Space-time Torsion as a Manifestation of Magnetism

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Abstract

A Riemannian manifold possesses two fundamental properties: curvature and torsion.[4]. Relativity uses curvature to explain gravity. We suggest that torsion can explain magnetism.

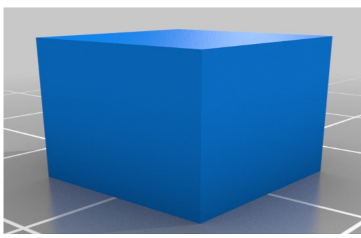
I. INTRODUCTION

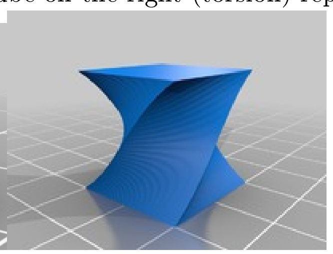
That torsion could be identified with magnetism was suggested by Kaare Borchenius[3]. We will be following his suggestion.

A much earlier paper[1] considered space-time to be stochastic. A later paper[2] additionally considered space-time to be granular at the Planck scale. Our granular space-time considers the grains to be Planck scale 4-dimensional cubes.

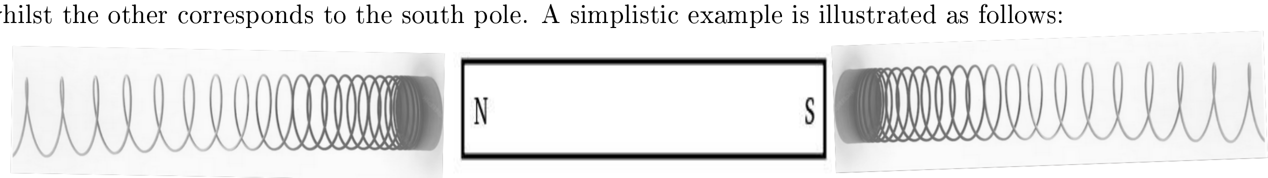
As an example of General Relativity using curvature, consider the Schwartzschild metric: solution:$-c^2d\tau^2 = -(1-\frac{r_s}{r})c^2dt^2 + (1-\frac{r_s}{r})^{-1}dr^2 + r^2d\Omega^2$. As per the Schwartzschild metric:

The flattened cube on the left represents the cube shortened in the direction of motion and lengthened in the direction of time. The twisted cube on the right (torsion) represents our model of magnetism.

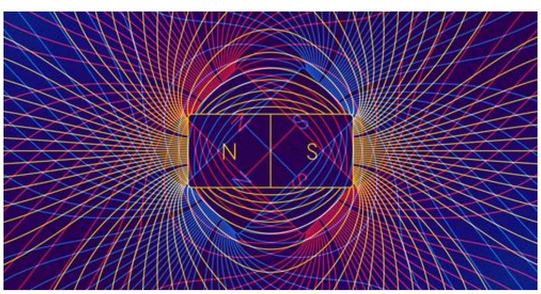




Torsion can be either left handed or right handed. We suggest one of them corresponds to a north pole of a magnet whilst the other corresponds to the south pole. A simplistic example is illustrated as follows:

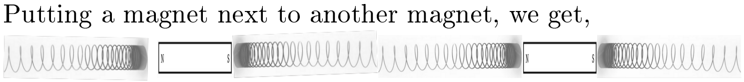


If however, we look at more than one field line, e.g,



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).

Unwinding at large distances can go only to zero because a magnet has two poles and at large distances the magnetism cancels. This might suggest the absence of magnetic monopoles.

Consider now, the Kerr-Newman solution. It describes a rotating charged mass.

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

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

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

$\Delta = r^2 - r_s r + a^2 + r_Q^2$
$r_s = \frac{2GM}{c^2}$
$r_Q^2 = \frac{Q^2 G}{4\pi\epsilon_0 c^4}$
The axis of rotation is coincident with the magnetic axis. We see then that as one moves away from the mass (along the axes) the magnetic field diminishes while the torsion decreases. This is a large-scale expression of our torsion/magnetism model.

Finally, Maxwell's Equations[5] are consistent with our model (particularly the indicated forth equation).

Maxwell's Equations
$\nabla \bullet D = \rho_v$
$\nabla \bullet B = 0$
$\nabla \times E = -\frac{\partial \boldsymbol{B}}{\partial t}$
—> $\nabla \times H = \frac{\partial D}{\partial t} + J$

[1] C. Frederick, "Stochastic space-time and quantum theory",Phys. Rev. D 3183 (1976)
[2] C. Frederick, "Stochastic space-time and quantum theory: Part B: Granular space-time", ArXiv 1601.0717V6 (20
[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