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Gravity is Electromagnetism: A Theoretical and Experimental Study

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Abstract

This paper introduces a new experimentally supported framework for understanding gravity, proposing that it originates from atomic nuclei rather than from mass or the curvature of space-time. Unlike Newtonian and Einsteinian models—which define gravity as a mass-based attraction or the result of spacetime deformation—this theory presents gravity as an electromagnetic force generated by positively charged nuclei. It introduces the concept of a "Nuclear Polarization Force" to explain gravitational interactions between nuclei and other bodies—neutral, negatively charged, or positively charged—through polarization and charge dynamics.

To validate this theory, an experiment was conducted demonstrating measurable weight differences in objects when charged positively or negatively, compared to their neutral state. The results suggest that gravitational force is influenced not only by mass but also by electric charge. This model aims to unify gravitational behavior across atomic, planetary, and cosmic scales, offering a new perspective on the dynamics of the solar system, black holes, and the expansion of the universe. By redefining gravity in electromagnetic terms, this research addresses existing gaps in cosmology and quantum gravity, potentially opening new pathways in fundamental physics.

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Introduction

Gravity is widely recognized as one of the four fundamental forces of nature, yet its true origin and mechanism remain subjects of ongoing scientific inquiry. Newton's theory conceptualizes gravity as a force of attraction between two masses, whereas Einstein's general theory of relativity redefines it as the curvature of space-time caused by mass and energy. Both models have significantly advanced our understanding of gravitational phenomena on macroscopic scales; however, they do not fully address gravitational interactions at atomic or subatomic levels, nor do they provide comprehensive explanations for all observed cosmic behaviors.

This paper presents an alternative model, proposing that gravity is fundamentally an electromagnetic phenomenon originating from atomic nuclei. Termed the "Nuclear Polarization Force," this force emerges from the positive charge present in the nucleus of atoms—especially in large celestial bodies such as stars, planets, and black holes. According to this model, the nucleus exerts an attractive force that depends on both the charge and the mass of the interacting object.

By redefining gravity as an electromagnetic interaction rather than a purely mass- or geometry-based force, this framework offers a unified view of gravitational behaviour across atomic, planetary, and cosmic scales. This theory challenges conventional gravitational models and provides a practical approach to bridging the gap between quantum mechanics and gravitational physics.

Gravity

Newton's Theory of Gravity

Newton's law of universal gravitation describes gravity as an attractive force between two masses. While this theory has proven effective for explaining many macroscopic phenomena, it does not fully explain gravitational interactions at quantum scales. Additionally, the force of gravity is extremely weak in everyday life, which raises questions about whether gravitational attraction depends solely on mass in all situations.

Einstein's Theory of Gravity

Einstein proposed a fundamentally different perspective in his General Theory of Relativity. He described gravity not as a force but because of the curvature of space-time caused by the presence of mass and energy. While Einstein's model has successfully predicted phenomena such as gravitational lensing and the perihelion precession of Mercury, it still leaves unresolved questions, particularly concerning gravity's behavior at the quantum level and its unification with the other fundamental forces.

Nuclear Polarization Force Theory

This paper introduces a new theory—the Nuclear Polarization Force—which posits that gravity is actually an electromagnetic force originating from the positively charged nuclei at the centers of celestial bodies, including planets, stars, and black holes. According to this view, these central nuclei exert an attractive force on nearby matter depending on both the charge and mass of that matter.
This theory identifies three primary types of gravitational interactions:

Attraction Between a Nucleus and a Neutral Object

When a neutral object interacts with a nucleus, the nucleus induces polarization in the object. This results in an attractive force due to the redistribution of charges within the object—an effect similar to electric polarization. At the quantum scale, this force can be described as a polarization interaction, and for neutral macroscopic objects, the gravitational force is defined as:

$$F = \frac{Km \,.\, \sum Q1 \,.\, \sum M}{r^2} \qquad (01)$$

Where:
F = attractive (gravitational) force
Km = constant of proportionality between charge and mass

