

Nonlinear Evolution Equations and Dynamical Systems 2007

17th NEEDS Workshop, L'Ametlla de Mar, Spain

needs

2007

nonlinear evolution equations and dynamical systems

This special issue of the Journal of Nonlinear Mathematical Physics collects papers related to the 17th NEEDS (Nonlinear Evolution Equations and Dynamical Systems) meeting, held from 15th to 24th June 2007 in L'Ametlla de Mar, Spain. The papers gathered here are refereed contributions from researchers in the field of integrable equations and dynamical systems on topics related to the main themes of the NEEDS meeting. As in previous editions, the workshop had an interdisciplinary character with emphasis on the following:

- Integrable and chaotic dynamical systems
- Analytic, algebraic and geometric aspects of integrable systems
- Mathematical methods in quantum mechanics: exact solutions, spectral problems
- Nonlinear phenomena and applications: waves, solitons, pattern formation

The workshop took place at Hotel Ametlla Mar in the small fishing village of L'Ametlla de Mar, in the area of Baix Ebre, Catalonia, Spain. This 17th edition was attended by 165 participants from 30 different countries (see the list of participants below). As a novel feature compared with previous editions of the NEEDS workshop series, this year the workshop was preceded by the *NEEDS 2007 School*, attended by 86 young scientists from 24 different countries. The school consisted of the following four courses:

- *An introduction to pattern formation*
Alastair Rucklidge (Leeds University)
- *Properties of low dimensional dynamical systems in the large*
Carles Simó (Universitat de Barcelona)
- *The transition from regular to irregular motion as travel on Riemann surfaces*
Paolo M. Santini (Università di Roma "La Sapienza")
- *Synchronization and networks*
Steven H. Strogatz (Cornell University)

Throughout the school and the workshop, all participants were lodged at the hotel where all meals were served and the scientific sessions were held. This arrangement, together with the open character of the participants, helped to create a scientifically stimulating yet relaxing and

friendly atmosphere, leading to much activity and many exchanges, in addition to the scheduled programme.

The high number of participants in this year's edition forced us to schedule general morning sessions and somewhat more specialized parallel sessions in the afternoon. Obviously this (highly arbitrary) distinction had many limitations and it was new to the NEEDS environment, yet it enabled us to run the meeting in such a way that every contribution had the same length (25 minutes presentation plus 5 minutes discussion), in accordance with a long and successful tradition. In total there were 104 talks presented at the conference, plus 18 contributions presented in the poster sessions.

The workshop opened with a special session dedicated to the memory of Martin Kruskal, the pioneer of soliton theory who sadly passed away on December 26th 2006. We all feel highly indebted to Martin, always an inspiring and active participant of the NEEDS series, who enthusiastically agreed to be a member of the Advisory Committee when the first call for the conference was launched.

As implied by the title of the workshop, the main focus of the meeting was to explore and understand the many different aspects of nonlinear equations, dynamical systems and their applications. The range of applications of methods developed in these fields is truly surprising, for even after thirty years of workshops¹, new methods and techniques are still being developed. This has been without doubt one of the most exciting aspects of these meetings.

The success of the conference, at least as far as the high attendance is concerned, leads us to conclude that our goal to bring together both experts and young researchers and encourage cross-disciplinary interaction in a pleasant atmosphere was largely met.

Acknowledgments

For most of us this has been our first experience in organizing a major scientific meeting. We have worked with all the strength and motivation that we had, most often filling our lack of experience with lots of enthusiasm and many hours of work.

A number of people and institutions have helped us in organizing and running the meeting, and we would like to thank all of them here. First of all, the Advisory Committee consisting of Mark J. Ablowitz (University of Colorado), Carl M. Bender (Washington University at St. Louis), Francesco Calogero (Università di Roma La Sapienza), Amadeu Delshams (Universitat Politècnica de Catalunya), Boris Dubrovin (SISSA, Trieste), Jean-Pierre Francoise (Université Pierre et Marie Curie), Martin Kruskal (Rutgers University), Luis Martinez-Alonso (Universidad Complutense de Madrid), Alexander Mikhailov (Leeds University), Frank Nijhoff (Leeds University), Ryu Sasaki (Yukawa Institute) and Alexei Shabat (Landau Institute). Special thanks in this respect go to Francesco Calogero, who is source of inspiration to us. He has been always ready to help with his constant and precious advice. We are also very grateful to the lecturers of the school, who delivered wonderful courses.

We are also specially grateful to some people involved in non-scientific aspects of the workshop. We would like to thank the support from the Universitat Politècnica de Catalunya through the OSRM (Oficina de Suport a la Recerca Matemàtica), and in particular to Raquel Caparrós for her extraordinary work, and the Departament de Matemàtica Aplicada I. The team of *Officine Romane Design* are responsible for the design of the new NEEDS logo and visual identity, and also for the poster of the conference for which we thank them warmly. Practicalities are always a

¹For a historical account of the NEEDS workshop series, see <http://www.needs-conferences.net/>

key issue in running a conference, and the personnel at Hotel Ametlla Mar have been incredibly collaborative and friendly, often turning situations from *chaotic* into *solvable*.

The meeting received financial support from several institutions which we here gratefully acknowledge

- Ministerio de Educación y Ciencia (i-MATH Consolider program and Acción Complementaria MTM2006-26625-E)
- Generalitat de Catalunya (Accions mobilitzadores ARCS2006-100145)
- Universitat Politècnica de Catalunya
- Societat Catalana de Matemàtiques

Finally we would like to thank all the authors for their contributions and the referees for their voluntary work, careful reading of the papers and remarks. We hope the reader will enjoy the papers collected here and will find them useful in gathering a picture of the recent progress in the fields of nonlinear evolution equations and dynamical systems.

Guest Editors

David Gómez-Ullate Oteiza

Andrew Hone

Sara Lombardo

Joaquim Puig i Sadurní



Generalitat de Catalunya
Departament d'Innovació,
Universitats i Empresa



UNIVERSITAT POLITÈCNICA
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Figure 1: NEEDS 2007 participants



Figure 2: Moments from the NEEDS 2007 School and Workshop

nonlinear evolution equations and dynamical systems

school & workshop

integrable and chaotic dynamical systems
analytic, algebraic and geometric aspects of integrable systems
mathematical methods in quantum mechanics: exact solutions, spectral problems
nonlinear phenomena and applications: waves, solitons, pattern formation

Ametlla de Mar, June 15 - 24 2007





nonlinear evolution equations and dynamical systems

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Alexei Shabat (Landau Institute)

SCHOOL

"An introduction to pattern formation"
Alastair Rucklidge (Leeds University)

"Properties of low dimensional dynamical systems in the large"
Carles Simó (Universitat de Barcelona)

"The transition from regular to irregular motion as travel on Riemann surfaces"
Paolo M. Santini (Università di Roma "Sapienza")

"Synchronization and networks"
Steven H. Strogatz (Cornell University)

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www.needs-conferences.net/2007



Figure 3: Poster of the NEEDS 2007 School and Workshop

Participants in the NEEDS 2007 School and Workshop

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