Abstract Submitted
for the DAMOP08 Meeting of
The American Physical Society

A Dipole in a Magnetic Field, Work, and Quantum Spin ROBERT J. DEISSLER[1], Physics Department, Cleveland State University, Cleveland, OH 44114 — Place an atom in a nonuniform static external magnetic field and, because of the interaction between the atom's magnetic moment and the magnetic field gradient, the atom will accelerate. An important and fundamental question, which has been neglected in the literature, is whether or not the magnetic field is doing work on the atom. It is shown that, while the magnetic field does no work on the electron-orbital contribution to the magnetic moment (the source of translational kinetic energy being the atom's internal energy), whether or not it does work on the electron-spin contribution to the magnetic moment depends on whether the electron has an intrinsic rotational kinetic energy associated with its spin. If the electron does have a rotational kinetic energy, which is shown to be consistent with the Dirac equation, the acceleration of a silver atom in a Stern-Gerlach experiment or the emission of a photon from an electron spin-flip can be explained without requiring the magnetic field to do work. A classical dipole (a spinning charged ball) is also studied. [1] Phys. Rev. E. **77**, 036609 (2008).

[1]http://deissler.us

Robert J. Deissler
Cleveland State University

Date submitted: 05 May 2008 Electronic form version 1.4