

Mass and Gravity as Emergent Properties of Fundamental Magnetic Interactions: A Novel Hypothesis

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ABSTRACT:

In classical physics and general relativity, mass is regarded as an inherent characteristic of matter, with Since Newton and Einstein, we have seen "mass" as a basic property that directly creates gravity. Quantum research, however, has revealed that the mass of protons and the energy of internal quark-gluon interactions is the primary source of neutrons rather than The primary source of neutrons is not their naked bodies, but their mass and the energy of internal quark-gluon interactions. This essay puts forth a novel theory: mass and gravity are actually big effects of basic magnetic interactions between the building Protons and electrons serve as the fundamental building blocks of matter. Consequently, magnetism is not a secondary force but rather the fundamental basis for gravity, mass, and stability.

Keywords: *emergent gravity; magnetic interactions; effective mass; quantum magnetism; magnetic solids; fundamental forces.*

INTRODUCTION:

Since Newton and Einstein, "mass" has been seen as a basic property that creates gravity. This perspective was expanded upon by general relativity, which explained mass/energy as the source of curvature of spacetime. However, advances in particle physics show that the majority of baryon mass The dynamic energy of quark-gluon interactions is the source of elements like protons and neutrons. Both Due to spin (and orbital motion), the electron and proton have inherent magnetic moments. contributions in the electron's case). This results in a fresh viewpoint: **effective mass and The collective effects of underlying magnetic interactions are gravitational.**

Theoretical Foundation:

1. The electron's magnetic properties:

- Intrinsic magnetic moment—spin.
- A magnetic field is created by orbital motion.

2. The proton's magnetism:

- Quarks and gluons, which have spin and charge, make up the proton.
- Its magnetic moment can be measured experimentally (e.g., in NMR and MRI).

3. Mass as Energy of Interaction:

- Mass is a condensed form of energy, according to $E = mc^2$.
- Internal field energy is responsible for the majority of nuclear mass (QCD binding).

4. Hypothesis Proposed:

- The spin-orbital-interaction magnetic energy of fundamental particles makes up where effective mass really comes from.
- The macroscopic manifestation of this fundamental force is gravity. spacetime magnetism.

Talk about:

Comparison with General Relativity: According to General Relativity, spacetime is curved by mass and energy. According to this theory, magnetic energy is the fundamental energy source.

Comparison with the Standard Model: the Higgs mechanism accounts for the rest mass of fundamental particles, but quark-gluon binding dominates the effective mass of baryons. vitality. According to this theory, this energy is magnetic by nature.

Scale-to-scale consistency:

- The spin and orbital behavior of electrons at the microscopic scale.
- Quark-gluon binding energy → nuclear scale.
- Macroscopic scale: planetary dynamics and gravity.

A New Class of Magnetic Solids

Apart from the basic understanding of mass and gravity, the notion of a "magnetic solid" can be This essay suggests a novel classification for condensed matter. Solids are categorized in the classical way as These solids can be classified as metallic, molecular, covalent, or ionic. But the distinguishing characteristic of a magnetic solid is not The classification focuses on the overall configuration of spins and exchange interactions, not just bonding type. Consistency And these spin alignments give rise to macroscopic behavior. Iron is one example of a natural substance. nickel, magnetite (FeO₄), and cobalt. Putting forth such a novel classification presents a substantial challenge for solid-state physics since it turns magnetism into a primary characteristic instead of a The essential standard by which matter is defined is based on the overall configuration of spins and exchange interactions rather than just bonding type.

Final Thoughts:

This essay suggests that mass is a result of rather than an independent intrinsic property. The focus of this essay is on basic magnetic interactions. Therefore, gravity can be understood at the cosmic scale as the This highlights the macroscopic face of magnetism. Additionally, the addition of a new class called "Magnetic Solids" This view of matter emphasizes the importance of magnetism across all scales, from the atomic to the planetary. This approach could aid in bridging the gap between general relativity and quantum magnetism.

Relationships and Fundamental Math:

We compare the orders of magnitude for gravitational, Coulomb, and magnetic dipole–dipole forces. The forces operate at both the atomic and nuclear length scales. These calculations clarify why magnetism predominates. Microscopically, magnetism is in charge, while macroscopically, gravity reigns supreme.

• Utilized constants (SI):

$$G = 6.6743 \times 10^{-11} m^3 kg^{-1} s^{-2},$$

$$k_e = 8.9876 \times 10^9 Nm^2 C^{-2},$$

$$\frac{\mu_0}{4\pi} = 1.0 \times 10^{-7} NA^{-2},$$

$$e = 1.6022 \times 10^{-19} C,$$

$$\hbar = 1.0546 \times 10^{-34} Js,$$

$$m_e = 9.1094 \times 10^{-31} kg,$$

$$m_p = 1.6726 \times 10^{-24} kg,$$

$$\mu_B = 9.2740 \times 10^{-24} JT^{-1}, \quad (\text{Bohr magneton})$$

$$\mu_N = 5.0508 \times 10^{-27} JT^{-1}, \quad (\text{Nuclear magneton})$$

$$\mu_p \approx 1.4106 \times 10^{-26} JT^{-1}, \quad (\text{Proton magnetic moment})$$

$$|\mu_e| \approx 9.285 \times 10^{-24} JT^{-1}. \quad (\text{Electron magnetic moment})$$

Nuclear scale (two protons at $r = 1$ fm):

- Gravitational: $F_g 1.8710^{-34} N$
- Coulomb (repulsive): $F_e 2.3110^2 N$
- Magnetic dipole: $F_m 5.9710^1 N$

Atomic scale (electron–proton at $r = 1$ Å):

- Gravitational: $F_g 1.0210^{-47} N$
- Coulomb (attractive): $F_e 2.3110^{-8} N$
- Magnetic dipole: $F_m 3.9310^{-16} N$

These comparisons demonstrate that, at microscopic scales, magnetism is far more powerful than gravity. In contrast, at macroscopic scales, gravity is dominant.

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