but the change of mass.

The Calculated Prediction using the New Equation

Programs were written to calculate the measured values. In general the process is as follows:

1. Assume values for the four parameters of the equation.

2. Calculate the desired value.

3. If the value is not correct, adjust the parameters and repeat 2 and 3. If the value is correct, record the parameters.

The value can always be found, but when the process is complete the a possible set of values for the parameters are known.

This leads to a chart with the following values in micro-grams.

Chart 4, Calculated Prediction of Change of Mass

de Hilster	Above	Center	Below
1st Experiment	NA	***-0.97***	NA
2nd Experiment	213	***-2.01***	-216

The values at the center of the mercury or lead cube are exact because they were forced. But the values above and below the lead cube are calculated using the parameters found by getting the value at the center of the cube. Hence they do not exactly match the measured value.

The Four Parameters

The Majorana Data

The data in Chart 5 is from the Majorana calculations.

Chart 5, The four parameters of the New Equation

Data Points	Np	Ng	Fg	Rf	h
1st Experiment	324,000	1	2.033E+8	2.831E-13	6.70E-12
2nd Experiment	64,800	1	1.017E+9	2.518E-13	2.80E-12

Majorana used the term "h" to denote the absorption constant. The value of h has the units of cm^2/g which is 10 times larger than the units for Rf. Rf is in m^2/Kg.

Some Comments

1. The product of Np * Ng * Fg is 6.589E+13 in both cases. Np is chosen to get enough non zero calculations so that the results are not irratic. The value of Fg is determined by dividing 6.589E+13 by the value of Np.

2. 'h' is higher than Rf and at the same time the 1st experiment has a higher value thatn the second.

3. There is some indications while doing the calculations that a different set of parameters could get the desired results. So chart 5 may not be the correct values.

More Data

The paper titled, "A New Equation for Gravity" has more data points. These are added to the chart.

Chart 6, The four parameters of the New Equation

Data Points	Np	Ng	Fg	Rf	h
Lunar Orbit, Elliptical	162,000,000	1	4.068E+5	2.736E-13	NA
Lunar orbit, circular	162,000,000	1	4.068E+5	2.725E-13	NA
2nd Experiment	64,800	1	1.017E+9	2.518E-13	2.80E-12
1st Experiment	324,000	1	2.033E+8	2.831E-13	6.70E-12

There is a very key point to be made here. The order in which the data is presented represents the degree of confidence in the result. The question is: "What data has the most credibility?"

Credibility

Lunar Orbits

Lunar orbits can be measured very accurately without having any theory or equations. So, these two come first.

Majorana's Experiments

Majorana's experiments use two different types of shielding. The lead cube which had 9603 Kg is much larger and much easier to measure than the 104 Kg mercury experiment. So they are set in that order.

Points to Consider

There are seveal concepts that become very interesting when the results are reviewed.

Is it a Reduction of Mass or Gravitational Acceleration?

This has been discussed in the first part of this paper. It is interesting to note that Majorana explains his experiment using the reduction of mass, and Einstein Special Theory of Relativity states that mass increases with an increase of velocity. Unless mass is added or subtracted by a specific physical mechanism, the author contends that mass is a constant. It is the reduction of g that is caused by the lead cube.

Is Gravity a Pulling or a Pushing Force?

A horse tied to a wagon does not pull the wagon, it pushes the harness. Pulling a can of soda toward you, is not being pulled by the thumb, but pushed by the fingers in back of the can. All mechanical forces, including gravity, that move objects, can be interpreted as a pushing force.

Is 1/R^2 a True Physical Property?

The use of 1/R^2 is used by many scientist as if it were an absolute reality. But Newton's Universal Law of Gravitation is based on Kepler's law of circular orbits, not elliptical orbits. 1/R^2 is a first order approximation. The new equation for gravity does not use 1/R^2 and still gets very good results.

Is Gravity caused by a Particle or a Continuum?

It is not clear how a continuum can impose a force on an object. The postulates for the new equation for gravity state that there is a particle with mass and velocity, which can impart a force. These particles are discrete and cannot be considered a continuum.

Can the Force be Calculated using a Double Integral?

If the objects involved are spheres, then an integral might be used. But Majorana's experiment with a lead cube is more difficult. How do you perform a double integral on a cube? A double integral can't be used because there are supporting equations needed to calculate the distance through the lead cube, through the earth and through the lead ball. And finally, the double summation agrees with the postulates presented for the new equation.

Is G a Constant?

Apparently the value of G, The universal gravitational constant has been hard to pin down. The paper titled "An Equation for G" attempts to explain how the curves for the new equation can be so similar to the Newtonian curves. The result is an equation for G.

It is amazing that the velocity of the shuttle and the moon, as shown in the paper titled "A New Equation for Gravity", is in the range of values predicted by this new equation.

Conclusion

It would be great to say that this analysis has proved that gravity is caused by a pushing particle. But that is not true. What has been shown is that the new equation can predict the the outcome of gravity experiments better that Newton, and can calculate the expected results of the experiment. Hopefully, the concept presented and the results are of enough interest, that this work will continue.

So what is next? Can an experiment be done that will actualy prove the existence of the particle? Where does it come from? Is it fully absorbed? Does it add mass to the object it hits? What about thermal considerations? What is the speed of gravity? What is its mass?

The new equation cannot answer these questions. But maybe, ***some day***, there will be experiments, with answers, and then it may be possible to understand the real cause of gravity.

Some day!

References

Books:

1. "Pushing Gravity", Edited by Matthew Edwards, published in 2002 by C. Roy Keys, Inc

2. "Elements of Physics", Second Edition, copyright in 1953 and 1955, by Prentice-Hall

Papers by Robert de Hilster

1. "Gravity Experiment 1" NPA Presentation, by Robert de Hilster, David de Hilster, and Geoff Hunter. Presented at the NPA conference in May of 2007.

2. "The Graviton Equations", by Robert de Hilster, presented at NPA 2008.

3. "An Equation for G", by Robert de Hilster, presented at NPA 2008.

4. "The Graviton Experiment", by Robert de Hilster, presented at NPA 2008.

5. "A New Equation for Gravity", by Robert de HIlster, presentes at NPA 2009.

Note: Copies of these papers can be seen on the internet at 'members.worldnpa.org'

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