Mathematisches Forschungsinstitut Oberwolfach

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Topological and Variational Methods for Differential Equations

Organised by
Thomas Bartsch (Giessen)
E. Norman Dancer (Sydney)

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Abstract. These notes contain the extended abstracts of the talks presented at the workshop. The range of topics includes nonlinear Schrödinger equations, singularly perturbed equations, symmetry and nodal properties of solutions, long-time dynamics for parabolic equations, Morse theory.

Mathematics Subject Classification (2000): 35xx, 47xx, 58xx.

Introduction by the Organisers

Topological and variational methods have been at the core of nonlinear analysis for a long time and are still experiencing major new developments. They have had enormous new applications in the study of boundary value problems for nonlinear differential equations, in analyzing complicated (possibly infinite-dimensional) dynamics, phase transition and pattern formation, to name a few.

The workshop was mainly dedicated to variational methods for nonlinear elliptic and parabolic differential equations and systems with a special emphasis on

- Morse theory, Lusternik-Schnirelmann theory
- nonlinear Schrödinger equations
- singularly perturbed equations and their stable solutions
- multi-peak type solutions, both positive and sign-changing
- symmetry and nodal properties of solutions to elliptic boundary value problems
- long-time dynamics for semilinear parabolic equations

The workshop was attended by 47 mathematicians from 17 countries (from the Americas, Asia, Australia, Europe). During the five days 27 talks were delivered,
both from leading researchers as well as young mathematicians. There was plenty of time for discussions and cooperative work in small groups outside the scheduled lecture time. This led to a fruitful and intensive scientific exchange between the participants. Many open problems were discussed and many collaborative projects were started or continued during this week. Many of the abstracts below list some open problems, thus guiding future research. We received a great deal of positive feedback from the participants and are sure that this workshop will lead to further collaboration between the participants.

It is our pleasure to thank the administration and staff of the MFO for their efficient work and their hospitality which was essential for the stimulating atmosphere during the workshop.