$\sum \boldsymbol{Q1}$ = total positive charge of the nucleus
$\sum \boldsymbol{M}$ = mass of the neutral object
$\boldsymbol{r}$ = distance between the nucleus and the object

Attraction between a Nucleus and a Negatively Charged Object

When the object has a net negative charge, two components of attraction arise:

1. Electrostatic attraction between the positively charged nucleus and the negative charge 2. Polarization-induced attraction based on the mass of the object The combined force is given by:

$$F = \left(Ke \underline{\qquad\qquad} \quad \underline{\qquad\qquad} . \sum rQ_{2}1 . \sum Q2 + Km . \sum rQ21 . \sum M \right) \tag{02}$$

Where:
$\sum Q2$ = total negative charge of the object
Ke = Coulomb's constant
Other symbols as previously defined

Interaction between a Nucleus and a Positively Charged Object

In this case, two opposing forces are involved:

- Polarization-based attraction due to the mass of the object
- Electrostatic repulsion between the like positive charges

Thus, the net force becomes weaker due to the repulsive effect, and the equation is:

$$F = (Km \underline{\qquad\qquad} \quad \underline{\qquad\qquad} . (\sum Qr21 . \sum M) - Ke . \sum Qr12 . \sum Q2) \tag{03}$$

Where:
$\sum Q2$ = total positive charge of the object
All other terms as previously defined
This formulation suggests that gravitational force is not universal in nature but contextually depends on both mass and electric charge, a significant departure from classical models.

Experiment

Objective

The purpose of this experiment is to test whether gravity has an electrostatic component—specifically, whether the gravitational force acting on an object changes with its electric charge. If gravity is influenced by both mass and electric charge, then positively and negatively charged objects should experience measurable differences in weight compared to when they are uncharged.

Theoretical Basis

If gravity originates from atomic nuclei and behaves as an electromagnetic force, it should interact with electric charge in addition to mass. Based on the proposed Nuclear Polarization Force theory, a positively charged object should experience a slight repulsion from the Earth's positively charged nucleus, resulting in a decrease in its effective weight. Conversely, a negatively charged object should experience a stronger attraction, leading to an increase in its effective weight. This experiment is designed to isolate the effect of charge by using two identical objects—one charged positively and the other negatively—while keeping mass constant. Observing any weight variation after charging would support the idea that gravitational force interacts with electric charge.

Experimental Setup

Initial Weight Measurement

A hollow metal sphere with a mass of 194.0 grams is used. Its weight is measured in an uncharged state using a high-precision electronic balance.

Charging the Object

The sphere is then charged using a Van de Graaff generator. It is charged both positively and negatively to equal magnitudes of electric charge (in the microcoulomb range).

Measuring the Weight of Charged Spheres

After each charging process (positive and negative), the weight of the sphere is measured again using the same precision balance under identical conditions.

Comparison of Results

The weight measurements before and after charging are compared to detect any changes attributable solely to the electric charge.

Experimental Results

- Positive Charge Case: After charging the sphere positively, the measured weight decreased from 194.0 grams to 124.5 grams, a difference of 69.5 grams. This reduction is interpreted as the result of electrostatic repulsion between the Earth's positively charged nucleus and the sphere.
- Negative Charge Case: After charging the sphere negatively, the weight increased from 194.0 grams to 398.9 grams, a difference of 204.9 grams. This increase is interpreted as electrostatic attraction between the negatively charged sphere and the Earth's positively charged nucleus.

