

# **Inertia as a Net Magnetic Effect and Gravity as a Net Electrostatic Force**

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## **Abstract**

This paper reveals the long standing mysteries of inertia and gravity, based on Weber's electrodynamics formula. Conventionally it is presumed that the electrical and magnetic force of interaction between opposite charges is equal in magnitude to the force of interaction between similar charges. Changing this view leads to a very compelling theory of inertia and gravity.

## **Introduction**

Two of the physical mysteries of the universe that have not been revealed to date are inertia and gravity. Why do objects have inertia ? What *is* gravity ? Newton gave only a description of gravity and did not explain what gravity *is*. Albert Einstein made an attempt to explain gravity as a warping of space-time in his general theory of relativity. It is increasingly being realized that Einstein's theories of relativity are wrong [1][3].

Inertia is even more mysterious. Only Ernest Mach made some progress to understand inertia. He suggested that inertia of a body arises from interaction of that body with all matter in the universe. However, he could not reveal the nature of that interaction.

In this paper we propose a new hypothesis regarding the origins of gravity and inertia.

## **Newtonian gravity as a net Coulomb's electrostatic force**

Gravity has been considered to be a force fundamentally different from the electromagnetic and nuclear forces. In this paper, we propose a simple, compelling theory of gravity as follows.

*Gravitational force is a difference between attractive electrostatic force and repulsive electrostatic force. The attractive electrostatic force between opposite charges of two bodies is slightly greater than the repulsive electrostatic force between similar charges of the bodies.*

This hypothesis contrasts the conventional belief (presumption ) that the attractive forces are equal to the repulsive forces. Consider two electrically neutral bodies A and B. Each of the bodies is made up of negatively charged electrons, positively charged protons and neutral neutrons.

The new theory is formulated as follows:

*Gravity = ( attractive force between electrons in A and protons in B + attractive force between protons in A and electrons in B )*

*MINUS*

*( repulsive force between electrons in A and electrons in B + repulsive force between protons in A and protons in B )*

In the above formulation, we haven't mentioned neutrons because a neutron is made of a proton and an electron. Therefore, neutrons have been accounted for in the above formula.

Note that we are talking about the classical Coulomb's law here, which is the first component of Weber's formula shown below, i.e.

$$F = \frac{Q_1 Q_2}{4\pi\epsilon_0 r^2}$$

The Coulomb's law is modified as follows.

For opposite charges  $Q_1$  and  $Q_2$  :

$$F = k_{opp0} \frac{Q_1 Q_2}{4\pi\epsilon_0 r^2}$$

and for similar charges  $Q_1$  and  $Q_2$  :

$$F = k_{sim0} \frac{Q_1 Q_2}{4\pi\epsilon_0 r^2}$$

In classical Coulomb's law,

$$k_{opp0} = k_{sim0} = 1$$

According to the new theory proposed in this paper,

$$k_{opp0} \neq k_{sim0} \approx 1$$

$k_{opp0}$  = coefficient for opposite charges ,  $k_{sim0}$  = coefficient for similar charges

That is,  $k_{opp0}$  is slightly greater than  $k_{sim0}$  , but both are close to 1, with extremely small difference between them, giving rise to Newtonian gravity, which is attractive and tens of orders smaller than the electrostatic force.

## Modified Weber's electrodynamics formula

We have introduced above a novel idea that can easily explain gravity. The new idea is that the force of interaction between opposite charges and the force of interaction between similar charges are not equal as has always been assumed conventionally. Now we extend this idea to all components of Weber's formula in order to explain inertia and other phenomena also.

