Space-time Torsion as a Manifestation of Magnetism

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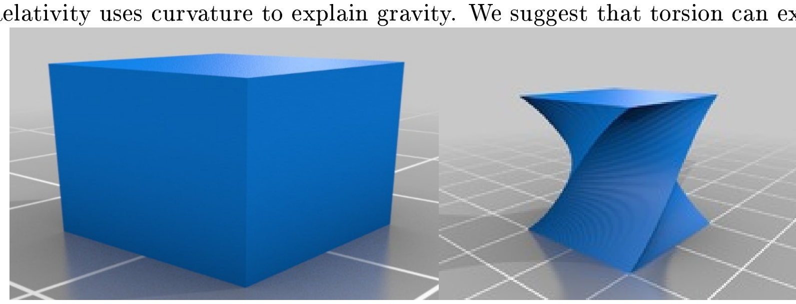
A Riemannian manifold possesses two fundamental properties: curvature and torsion. General Relativity uses curvature to explain gravity. We suggest that torsion can explain magnetism.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A discrete, granular space-time provides a good framework for space-time torsion: A much earlier paper[1] postulated that space-time was stochastic. And that implied that space-time was granular[2].

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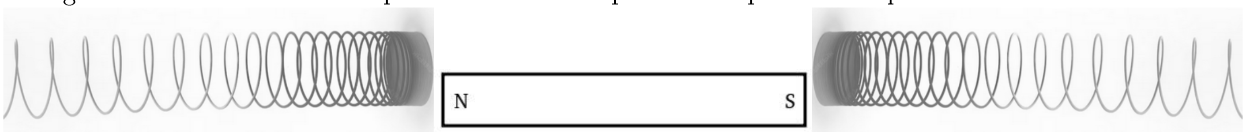
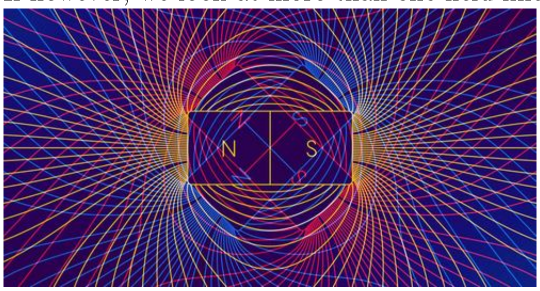
I. INTRODUCTION

That torsion could be identified with magnetism was suggested by Kaare Borchenius[3]. We are following his suggestion. Torsion[4] can be either left handed or right handed. We suggest one of them corresponds to a north pole of a magnet whilst the other corresponds to the south pole. A simplistic example is illustrated as follows

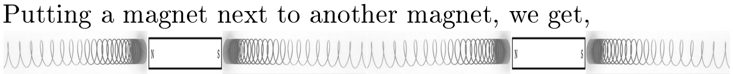


If however, we look at more than one field line, e.g,



we get a more complex picture.

Putting a magnet next to another magnet, we get,



In this case, the magnets (N to S) pull together.

Reversing one of the magnets (S to S or N to N), the magnets are pushed apart. The push force decreases as the magnets increase their distance apart. As the distance increases, the torsion decreases (as evidenced by the spiral connecting them unwinding).

Maxwell's Equations[5]

The curl H term is consistent with (and weakly supportive of) our torsion/magnetism model.

$\nabla \bullet D = \rho_v$

$\nabla \bullet B = 0$

$\nabla \times E = -\frac{\partial \boldsymbol{B}}{\partial t}$

$\nabla \times H = \frac{\partial D}{\partial t} + J$

Charged rotating: Kerr-Newman metric[6]

The metric describes a rotating mass with a magnetic moment. The rotation and magnetic field axes are the same. As one travels on the magnetic field axis away from the mass, the rotation slows and the magnetic field diminishes. This is a large scale reproduction of our torsion/magnetism model.

$c^2 d\tau^2 = -(\frac{dr^2}{\Delta} + d\theta^2)\rho^2 + (cdt - \alpha sin^2\theta d\phi)^2 \frac{\Delta}{\rho^2} - ((r^2 + a^2)d\phi - acdt)^2 \frac{sin^2\theta}{\rho^2}$

$a = \frac{J}{Mc}$

$\rho^2 = r^2 + a^2 cos^2\theta$

$\Delta = r^2 - r_s r + a^2 + r_Q^2$

$r_s = \frac{2GM}{c^2}$

$r_Q^2 = \frac{Q^2 G}{4\pi\epsilon_0 c^4}$

Bibliography

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[3] K. Borchenius, “An Extension of the Nonsymmetric Unified Field Theory”,Gen Relat Gravit 7, 527-534
[4] L. Fabbri (editor), “Torsion-Gravity and Spinors in Fundamental Physics”, Universe (ISSN 2218-1997) (2023)
[5] https://Maxwells-equations.com
[6] Kerr-Newman metric: A Review, arXiv 1410.6626v2 [Nov. 2016)