Grupo de Física Matemática
da Universidade de Lisboa

SEMINÁRIO DE FÍSICA-MATEMÁTICA

Dia **4 de Fevereiro de 2011** (sexta-feira), às **14h30m**, na **Sala A2-25**

"Submanifolds with parallel mean curvature in calibrated manifolds: A variational approach"

Isabel Salavessa
(Centro de Física das Interacções Fundamentais, IST)

Abstract

It is well known that m-spheres are the unique smooth solutions for the isoperimetric problem in R^{m+1}. This can be proved by showing that spheres are the unique stable hypersurfaces with constant mean curvature for the Area functional acting on hypersurfaces with a fixed enclosed volume. This was proved by Barbosa and do Carmo (1980) and extended to geodesic spheres in space forms in a jonit work of the same autors with Eschenburg (1988). I show how to extend this variational problem to m-submanifolds in a $(m+n)$-dimensional Riemannian manifold N possessing a calibration Ω of rank (m+1), by defining an enclosed Ω-volume for one-parameter variations. The Jacobi operator arising from the second variation is now the usual one plus a first-order differential operator depending on the calibration, conditioning the stability. I study the stability of geodesic m-spheres on Hopf fibrations of S^{m+n} or on fibrations of R^{m+n} and of H^{m+n} with totally geodesic fibres. If $N = R^{m+n}$ necessary and sufficient conditions are given on the calibration for m-spheres to be the unique stable solutions. I study the case S^2 in R^7 with the associative 3-calibration coming from the octonions, and related to this variational problem, and using the Hodge and spectral theory of S^2, I derive some Cauchy-Riemann type inequalities for pairs, or more generally, for 4-tuples of functions in S^2. Some other examples coming from special geometries are described. Finally, I propose a forced mean curvature flow related to this problem.

Local:
INSTITUTO PARA A INVESTIGAÇÃO INTERDISCIPLINAR
DA UNIVERSIDADE DE LISBOA
Av. Prof. Gama Pinto, 2
1649-003 Lisboa, Portugal