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Observation of Orbital and Spin Torques in Charged Salt Particles and Explanation with Einstein Cartan Evans Unified Field Theory

by

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Abstract

An applied static electric field is observed to produce orbital and spin torques in charged sodium chloride powder contained in a Petrie dish. The axis of the spin torque is approximately parallel to that of the applied electric field, and is observed by the rotational motion of the powder. This is a Lorentz force law phenomenon which is described from first principles in ECE theory through the transformation properties of the Cartan torsion.

Keywords: Einstein Cartan Evans (ECE) unified field theory, orbital torque produced by a static electric field.

9.1 Introduction

Recently [1] it has been observed by Thomson that a static electric field produces a tornado like structure in sodium chloride powder contained in a Petrie dish. A rotational motion is induced in the powder about an axis parallel to the applied field. In this paper a simple explanation for this phenomenon is given using the basic ansatz of the Einstein Cartan Evans (ECE) field theory [2–7]. This ansatz is

$$F^a = A^{(0)} T^a \tag{9.1}$$

where F^a is the field form $A^{(0)}$ is a scaling constant where $cA^{(0)}$ has the units of voltage, and T^a is the Cartan torsion form [8]. In Section 9.2 a review of the theory of unified classical dynamics and electrodynamics in ECE is given, and it is shown there that a static electric field is proportional to the orbital part of the Cartan torsion, which in turn is proportional to an orbital torque. In Section 9.3 the experimental details are summarized, showing that the experiment is repeatable and reproducible.

9.2 Review of the Theory of Unified Classical Dynamics and Electrodynamics

Using vector notation the equations of classical electrodynamics in ECE theory are as follows. The Gauss Law of magnetism is:

$$\boldsymbol{\nabla} \cdot \boldsymbol{B}^a = \mu_0 \widetilde{j}^{a0}_{\mathrm{em}} \tag{9.2}$$

The Faraday law of induction is:

$$\boldsymbol{\nabla} \times \boldsymbol{E}^a + \frac{\partial \boldsymbol{B}^a}{\partial t} = \mu_0 \widetilde{\boldsymbol{j}}^a_{\mathrm{em}} \tag{9.3}$$

The Coulomb law is:

$$\boldsymbol{\nabla} \cdot \boldsymbol{E}^a = \mu_0 c \widetilde{J}^{a0}_{\mathrm{em}} \tag{9.4}$$

and the Ampère Maxwell law is:

$$\boldsymbol{\nabla} \times \boldsymbol{B}^a - \frac{1}{c^2}\frac{\partial \boldsymbol{E}^a}{\partial t} = \frac{\mu_0}{c} \widetilde{\boldsymbol{J}}^a_{em}. \tag{9.5}$$

Here $\boldsymbol{B}^a$ is the magnetic flux density in tesla, $\boldsymbol{E}^a$ is the electric field strength in volts per meter, μ_0 is the S.I. vacuum permeability. Here $\widetilde{j}^{a0}_{em}$ and $\widetilde{\boldsymbol{j}}^a_{-em}$ are parts of the four-vector:

$$\widetilde{j}^{a\nu}_{em} = A^{(0)} \widetilde{j}^{a\nu} = A^{(0)} \left(\frac{1}{c} \widetilde{j}^{a0}, \widetilde{\boldsymbol{j}}^a \right) \tag{9.6}$$

and $\widetilde{J}^{a0}_{em}$ and $\widetilde{\boldsymbol{J}}^{a}_{em}$ are parts of the four-vector:

$$\widetilde{J}^{a\nu}_{em} = A^{(0)}\widetilde{J}^{a\nu} = A^{(0)}\left(\frac{1}{c}\widetilde{J}^{a0}, \widetilde{\boldsymbol{J}}^{a}\right) \tag{9.7}$$

where $A^{(0)}$ is the constant of proportionality from Eq. (9.1). The index a comes from Cartan geometry and is well understood as a polarization index [2–7].

