BULLETIN

INTERNATIONAL CENTER FOR MATHEMATICS

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2004 EVENTS

THEMATIC TERM ON MATHEMATICS AND THE ENVIRONMENT

COORDINATORS

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DATES

May-July 2004

The **CIM Thematic Term** for 2004 is about Mathematics and the Environment. The topic could hardly be more timely. The knowledge about the impact of human activities on our planet's ecosystems is nowadays more vital than ever. Increasing human population to the detriment of others, cutting and burning vast areas of forest, polluting soil, air and water, are just few examples of how we humans have altered our environment. Within this Thematic Term we intend to address some of these issues from a mathematical and a physical modelling point of view.

The first event, School and Workshop on Dynamical Systems and Applications, was aimed at consolidating the research activities in Portugal in this area of mathematics fundamental for the understanding of evolution of ecological environments and monitoring of global changes. The Workshop on Forest Fires attempts to promote the communication among researchers with an interest on theoretical modelling of forest fires, in particular on fire front propagation. The third and fourth events, School on Atmospheric Sciences and Climate Dynamics and School and Workshop on Oceanography, Lakes and Rivers, are closely related and, hence, planned to be organized in two consecutive weeks. As their titles indicate, they address probably the most important natural processes for the world's ecosystem, and will touch on issues such as air quality, weather prediction, ocean waves and currents, estuarine dynamics, and avalanches, among others.

The programme of events is the following:

3-8 May: School and Workshop on Dynamical Systems and Applications

ORGANIZERS

José Ferreira Alves (Univ. Porto), Marcelo Viana (IMPA, Brazil).

For more information on this event, please visit the site

http://www.mat.uc.pt/∼tt2004/dynsystems

June 3 - 5: Workshop on Forest Fires

ORGANIZERS

Jorge André (Univ. Coimbra), José Miguel Urbano (Univ. Coimbra).

AIMS

Along the past century, in many parts of the world, for human and natural causes, forest fires have become an increasing threat to ambient and man. At the broadest scale, forest fires interest researchers from very different areas, such as: forestry, ecology, geography, physics and chemistry, mechanical and chemical engineering, and applied mathematics. At a finer scale, forest fire physics can be considered mainly as a sub-area of fire science, itself a part of combustion science, but has also important intersections with forestry (fuels characterisation) and meteorology (interactions between the fire and the atmosphere, at various spatial and temporal scales). Within the different phenomena that have been studied, the quasi-steady propagation of surface forest fire fronts of low-to-medium intensity is the most developed research subject of forest fire physics, which justifies the emphasis of the workshop. Since the nineties, the two-sided challenge of constructing models describing the behaviour of the fire front that are, on the one hand, physically sound and general, and, on the other hand, potentially applicable on operational grounds, has originated the proposal of a diversity of modelling strategies, each one of them giving rise to some hard mathematical problems. Such strategies are in different stages of theoretical development and antagonize or complement each other in a larger or lesser extent, none of them self-imposing as clearly superior to the others. The choice of the lecturers precisely reflects the desire to encompass the most relevant strategies that have been proposed.

The main goals of the event are:

- to promote the communication (i.e., mutual knowledge, criticisms, possible future synergies respecting results and, above all, strategies of research) among researchers with a common interest and competence on theoretical modelling issues of forest fires, with an emphasis on fire front propagation;

- to introduce to the Portuguese mathematicians the open mathematical and physical research problems brought up by some representative theoretical modelling strategies that are being used to describe the behaviour of forest fire fronts.

The workshop will be held at the Departamento de Engenharia Mecânica da Universidade de Coimbra located in Pólo II.

Numerical simulation of wild fires

Terry L. Clark (University of British Columbia, Canada)

What is missing from fire ecology?

Edward A. Johnson (University of Calgary, Canada)

Convection in forest fires

Jacques Simon (Université Blaise Pascal/CNRS, France)

Some developments in premixed combustion modeling

Gregory Sivashinsky (Tel-Aviv University, Israel)

On the modelling of forest fire propagation

Olivier Séro-Guillaume (CNRS, France)

For more information about the event, see

> http://www.mat.uc.pt/∼tt2004/fire

July 12 - 16: School on Atmospheric Sciences and Climate Dynamics

ORGANIZERS

Didier Bresch (CNRS/Univ. Joseph-Fourier, France), José Miguel Urbano (Univ. Coimbra), Juha Videman (Instituto Superior Técnico, Lisbon)

AIMS

The understanding of the fluid dynamics of the atmosphere and oceans and the development of techniques to simulate weather and climate are among the most important challenges for today's science. To make progress in this field and deepen our understanding of the complex processes that control the climate, the chemistry of the coupled atmosphere-ocean system, and the physics of the upper atmosphere, it is fundamental to intensify interdisciplinary collaborations amongst applied mathematicians and geophysicists.

The main goals of the event are:

- to promote the exchange of ideas among the distinct fields that share a common interest in Atmospheric Sciences, including fluid dynamics, physical oceanography, meteorology and applied mathematics;

- to provide students with a broad overview of this challenging topic.

The school will be held in Lisbon at the Complexo Interdisciplinar of the Instituto Superior Técnico.