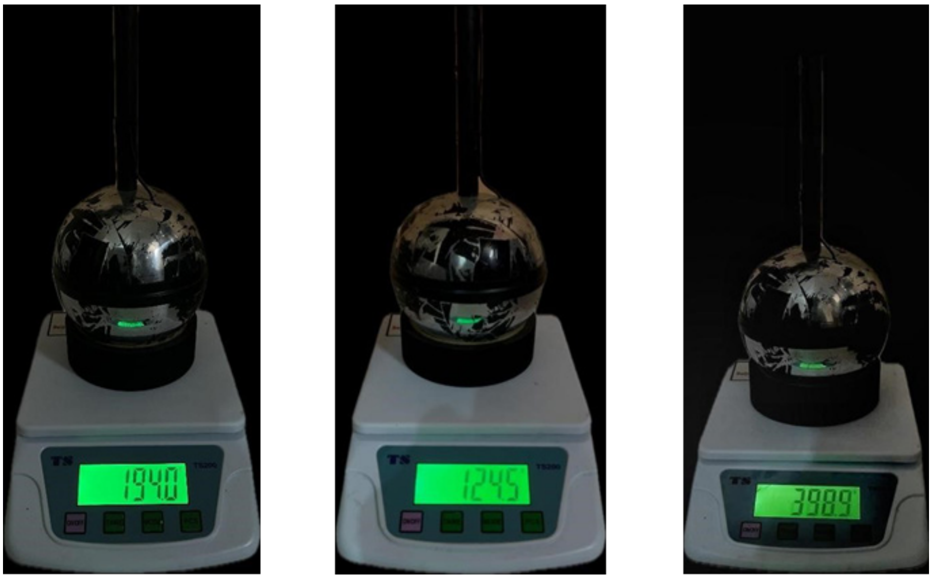

Figure 1: The experimental setup shows weight variations due to changes in the object's electric charge.

Interpretation

These results indicate that electric charge affects the gravitational interaction between the object and the Earth. The observed weight differences support the hypothesis that gravity is not solely a function of mass but also depends on electric charge—thus providing experimental evidence in favour of the Nuclear Polarization Force theory.

Gravity in the Solar System

Revised Understanding of Solar System Gravity

According to the Nuclear Polarization Force theory, the Sun does not attract planets in the traditional sense. Instead, due to the presence of similar positive charges in the cores of both the Sun and the planets, a repulsive force exists. This stands in contrast to Newton's view, which explained planetary motion as a balance between gravitational attraction and centrifugal (centripetal) force but did not explain the source of that motion.

In this model, the Sun's repulsive force is not strong enough to push the planets completely away.
However, it influences them in complex ways. Once an object moves beyond the gravitational influence of Earth, the Sun's electromagnetic force becomes more dominant. The Sun's gravitational field—reinterpreted here as an electromagnetic repulsion-modified field—extends throughout the solar system, weakening with distance. Beyond a certain point, this field becomes too weak to retain planetary orbits, effectively marking the boundary of the solar system.

Additionally, the side of a planet that faces the Sun experiences a stronger repulsive interaction due to proximity, while the far side feels less of this influence. This asymmetry causes the Sun's field lines to bend around the planets.

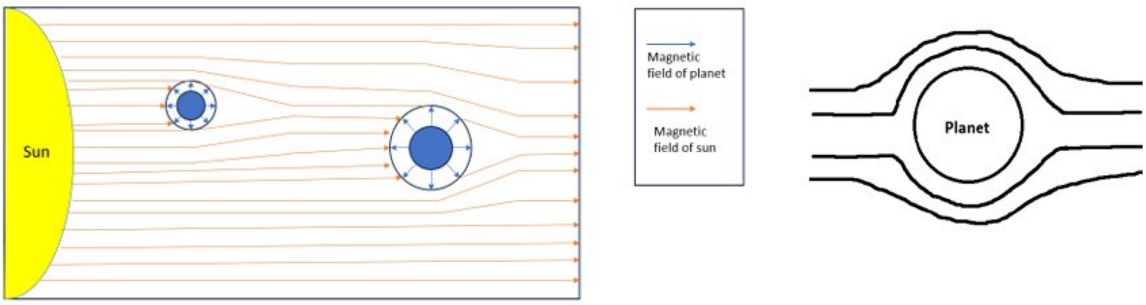

Figure 2: Schematic showing how the Sun's gravitational (electromagnetic) field lines interact with planets and bend around their surfaces.

