Review of: "Supersymmetry Via EDM (Electric Dipole Moment)"

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Potential competing interests: No potential competing interests to declare.

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The paper in question is very interesting although it requires to be supported by some mathematical arguments. Roughly, as I understand it, the paper proposes to explain
the half integer spin of Fermionic particles from Bosonic particles such as photons, gravitons and Higgs scalar Bosons or even Yang-Mills non-Abelian gauge field Bosons, by assuming that these Bosonic particles are composed of several subparticles in the form of Mobius strips and Klein Bottles and that these Bosonic particles have inherently an electric dipole moment
within them. The argument of the paper is that when an electric field produced by charges around interacts with the electric dipole moment within these Bosons, it causes the subparticles
within them to precess in accordance with the classical equation for precession: $dL(t)/dt=p(t)\times E$ where $p(t)$ is the electric dipole moment within the Bosonic particle and
$L(t)$ is the total angular momentum of the subparticle which includes it spin. This is just the statement that the rate of change of angular momentum equals the torque on it.
The idea of the paper seems roughly that when this equation is translated into the quantum mechanical language of observables being modeled as self-Adjoint operators in a Hilbert space, this equation implies that any fixed component of $L(t)$ after some time will start having eigenvalues that are half integer multiples of Planck's constant. Although the paper does not explain these ideas very clearly, it suggests that when the Bosonic particle has a subparticle within it that has the shape of a Mobius strip which has the same property of a half integer spin particle, namely, that two rotations of 2π each are required to come back to the same position, and when the electric dipole moment of such a subparticle interacts with an electric field, then it naturally acquires the characteristic of such a half integer spin particle. The crucial idea appears to be that spin manifests itself only after interaction with an external electric field. We could say the same for magnetic fields interacting with a magnetic dipole moment but the existence of a magnetic dipole moment inherently assumes that the particle has a spin, so it looks like the electric field interacting with the electric dipole moment of a Boson to generate Fermions is a more compelling feature that explains how Fermions are created from Bosons. This arguement therefore partially explains the presence of supersymmetry, namely, invariance of the laws of physics under Boson-Fermion exchange. One could also go the other way round for explaining how Bosons are created from Fermions by the interaction of the magnetic dipole moment with a magnetic field in accordance with the torque equation $dL(t)/dt=m(t)\times B$. In this regard, we can start with Dirac's relativistic equation for the electron in the presence of and

electromagnetic field and derive using Heisenberg's matrix mechanics the rate of change of total angular momentum $r\times p+\sigma/2$ to show it is given by the toatl torque equation with the electric dipole moment being proportional to the Dirac α matrices and the magnetic dipole moment being proportional to the Dirac spin matrices $\Sigma/2=diag[\sigma/2,\sigma/2]$. These formulas for the electric and magnetic dipole moment operators can also be deduced directly from Dirac's equation by premultiplying it with the Dirac operator with negative mass thereby arriving at the Klein-Gordon equation with additional correction terms given by $e(\alpha,E)$ and $e(\Sigma,B)$. Some interesting connections here can also be made with superstring theory which states that all the elementary particles in nature can be explained in terms of the states of a quantized vibrating string by constructing the string Hamiltonian acting in Fock space and showing that any state of definite energy can be viewed as a joint eigenstate of the Hamiltonians of a countably infinite number of Bosonic and Fermionic harmonic oscillators.
When such a superstring interacts with a homogeneous string gauge field, then the interaction energy is a quadratic function of the Bosonic string amplitude thereby enabling transitions between two states of definite energy. In string theory, there is also available gauge symmetry by assuming charge to be distributed along the length of the string and constructing vertex functions whose commutators lead to the gauge group E_8.

I suggest that the author attempt to explain how half-integer particles are generated using eigenvalues of the angular momentum of a Möbius strip carrying surface charge interacting with an electric field. The paper contains a fundamentally new idea, and it should be taken seriously for further development.

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