

MATHEMATISCHES FORSCHUNGSINSTITUT OBERWOLFACH

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Dynamische Systeme

Organised by
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7 July – 13 July 2013

ABSTRACT. This workshop continued the biannual series at Oberwolfach on Dynamical Systems that started as the “Moser-Zehnder meeting” in 1981. The main themes of the workshop are the new results and developments in the area of dynamical systems, in particular in Hamiltonian systems and symplectic geometry related to Hamiltonian dynamics. Highlights were the solution of a fifty year old problem in Arnold diffusion and a KAM-result on quasi-linear perturbations of the KdV-equation.

Mathematics Subject Classification (2010): 37, 35, 53D.

Introduction by the Organisers

The workshop was organized by H. Eliasson (Paris), H. Hofer (Princeton) and J.-C. Yoccoz (Paris). It was attended by more than 50 participants from 11 countries and covered a large area of dynamical systems centered around classical Hamiltonian dynamics: KAM theory, Arnold diffusion, geodesic flows, periodic solutions of symplectic flows, Floer homology. Other subjects treated were dynamics of PDEs, magnetic fields, quasi-periodic co-cycles and Schrödinger operators, pseudo-rotations, Teichmüller dynamics, pentagram maps, discrete bicycle transformations, group actions and algebraic number theory.

C-Q Cheng and V. Kaloshin presented their proofs of existence of Arnold diffusion in “generic” nearly integrable Hamiltonian systems in $2\frac{1}{2}$ degrees of freedom. This is a fifty year old problem to whose solution many mathematicians, in particular J. Mather, have contributed.

M. Berti presented a perturbation result of KAM-type for quasi-linear perturbations of the KdV equation. Quasi-linear perturbations are particularly important

for the connection of KdV with water wave equations whose perturbation theory is one of the most challenging problem in the KAM-theory for PDE's. M. Guardia reported on growth of Sobolev norms for the non-linear cubic Schrödinger equation and L.-S. Young discussed a work on center manifolds and chaotic dynamics in infinite dimension with applications to certain PDE's.

A. Abbondandolo presented new results on the old problem of periodic solutions in magnetic fields. V. Ginzburg P. Albers and U. Hryniewicz discussed pseudo holomorphic curve and Floer homology methods in symplectic and contact dynamics. M.-C. Arnaud reported on a generalization of the (former) Hopf conjecture to Tonelli Hamiltonians.

Pseudo-rotations were discussed by B. Bramhan and P. Le Calvez and also in the talk of J. Franks on Tits alternative for symplectic surface diffeomorphisms. New results on reducibility and Lyapunov exponents for quasi-periodic co-cycles were presented by N. Karaliolios, K. Bjerklov and J. You. Teichmuller dynamics was discussed in the talks of C. Matheus Silva Santos and C. Ulcigrai.

The meeting was held in an informal and stimulating atmosphere. The weather was very nice the whole week and the traditional walk to St. Roman, this year under the leadership of Sergei Tabachnikov, was even more pleasant than usual.

Workshop: Dynamische Systeme**Table of Contents**

Marian Gidea (joint with Rafael de la Llave, Tere Seara)	
<i>Local and global instability in nearly integrable Hamiltonian systems</i> . . .	1979
Massimiliano Berti	
<i>KAM for quasi-linear KdV equations</i>	1982
Viktor L. Ginzburg (joint with Bařak Z. Gürel)	
<i>Hyperbolic fixed points and periodic orbits of Hamiltonian systems</i>	1985
Lai-Sang Young	
<i>Toward a smooth ergodic theory for infinite dimensional systems</i>	1988
Alain Chenciner	
<i>Angular momentum and Horn's problem</i>	1989
Peter Albers (joint with W. Merry, U. Fuchs, U. Frauenfelder)	
<i>Orderability of contactomorphism groups</i>	1990
Chong-Qing Cheng	
<i>Arnold diffusion in nearly integrable Hamiltonian systems</i>	1991
Carlos Matheus (joint with Martin Möller and Jean-Christophe Yoccoz)	
<i>A criterium for the simplicity of Lyapunov exponents of origamis</i>	1992
Patrice Le Calvez	
<i>A finite dimensional approach to Bramham's approximation theorem</i> . . .	1996
Marcel Guardia (joint with Vadim Kaloshin)	
<i>Growth of Sobolev norms for the cubic nonlinear Schrödinger equation</i> .	1998
Nikolaos Karaliolios	
<i>Reducibility of quasiperiodic cocycles in semi-simple compact Lie groups</i>	2001
Barney Bramham	
<i>First steps towards invariant circles using pseudoholomorphic curve</i> <i>methods</i>	2004
Marie-Claude Arnaud (joint with Marc Arcostanzo, Philippe Bolle, Maxime Zavidovique)	
<i>Tonelli Hamiltonians with no conjugate points and C^0 integrability</i> . . .	2006
Serge Tabachnikov	
<i>Tire tracks geometry, continuous and discrete bicycle transformation,</i> <i>and the filament equation</i>	2008

Umberto L. Hryniewicz (joint with Joan E. Licata, Pedro A. S. Salomão and Kris Wysocki) <i>Existence of special finite-energy foliations on $SO(3)$ and applications to positively curved geodesic flows on the 2-sphere</i>	2010
Vadim Kaloshin (joint with Marcel Guardia, Ke Zhang) <i>Arnold diffusion and weak quasiergodic hypothesis</i>	2012
Corinna Ulcigrai (joint with Pascal Hubert and Luca Marchese) <i>Lagrange spectra for translation surfaces</i>	2015
Kristian Bjerklöv <i>The dynamics of a class of quasi-periodic Schrödinger cocycles</i>	2018
Svetlana Katok (joint with A. Katok and F. Rodriguez Hertz) <i>The Fried entropy for smooth group actions and connections with algebraic number theory</i>	2020
Karl Friedrich Siburg (joint with Andreas Knauf and Frank Schulz) <i>A nightcap on magnetic dynamics</i>	2021
Alberto Abbondandolo (joint with Leonardo Macarini and Gabriel P. Paternain) <i>Closed orbits for exact magnetic flows on surfaces below the Mañé critical value</i>	2022
Boris Khesin (joint with Fedor Soloviev) <i>Higher-dimensional pentagram maps and KdV flows</i>	2025
John Franks (joint with Michael Handel) <i>The group of symplectic surface diffeomorphisms</i>	2028