Abstract Submitted
for the DPP05 Meeting of
The American Physical Society

Recent Developments in the theory of the turbulent MHD dynamo DAVID MONTGOMERY, Dartmouth College, PABLO MININNI, ANNICK POUQUET, NCAR — Turbulent dynamos amplify arbitrarily small magnetic fields in conducting MHD fluids. The theoretical/computational problem is typically formalized in 3D rectangular periodic boundary conditions. An external "forcing function" is added to mimic a relevant laboratory, geophysical, or astrophysical mechanical process. Inducing dynamo action by forcings that generate familiar simple flows (e.g., helical "Roberts flow," discussed here) is surprisingly easy, with or without mechanical helicity injection. For an "unforced kinematic dynamo," any turbulent velocity field that will produce enstrophy will amplify magnetic fields for low enough resistivity and viscosity. Triply periodic boundary conditions limit the realism of the fields generated, and also are on occasion inconsistent with Maxwell's equations. We are attempting to move beyond 3D periodicity by developing a wholly spectral code based on an expansion of the fields in spherical Chandrasekhar-Kendall eigenfunctions of the curl.

David Montgomery
Dartmouth College

Date submitted: 18 Jul 2005 Electronic form version 1.4