SHORT COURSES

Evidence for human influence on climate and implications for climate forecasting

Myles Allen (University of Oxford, UK)

Energy balance models in climate dynamics

Jesus Ildefonso Díaz (Universidad Complutense de Madrid, Spain)

Transport, stirring and mixing in atmospheric chemistry and dynamics

Peter Haynes (University of Cambridge, UK)

Modeling ocean mixing

Esteban G. Tabak (Courant Institute, NYU, USA)

For more information about the event, see

> http://www.mat.uc.pt/∼tt2004/atmosphere

July 19-24: Summer School and Workshop on Oceanography, Lakes and Rivers

ORGANIZERS

Didier Bresch (CNRS/Univ. Joseph-Fourier, France), José Miguel Urbano (Univ. Coimbra), Juha Videman (Instituto Superior Técnico, Lisbon)

AIMS

Mathematics has always played a fundamental role in the study of oceans and river flows, although these research fields are still perhaps more familiar to oceanographers, geophysicists and environmental engineers than to mathematicians. Nonlinear PDEs are crucial in describing ocean processes such as internal and surface waves, ocean tides and currents, turbulence, changes in salinity and temperature, just to mention a few.

The main goals of the event are:

- to promote the communication and interactions between the specialists working on different frontiers of Oceanography;

- to introduce to the Portuguese applied mathematicians, in particular to graduate and PhD students, the fundamentals, as well as some of the most relevant current problems, of Environmental and Geophysical Fluid Dynamics;

- to provide an opportunity for physical oceanographers and mathematicians to establish contacts and develop common research projects.

The event consists of a four-day summer school and a two-day workshop and will be held in Lisbon at the Complexo Interdisciplinar of the Instituto Superior Técnico.

SHORT COURSES IN THE SUMMER SCHOOL

Turbulent geophysical flows and transport in rotating fluids

Peter Constantin (University of Chicago, USA)

Hydrodynamics of rivers and estuaries

Benoît Cushman-Roisin (Dartmouth College, USA)

Rotating fluids and associated boundary layers

Emmanuel Grenier (ENS-Lyon, France)

Elements of geophysical fluid dynamics

Joseph Pedlosky (Woods Hole Oceanographic Institution, USA)

The Saint-Venant system for shallow water. Derivation from Navier-Stokes and numerical solution

Benoît Perthame (ENS-Paris, France)

PLENARY LECTURES AT THE WORKSHOP

Stability of Ekman boundary layers and applications

Benoît Desjardins (École Polytechnique, France)

Avalanches: models and mathematical results

Reinhard Farwig (TU Darmstadt, Germany)

Mathematical and numerical analysis of the primitive equations in oceanography

Francisco Guillén-González (Universidad de Sevilha, Spain)

Adjustment of the global thermohaline circulation to local forcing anomalies

David Marshall (University of Reading, UK)

Bifurcations and pattern formation in Geophysical Fluid Dynamics

João Teixeira (UCAR/NRL, USA)

Turbulence, clouds and climate models

Shouhong Wang (Indiana University, USA)

For more information about the event, see

http://www.mat.uc.pt/∼tt2004/ocean

Other CIM events in 2004:

Workshop on Nonstandard Mathematics NSM2004

Universidade de Aveiro, 5-10 July, 2004

Organizers:

Francine Diener, Université de Nice, France

Imme van den Berg, University of Évora, Portugal

A. J. Franco de Oliveira, University of Évora, Portugal

João Paulo Teixeira, IST, Lisbon, Portugal

Keith D. Stroyan, University of Iowa, USA

Vítor Neves, University of Aveiro, Portugal

Aims

The conference will be held in honor of Abraham Robinson on the 30th anniversary of his death. The meeting is planned to be of interest to a broad mathematical public, especially mathematicians engaged in research in any area where Nonstandard Analysis has been found to be relevant, such as **Foundations, Analysis and Functional Analysis, Potential Theory, Control Theory, Stochastics, Differential Equations, Perturbation Theory, Economics, Quantum Physics**, amongst others.

The main part of the conference will consist of plenary talks and contributed talks. A *course in* ***Calculus with infinitesimals*** is foreseen as well as a *debate* ***Non Standard Mathematics, past, present and future of a new paradigm in Mathematics*** as part of a general assessment of the state of the field.

Main Lecturers

Imme van den Berg (Univ. of Évora, Portugal), Nigel Cutland (Univ. of Hull, England), Francine Diener (Univ. of Nice, France), Renling Jin (Coll. of Charleston, USA), H. Jerome Keisler, (Univ. of Wisconsin, Madison, USA), Peter Loeb (Univ. of Illinois, Urbana-Champaign, USA), Edward Nelson (Princeton Univ.), David Ross (Univ. of Hawaii, USA), Tewfik Sari (Univ. of Haute-Alsace, France), Keith Stroyan (Univ. of Iowa, USA), Manfred Wolff (Univ. of Tübingen, Germany).

For more information about this event, see

http://www.mat.ua.pt/eventos/nsmath2004/

Summer School on Mathematics in Biology and Medicine

20-24 September, 2004

Organizers:

Gabriela Gomes, IGC, Oeiras, Portugal

Jorge Carneiro, IGC, Oeiras, Portugal

Pedro Coutinho, IGC, Oeiras, Portugal

Isabel Gordo, IGC, Oeiras, Portugal

José Faro, IGC, Oeiras, Portugal

Francisco Dionísio, IGC, Oeiras, Portugal

For more information about this event, see

http://eao.igc.gulbenkian.pt/mbm2004/

Autumn School and International Conference on Stochastic Finance

20-30 September, 2004

Organizers:

Paulo Brito, ISEG, Lisbon, Portugal

Manuel L. Esquível, New University of Lisbon, Portugal

Maria do Rosário Grossinho, ISEG, Lisbon, Portugal

João Nicolau, ISEG, Lisbon, Portugal

Paulo Eduardo Oliveira, University of Coimbra, Portugal

For more information about this event, see

http://pascal.iseg.utl.pt/∼stochfin2004/

For updated information on these events, see http://www.cim.pt/cimE/eventos04.html.

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