We start from Weber's electrodynamics formula. The Weber's formula for electrical attraction between two point charges is given by [2] :

$$F = \frac{Q_1 Q_2}{4\pi\epsilon_0 r^2} \left[ 1 + \frac{u^2}{c^2} - \frac{3\dot{r}^2}{2c^2} + \frac{\vec{r} \cdot \vec{a}}{c^2} \right]$$

where  $r$  is the distance between the charges,  $\mathbf{u}$  is the relative velocity of the charges.

$$\dot{r} = \frac{dr}{dt}$$

is the rate of change of distance between the charges,  $\mathbf{a}$  is the relative acceleration of the charges.

$$\mathbf{u} = \frac{d\vec{r}}{dt} \quad \text{and} \quad \mathbf{a} = \frac{d\mathbf{u}}{dt}$$

Now, modified Weber's formula for two opposite charges  $Q_1$  and  $Q_2$  is proposed as follows:

$$F_{opp} = \frac{Q_1 Q_2}{4\pi\epsilon_0 r^2} \left[ k_{opp0} + k_{opp1} \frac{u^2}{c^2} - k_{opp2} \frac{3\dot{r}^2}{2c^2} + k_{opp3} \frac{\vec{r} \cdot \vec{a}}{c^2} \right]$$

and modified Weber's formula for similar charges  $Q_1$  and  $Q_2$  is proposed as:

$$F_{sim} = \frac{Q_1 Q_2}{4\pi\epsilon_0 r^2} \left[ k_{sim0} + k_{sim1} \frac{u^2}{c^2} - k_{sim2} \frac{3\dot{r}^2}{2c^2} + k_{sim3} \frac{\vec{r} \cdot \vec{a}}{c^2} \right]$$

The force between two neutral bodies is thus given by:

$$\mathbf{F}_{gravitation} = \mathbf{F}_{opp} - \mathbf{F}_{sim} =$$

$$\sum \frac{Q_1 Q_2}{4\pi\epsilon_0 r^2} \left[ (k_{opp0} - k_{sim0}) + (k_{opp1} - k_{sim1}) \frac{u^2}{c^2} - (k_{opp2} - k_{sim2}) \frac{3\dot{r}^2}{2c^2} + (k_{opp3} - k_{sim3}) \frac{\vec{r} \cdot \vec{a}}{c^2} \right]$$

1st component

(Newton's gravity )

2nd component

3rd component

4th component

( inertia )

where  $Q_1$  and  $Q_2$  represent all the charged particles ( electrons, protons ) in the two electrically neutral bodies.

### Inertia as a net 'magnetic' effect

As shown in the above equation, the first component gives rise to Newtonian gravity. We propose that the fourth component explains inertia of an (electrically neutral ) object.

The fourth term,

$$\sum (k_{opp3} - k_{sim3}) \frac{Q_1 Q_2}{4\pi\epsilon_0 r^2} \left[ \frac{\vec{r} \cdot \vec{a}}{c^2} \right]$$

is responsible for the inertia of all physical bodies.

According to the fourth component of Weber's formula, shown below in **bold**,

$$F = \frac{Q_1 Q_2}{4\pi\epsilon_0 r^2} \left[ 1 + \frac{u^2}{c^2} - \frac{3\dot{r}^2}{2c^2} + \frac{\vec{r} \cdot \vec{a}}{c^2} \right]$$

the acceleration  $\mathbf{a}$  is positive for a charge accelerating away from another charge, for opposite charges  $Q_1$  and  $Q_2$ . If charge  $Q_2$  accelerates away from charge  $Q_1$ , an attractive reactive force will arise due to the fourth component of Weber's formula. This is the fundamental explanation of inertia.



$Q_1$



$Q_2$



Weber's formula suggests that for opposite charges the reactive force arising from receding acceleration is attractive, whereas for similar charges the reactive force for receding acceleration is repulsive. The opposite is true for approaching acceleration.

