A PEP model of the electron. R.L. COLLINS, retired UT Austin —
One of the more profound mysteries of physics is how nature ties together EM fields
to form an electron. A way to do this is examined in this study. A bare magnetic
dipole containing a flux quantum spins stably, and produces an inverse square \( E = -v \times B \) electric field similar to what one finds from “charge”. Gauss’ law finds charge
in this model, though there be none. For stability, a current loop about the waist
of the magnetic dipole is needed and we must go beyond the classical Maxwell’s
equations to find it. A spinning \( E \) field is equivalent to an electric displacement
current. The sideways motion of the spinning \( E \) (of constant magnitude) creates a
little-recognized transverse electric displacement current about the waist. Transverse
motion of \( E \) supports the dipolar \( B \) field, \( B = v \times E / c^2 \). Beyond the very core of
the magnetic dipole, each of these two velocities is essentially \( c \) and \( v \times E / c^2 = \frac{v \times (-v \times B)}{c^2} = B \). The anisotropy of the \( v \times B \) field is cured by precession about
an inclined axis. Choosing a Bohr magneton for the magnetic dipole and assuming
it spins at the Compton frequency, Gauss’ law finds \( Q = e \). Charge is useful but not
fundamental. With this, Maxwell’s equations can be written in terms of the \( E \) and
\( B \) fields alone.