At a specific point in space—where the gravitational forces from both the Sun and a planet balance—lies a Lagrange point, where objects can remain relatively stable. This model reinterprets the Sun's influence as varying based on charge distribution and distance, suggesting a new way of visualizing planetary motion and gravitational equilibrium.

Relationship between the Solar System and the Black Hole at the Galactic Center
This theory also proposes that a black hole is not a void or a singularity in the traditional sense, but rather a super-solid, high-density object composed entirely of nuclei. Such a body would possess an extremely strong nuclear polarization force, which extends across large regions of space.

The black hole resides at the center of the galaxy, binding and controlling numerous solar systems within its gravitational domain. Just as the Sun governs the motion of the planets within the solar system, the galactic black hole governs the orbits of solar systems within the galaxy. The boundary of a galaxy is therefore defined by the extent of this central gravitational (nuclear polarization) field.

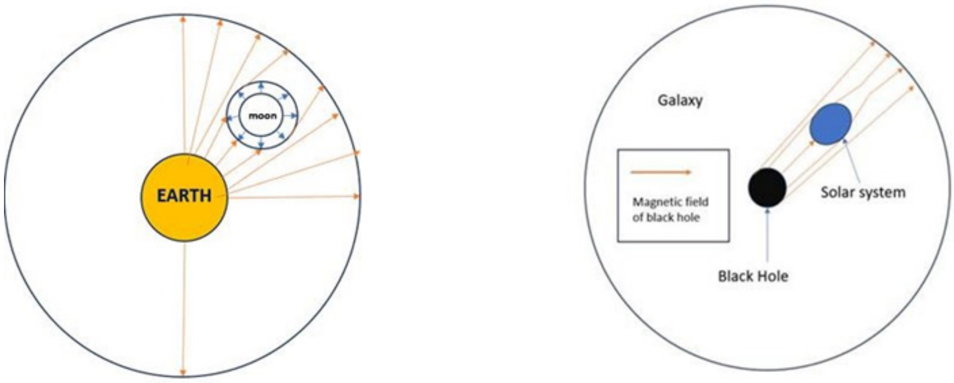

Figure 3: Comparison of gravitational influence: Earth on the Moon, Sun on the planets, and the black hole on the solar system.

Although the Earth repels the Moon due to the similar positive charge of their cores, the Moon remains gravitationally bound to the Earth due to its mass and distance. This is analogous to the way planets remain bound to the Sun, and how the solar system stays bound to the black hole at the galaxy's center.

Solar System Dynamics

Direction of Planetary Rotation

According to the Nuclear Polarization Force theory, planetary motion within the solar system is influenced by the motion of the solar system itself, which revolves around the central black hole at the core of the galaxy. This galactic rotation indirectly governs the orientation and rotational direction of planets around the Sun. Observations show that most planets revolve around the Sun in a counterclockwise direction (as viewed from above the Sun's north pole). This model explains that the solar system rotates clockwise around the black hole, and due to the principle of inertia, the planets appear to move in the opposite (counterclockwise) direction—similar to how a ball on a sliding sheet moves in the opposite direction when the sheet is pulled.

Additionally, the Sun's own rotation on its axis—also counterclockwise—influences the orbital direction of the planets. Since all planets are gravitationally (electromagnetically) bound to the Sun, its rotational motion affects both their revolution around it and their own axial rotation.

