Abstract Submitted
for the DFD07 Meeting of
The American Physical Society

Pipe flow dynamics on the critical threshold. FERNANDO MELLIBOVSKY, ALVARO MESEGUER, Universitat Politecnica de Catalunya — Pipe flow undergoes transition to turbulence despite the linear stability of its basic laminar solution. Finite amplitude solutions in the form of travelling waves, coexisting with the basic flow, have been identified recently. While they have been proved to play a role in the turbulent dynamics, their involvement in the transition process seems to be simply ungrounded. Furthermore, some recent experimental results point at a transitory nature of turbulence, thus questioning the mere existence of a well defined critical threshold. The region of phase space dominated by turbulent dynamics would then be constituted by a surging amount of bifurcating complex solutions as the Reynolds Number is increased, acting as an attractor most of the time, but always retaining some probability that any trajectory finds its way back to laminarity. However transient may turbulence be, the notion of a threshold separating initial conditions that lead to transition from others that end up decaying still applies. It suffices to define the threshold as the point where the perturbation lifetime seems to diverge, possibly not to infinity if turbulence is a transient phenomenon, but still abruptly. Then, the threshold regains interest, and the question can be asked of how a solution wandering about criticality would look like. Starting from different initial conditions, and through accurate refinements, trajectories on the edge between turbulence and laminarity can then be analysed to elucidate which properties of a solution determine whether it belongs to the laminar or the turbulent basin of attraction. We analyse these trajectories to try and understand transition.

Fernando Mellibovsky
Universitat Politecnica de Catalunya

Date submitted: 02 Aug 2007 Electronic form version 1.4