



McMaster University



University of Toronto



University of Waterloo

THE FIELDS INSTITUTE FOR RESEARCH IN MATHEMATICAL SCIENCES

COLLOQUIUM IN DYNAMICAL SYSTEMS

SPEAKER:

JURGEN SCHEURLE
Universitat Hamburg

On the Topic:

Discretization of Autonomous Systems, Homoclinic Orbits and "Invisible Chaos"

Abstract: Given a finite-dimensional autonomous first order system of ordinary differential equations and a one-step discretization method. Then the diffeomorphism associated to the corresponding discretized system can be viewed as the time-period map of a certain nonautonomous system with a rapid, periodic forcing. The forcing frequency tends to infinity as the step size of the discretization tends to zero. We shall outline a proof for this lemma. Furthermore, we discuss some consequences concerning the numerical simulation of the long-time behaviour of autonomous systems near homoclinic orbits. In particular, we discuss the fact that discretizing a homoclinic orbit generally breaks the homoclinic orbit and leads to chaos. This fact will be discussed for both, Hamiltonian and general systems. However, in the analytic case, the splitting effects are exponentially small with respect to the step size and thus it is not easy to detect them numerically.

Wednesday, February 17, 1993

3:30 pm, room 3018

at

The Fields Institute

185 Columbia Street West, Waterloo, Ontario N2L 5Z5 Telephone: (519) 725-0096 Fax: (519) 725-0704

Supported by the Ministry of Colleges and Universities of Ontario and the Natural Sciences and Engineering Research Council of Canada