Applied

Mathematics

McGill Applied Mathematics Seminar Series

Feb. 21st, 2002

Prof. J. Vanneste, University of Edinburgh

Title: Adiabatic invariance and geometric phase in two-dimensional fluids

Thursday Feb 21,2002

Time: 4:00 pm

Room: 934 Burnside Hall

Abstract:

We examine the response of two-dimensional, incompressible and inviscid fluids to slow deformations of the boundary of their domain. Two issues are addressed using perturbation techniques: (i) the determination of the (leading-order) Eulerian flow fields, which are shown to depend only on the shape of the fluid domain at any given time, and (ii) the determination of Lagrangian particle trajectories, which depend on the successive shapes taken by the domain. We emphasise the similarity between this problem and some familiar finite-dimensional analogues, such as the pendulum with varying length, and in particular the connection between (ii) and the Hannay–Berry (geometric) angles. We present explicit results for nearly axisymmetric flows in slightly deformed discs.