Abstract Submitted
for the DPP10 Meeting of
The American Physical Society

A General Theory for Gauge-Free Lifting[1] P.J. MORRISON, Physics Department and IFS, The University of Texas at Austin — Given a Hamiltonian set of orbit equations, defined on a phase space of arbitrary dimension, with 'forces' that depend explicitly on given electric and magentic fields and possibly all of their derivatives, how does one lift to a Hamiltonian kinetic theory coupled to Maxwell's equations? A general theory that answers this question will be presented. The theory produces magnetization and polarization effects in Maxwell's equations via a noncanonical Poisson bracket that generalizes that for the Vlasov-Maxwell system[2]. Several examples will be treated, including the generalized guiding-center kinetic theory of Pfirsch and the author[3], which relies on the introduction of redundant variables via Dirac constraint theory. Theories without the redundant variables are also being investigated[4].

[1]U.S. Dept. of Energy Contract # DE-FG05-80ET-53088
[2]P.J. Morrison, Phys. Lett. **80A**, 383 (1980); AIP Conference Proceedings **88**, 13 (1982); J. Marsden and A. Weinstein, Physica **4D**, 394 (1982).
[3]D. Pfirsch and P. J. Morrison, Phys. Rev. **32A**, 1714 (1985); Phys. Fluids **3B**, 271 (1991).
[4]A. Brizard et al., adjacent poster; P.J. Morrison and M. Vittot, research in progress.

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Date submitted: 16 Jul 2010 Electronic form version 1.4