The fourth term of Weber's modified formula (for neutral bodies ) can be rewritten as

$$\begin{aligned} \sum (k_{opp3} - k_{sim3}) \frac{Q_1 Q_2}{4\pi\epsilon_0 r^2} \left[ \frac{\vec{r} \cdot \vec{a}}{c^2} \right] &= \sum (k_{opp3} - k_{sim3}) \frac{Q_1 Q_2}{4\pi\epsilon_0 r^2} \frac{r a \cos\theta}{c^2} \\ &= \sum (k_{opp3} - k_{sim3}) \left( \frac{Q_1 Q_2}{4\pi\epsilon_0 r^2} \frac{r \cos\theta}{c^2} \right) a = m a \end{aligned}$$

where

$$\begin{aligned} m = \text{inertial mass} &= \sum (k_{opp3} - k_{sim3}) \left( \frac{Q_1 Q_2}{4\pi\epsilon_0 r^2} \frac{r \cos\theta}{c^2} \right) \\ &= \sum (k_{opp3} - k_{sim3}) \left( \frac{Q_1 Q_2}{4\pi\epsilon_0 r} \frac{\cos\theta}{c^2} \right) \end{aligned}$$

The inertial mass of a body is the resultant of all such interactions of the charged particles constituting the body with all charges constituting all matter in the universe.



We see that inertia of \$Q\_2\$ decreases inversely with distance \$r\$ from \$Q\_1\$.

This is in fact the origin of electrical self inductance of a current carrying coil. Therefore, inertia and electrical self inductance are fundamentally the same phenomenon. Self inductance in electric circuit arises from interaction of the accelerating electrons with all matter in the universe. The reason why current in an electrical circuit cannot change instantaneously is the same reason why velocity of a physical object, say a car, cannot change instantaneously. A reactive force arises from the fourth component of Weber's electrodynamics formula.

This is a compelling explanation of inertia as it explains not only inertia of charged bodies (electromagnetic inertia ), but also the inertia of neutral bodies. In fact, inertia of a neutral object such as a car and inertia of a charged particle are the same fundamental phenomenon.

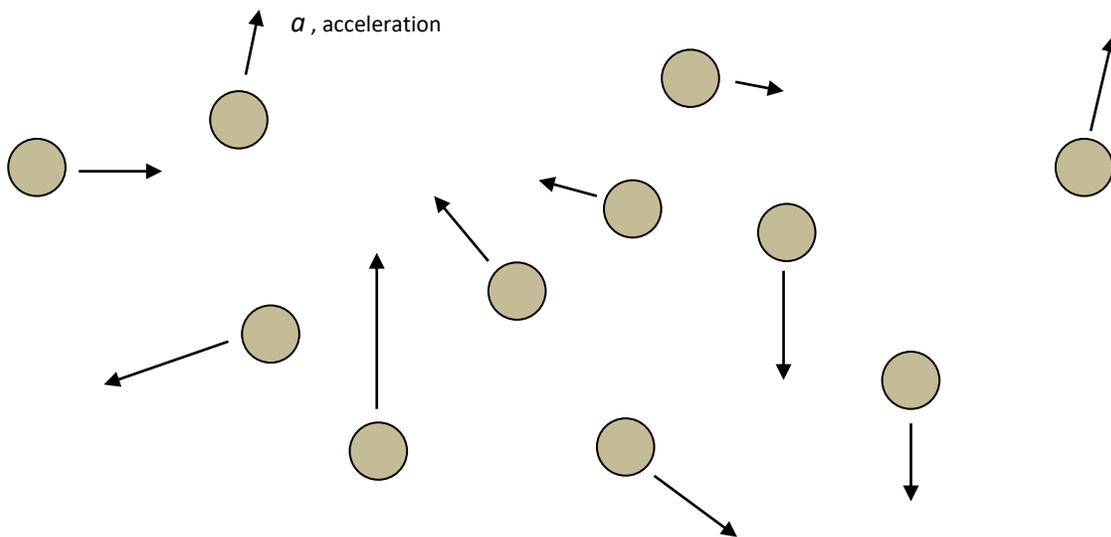
Consider two neutral physical bodies A and B .



