Swansea University
Prifysgol Abertawe

Calculus of Variations and Nonlinear PDEs

WIMCS – LMS Workshop

Friday 20 May 2011, Mathematics Department, Swansea University

Programme	
12.30pm - 1.30pm	Arrivals. Lunch in Aubrey Truman Room (room 213)
1.30pm - 2.20pm	**John Toland** (Bath, UK) *Waves with prescribed distribution of vorticity* *Abstract.* This concerns a variational theory of steady periodic surface waves in which the distribution function of vorticity (its rearrangement class) in the underlying flow is prescribed. Waves arise from minimizing the total energy and the functional dependence of vorticity on the stream function emerges as the Lagrange multiplier that comes from prescribing the vorticity distribution. The theory does not distinguish between irrotational waves and waves with locally square-integrable vorticity.
2.30pm - 3.20pm	**Veronica Felli** (Milan, Italy) *Monotonicity methods for asymptotics of solutions to elliptic and parabolic equations near singularities of the potential* *Abstract.* The effect of singularities on profile of solutions to partial differential equations of elliptic and parabolic type will be discussed, mainly focusing on singularities generated by homogeneous potentials which, having the same order of homogeneity as the differential operator, make it invariant by scaling and can therefore be regarded as "critical" from the mathematical point of view. Local asymptotics of solutions will be investigated by a monotonicity method based on Almgren type formulas combined with blow-up methods and separation of variables; the strength of such methodology relies in the use of monotonicity to prove not only unique continuation but also precise asymptotics of solutions, by extracting such precious information from the behavior of the quotient associated with the Lagrangian energy and providing a unified approach for linear and nonlinear equations.
3.20pm - 4.00pm	Tea
4.00pm - 4.50pm	**Jean Dolbeault** (CEREMADE Paris, France) *Existence, symmetry and symmetry breaking for extremal functions of some interpolation functional inequalities* *Abstract.* I will present a review of some recent results on existence, symmetry and symmetry breaking of optimal functions for Caffarelli-Kohn-Nirenberg (CKN) and weighted logarithmic Hardy (WLH) inequalities. These results have been obtained in a series of papers in collaboration with M. del Pino, M.J. Esteban, S. Filippas, M. Loss, G. Tarantello and A. Tertikas. The highlights will be put on a symmetry breaking result: extremals of some inequalities are not radially symmetric in regions where the symmetric extremals are linearly stable. Special attention is paid to the study of the critical cases for (CKN) and (WLH).
5.00pm - 5.50pm	**Gui-Qiang Chen** (Oxford, UK) *Nonlinear Partial Differential Equations of Mixed Elliptic-Hyperbolic Type* *Abstract.* Many nonlinear partial differential equations arising in mechanics and geometry naturally are of mixed hyperbolic-elliptic type. The solution of some fundamental issues in these areas greatly requires a deep understanding of such nonlinear partial differential equations of mixed type. Important examples include transonic flow equations in fluid mechanics and the Gauss-Codazzi system for isometric embedding in differential geometry. In this talk we will discuss some recent developments in the analysis of nonlinear partial differential equations of mixed type through these examples with emphasis on identifying/developing mathematical approaches, ideas, and techniques to deal with the mixed-type problems. Further trends, perspectives, and open problems in this direction will also be addressed.
5.50pm	Tea
7.00pm	Dinner

Lectures will be held in the Mathematics Seminar Room (room 224, 2nd floor of the Talbot Bulding). Refreshments will be served in the adjacent Mathematics Common Room (room 223).