The equations of rotational dynamics in ECE theory are similar in structure to the equations of electrodynamics and are expressed in terms of an orbital torsion vector $\boldsymbol{T}^a_L$ and a spin torsion vector $\boldsymbol{T}^a_S$ as follows:

$$\boldsymbol{\nabla}\cdot\boldsymbol{T}^a_S = \frac{\widetilde{j}^{a0}}{c} \tag{9.8}$$

$$\boldsymbol{\nabla}\times\boldsymbol{T}^a_L + \frac{1}{c}\frac{\partial \boldsymbol{T}^a_S}{\partial t} = \widetilde{\boldsymbol{j}}^{a} \tag{9.9}$$

$$\boldsymbol{\nabla}\cdot\boldsymbol{T}^a_L = \widetilde{J}^{a0} \tag{9.10}$$

$$\boldsymbol{\nabla}\times\boldsymbol{T}^a_S - \frac{1}{c^2}\frac{\partial \boldsymbol{T}^a_L}{\partial t} = \widetilde{\boldsymbol{J}}^{a} \tag{9.11}$$

Eq. (9.9) describes the gravitational equivalent of the Faraday law of induction as observed recently [9] in spinning superconductors. Eq. (9.10) is the gravitational equivalent of the Coulomb law of ECE theory, Eq. (9.4).

It is seen that the static electric field (volts/meter) is directly proportional to the orbital torsion as follows:

$$\boldsymbol{E}^a = cA^{(0)}\boldsymbol{T}^a_L. \tag{9.12}$$

The spin torsion is proportional to magnetic flux density as follows:

$$\boldsymbol{B}^a = A^{(0)}\boldsymbol{T}^a_S \tag{9.13}$$

The salt particles in the Thomson experiment are charged (see Section 9.3), so it is expected that their motion will follow a force law due to the electric and magnetic fields that may be present in the experiment. The initially applied static electric field is described [2–7] by a $\frac{1}{r}$ spin connection and may be seen as the straight line limit of curvature. If this static electric field develops a non-zero curl, it may induce a magnetic field through the equation:

$$\boldsymbol{\nabla}\times\boldsymbol{E}^a + \frac{\partial \boldsymbol{B}^a}{\partial t} = \boldsymbol{0} \tag{9.14}$$

and the magnetic field is proportional to the spin torque, denoting a spinning of space-time with a different spin connection in ECE theory. The induced magnetic field will spin the salt particles and the electric field will translate the salt particles. In ECE theory the Lorentz force equation is obtained [2–7] from a coordinate transformation of the electromagnetic field form. In a well defined limit this reduces to the Lorentz force law:

$$\boldsymbol{F}^a = e(\boldsymbol{E}^a + \boldsymbol{v} \times \boldsymbol{B}^a) \tag{9.15}$$

which is responsible for the motion of the salt particles. It is therefore concluded that the motion of the charged salt particles indicates the presence of orbital and spin torque.

9.3 Experimental Details

The experiment by Thomson was repeated at West Monmouth School and the motion of the salt particles was observed reproducibly. However it was found that the particles were charged by the van der Graff generator used to generate a static electric field, so their motion is governed primarily by a Lorentz type force law. There will also be contributions to the motion from other properties such as the electric dipole moment of sodium chloride generating a torque with the applied electric field. It was found that the applied electric field was not stable in the direction defined by the electrodes. The swirling motion of the salt particles suggests that a magnetic field was induced by a non zero curl of the electric field, but no tests were carried out with a magnetometer. The electric field causes a direct translational force:

$$\boldsymbol{F}^a = e\boldsymbol{E}^a \tag{9.16}$$

and so if it precesses such that:

$$\boldsymbol{\nabla} \times \boldsymbol{F}^a \neq \boldsymbol{0} \tag{9.17}$$

the overall motion of the charged salt particles will be a combination of translation of this type and the magnetic force:

$$\boldsymbol{F}^a = e\boldsymbol{v} \times \boldsymbol{B}^a. \tag{9.18}$$

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References

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