CMUP
Centro de **Matemática**
Universidade do Porto

Dynamical Systems Seminar

Date. November 20, 15h30 (Unusual time)

Place. Room M031

Speaker. Tomás Lázaro[1] (Universitat Politècnica de Catalunya, Spain)

Title. Mixed dynamics in planar reversible diffeomorphisms

Abstract. One of the main interest studying reversible systems is the fact that they can exhibit, simultaneously, both conservative and dissipative-like behaviour. In our context, we will consider diffeomorphisms which are smoothly conjugate to their inverse map through an involution R ($R^2 = Id$, $R \neq 0$). They are referred as R-reversible or, simply, reversible maps. Following pioneering ideas from Newhouse, Gavrilov, Shil'nikov, Palis, Viana, Duarte, Romero, Gonchenko, Turaev and many others for the conservative and dissipative case, we will focus our attention on the problem of *mixed dynamics* in a reversible setting. In a few words, it is said that a system presents mixed dynamics if the following two properties hold:

(i) it has, simultaneously, infinitely many hyperbolic periodic orbits of all possible types, that is, stable, completely unstable and saddle;

(ii) these orbits are not "separated" as a set, that is, the closures of sets of orbits of different types have non-empty intersection.

As a consequence of the works of Newhouse and Gavrilov–Shilnikov on bifurcations of homoclinic tangencies, this property of mixed dynamics seems to be generic. In particular, under some assumptions on the jacobians, it is known that Newhouse regions with mixed dynamics, exist near any two-dimensional diffeomorphism having a non-transversal heteroclinic cycle. From the paper of Lamb-Sten'kin, it has been conjectured that two-dimensional reversible maps with mixed dynamics are generic in Newhouse regions where maps with symmetric homoclinic and/or heteroclinic tangencies are dense. And such property seems to be connected with the coexistence of infinitely many attracting, repelling, saddle and elliptic periodic orbits. The aim of this talk is to present two examples where this coexistence appears: a first one with two symmetric saddle points with a non-transversal heteroclinic tangency and a second one with a figure "8" homoclinic orbit. This is part of a common project still going on in collaboration with A. Delshams, S. Gonchenko, M. Gonchenko and O. Sten'kin.

[1]Tomás Lázaro has been graduated in Mathematics at the Universitat de Barcelona and PhD in Mathematics at the Universitat Politècnica de Catalunya under the supervision of Prof. Amadeu Delshams. His favourite topics are reversible systems, normal forms, an approach to the study of the maximal number of limit cycles in a polynomial planar system, models in Biology and, in the last years, singular perturbation theory. He has done stages in Firenze (Italy, one year) working on discrete breathers and in Bristol (UK, 6 months) devoted to singular perturbation problems for a 4D-reversible system.

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