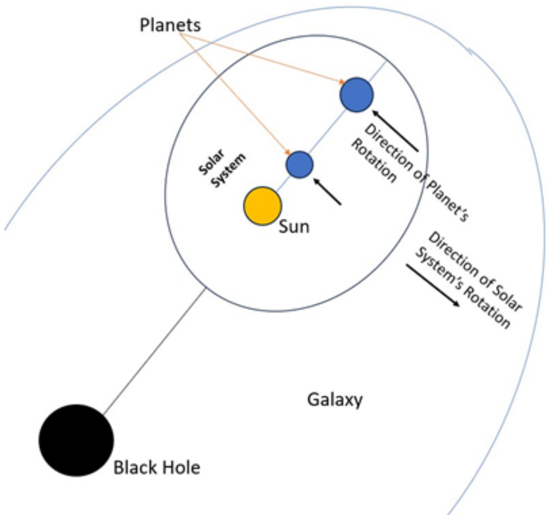

Figure 4: Illustration of planetary orbits around the Sun, influenced by the solar system's rotation around the galactic black hole.

Speed of Planetary rotation

The speed at which planets revolve around the Sun depends on two primary factors:

Distance from the Sun 2. Mass of the planet

Planets that are closer to the Sun revolve faster due to experiencing a stronger electromagnetic force from the Sun. These inner planets attempt to match the Sun's rotational speed but are limited by their own mass— inertia prevents them from reaching the Sun's speed.

Planets farther from the Sun rotate more slowly because the Sun's influence weakens with distance. The larger the distance, the weaker the force, and therefore the slower the orbital velocity.

Furthermore, a planet's rotation on its axis is also influenced by its orbital motion and location. Inner planets—being more tightly bound to the Sun—rotate more slowly on their axes. Outer planets, less constrained by the Sun's force, rotate more quickly.
While the exact angle of a planet's axial tilt is influenced by multiple factors, including the Sun's and planet's own gravitational characteristics, the detailed cause remains an area for future study. However, this dynamic model offers a more practical and observable explanation of rotation mechanics compared to traditional gravity-based models.

This concept can be visualized through a simple analogy. Imagine a rubber band stretched horizontally, with three steel balls of different masses placed between it. The elastic strength of the rubber band decreases from left to right, and the masses are arranged such that m1 = m3 < m2. When the rubber band is moved in one direction, it attempts to drag all the balls along with it.

The lighter ball (m1) positioned at the stronger end of the band moves more easily in the direction of motion. In contrast, the heavier ball (m2) resists movement, stretches the rubber band more, and lags the other two. This illustrates how the speed of orbital motion is influenced by both the mass of the object and the strength of the gravitational (or nuclear polarization) field acting on it.

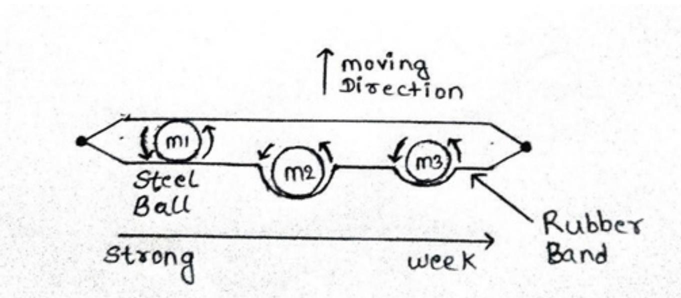

Figure 5: A rubber band and three steel balls illustrate how objects of different masses respond to varying elastic (gravitational) tension.

Mathematical Equation of Planetary Rotation Around Sun

To mathematically represent the orbital speed of a planet around the Sun, the following equation is proposed:

$$V = \frac{K}{M \cdot d} \tag{04}$$

Where:
V = orbital speed of the planet (Km/s), ***M*** = mass of the planet (Kg), ***d*** = distance from the planet to the Sun (Km).

K = proportionality constant
K = 2.66 × 1034 km2·kg·s-1

This equation implies that a planet's speed is inversely proportional to both its mass and distance from the Sun. Using the known mass and orbital speed of the Earth, the constant KKK can be determined. Once K is known, this formula can be used to estimate the mass and orbital speed of other planets.