Assume that force is applied to physical object B to accelerate it away from body A. If we make the conventional assumption that the interaction between opposite charges is equal in magnitude to the interaction between similar charges, the fourth component of Weber's formula would not predict inertia for neutral bodies.

Thus, just as for gravitational force, we have made the hypothesis that the reactive force arising from interaction of opposite charges ( during acceleration ) is slightly greater in magnitude than the reactive force arising from interaction of similar charges. Here we are talking about the fourth component of Weber's formula. This will give rise to inertia of a neutral body.

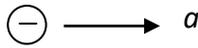
Thus the inertia of a physical (neutral) object is such interactions of the object with all matter in the universe.



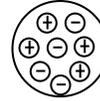
Note that the title of this paper ' inertia as a magnetic effect ' is not strictly accurate because there is no such thing as magnetic field in Weber's electrodynamics.

## The Podkletnov "impulse gravity" and " gravity shielding" experiment

Perhaps the new theory may also explain such exotic phenomenon as the Podkletnov "gravity beam" phenomenon. Podkletnov reported that (neutral ) objects at considerable distance within a 'gravity beam' are pushed and knocked down during high voltage discharge. He claimed that gravity beam is produced when there is a high voltage discharge, with a superconductor used as one of the electrodes.



electron accelerating during high voltage discharge



Neutral object

This effect may be explained by Weber's electrodynamics and the new hypothesis in this paper that the force of interaction between opposite charges is slightly greater than the force of interaction between opposite charges. This applies to all the four component's of Weber's formula. By using this hypothesis, we have been able to explain Newtonian gravity and inertia.

The effect may be explained by the fourth component of modified Weber's formula.

$$\frac{Q_1 Q_2}{4\pi\epsilon_0 r^2} (k_{opp3} - k_{sim3}) \frac{\vec{r} \cdot \vec{a}}{c^2}$$

During the high voltage discharge, the electrons will undergo very high acceleration. The force arising due to the interaction of the electrons with the protons in the neutral object will be greater than that with the electrons in the neutral object. This will give rise to a new form of non-Newtonian (dynamic or impulse) gravity.

Podkletnov also noticed that objects above a superconducting disk lost a small percentage of their weight. The scientific community was intrigued by this or rejected this claim outright. Gravity has always been thought to be a fundamentally different phenomenon unrelated to the electromagnetic or the nuclear force. It is universally thought that there is no gravity shield. However, if gravity is a net electrostatic force, it should also somehow behave as an electrostatic force. Perhaps the reason why no gravity shielding effect has ever been observed before is because the electrical resistivity of ordinary materials is non-zero. Superconductors, having exactly zero resistance, may have significant gravity shielding effect as observed in the Podkletnov experiment. Here we don't claim to fully explain the gravity shielding effect.

## **Discussion**

The new theory of inertia may solve the long standing mysteries of Pioneer anomaly and cosmological acceleration. The small anomalous deceleration of Pioneer spacecraft towards the Sun may be due to a continuous decrease of inertial mass of the spacecraft with distance from the Sun. The Earth flyby anomaly may also be connected with the new theory introduced in this paper which consists of two key concepts. That is, adoption of Weber's electrodynamics formula (hence rejecting Maxwell's magnetic field concept ) and a new hypothesis that the force of interaction between opposite charges is slightly greater than the force of interaction between similar charges.

## **Conclusion**

Conventionally it is assumed that the magnitude of the interaction force between opposite charges is equal to the magnitude of interaction between similar charges. By changing this view, we have presented very compelling explanations of inertia and gravity based on Weber's electrodynamics formula. For all the four components of Weber's electrodynamics formula, the force of interaction between opposite charges is slightly greater than the force of interaction between similar charges. The first component explains Newtonian gravity. The second and third components predict a new kind of (dynamic ) gravity. The fourth component explains inertia.

Thanks to God and His Mother Our Lady Saint Virgin Mary

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