Practical Observation:

A nearby object that is not physically attached to Earth tends to move at the same speed as Earth's surface. This is because it is within the influence of Earth's gravitational (nuclear polarization) force. As the distance increases, as in space, this coupling weakens, and the object's speed no longer matches Earth's. This is like how planets farther from the Sun move more slowly in orbit.

Expantion of the Universe

This theory proposes that the universe has a spherical shape with a fixed boundary, and that a supermassive black hole lies at its center. Galaxies orbit this central black hole much like planets orbit stars.

The observed expansion of the universe is explained not by space itself stretching, but by the differing orbital speeds of galaxies at various distances from this central point.

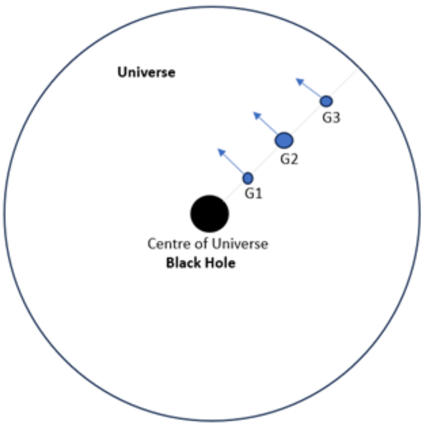

Figure 6: The diagram illustrates how galaxies G1 and G2 orbit a central supermassive black hole. G1, being closer to the center, moves faster than G2. As a result, G2 appears to move away from G1—creating the illusion of cosmic expansion.

As illustrated in Figure 6, let us imagine that we are in Galaxy G1, which is orbiting a supermassive black hole at the center of the universe. Another galaxy, G2, is positioned farther from the center than G1. According to the principles of orbital motion, G1 revolves faster than G2, just as planets closer to the Sun orbit more quickly than those farther away.

If both galaxies—G1 and G2—were moving at the same speed, G2 would appear stationary relative to us. However, because G1 (our galaxy) moves faster around the central black hole, G2 appears to be moving away from us. This is simply due to the difference in orbital speed.

Conversely, if G2 were somehow moving faster than G1, it would appear to be approaching us. Therefore, the farther a galaxy is from us, the slower its orbital speed will be in comparison, making it appear to recede more rapidly. This leads to the illusion of universal expansion—even though the galaxies are not actually moving away from a central point in space but instead rotating at different speeds around a massive central object.

In short, the observed separation between galaxies over time is not necessarily due to space itself expanding, but rather a consequence of their differential orbital velocities around a central gravitational source.

Real-World Evidence:

This interpretation aligns with existing observational data. For example, the Andromeda Galaxy appears to be approaching us, while many other galaxies appear to be receding. These observations support the idea that different galaxies are moving at non-uniform speeds, consistent with rotation around a central massive body rather than uniform expansion in all directions.

Conclusion

This research presents a novel and experimentally supported perspective on gravity, proposing that it is not a consequence of mass or space-time curvature, but rather an electromagnetic force originating from the positively charged nuclei of atoms. Through the introduction of the Nuclear Polarization Force, the paper offers a unified framework for understanding gravitational interactions at atomic, planetary, and cosmic scales.
An experimental approach demonstrated that electrically charged objects exhibit measurable differences in weight under Earth's gravitational influence. This supports the idea that gravity is affected not only by mass but also by electric charge—consistent with the electromagnetic nature of the proposed force. Furthermore, the theory offers alternative explanations for the motion of planets, the structure of black holes, and the apparent expansion of the universe, all of which align with observable phenomena.

By redefining gravity in electromagnetic terms, this study challenges long-standing assumptions in classical and relativistic physics and offers a practical path toward unifying gravity and quantum mechanics. While more rigorous experimental validation is required, the theory opens up promising avenues for future research in both fundamental physics and cosmology.

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