



# BULLETIN

## INTERNATIONAL CENTER FOR MATHEMATICS

JUNE 2003

14

### CONTENTS

Coming Events	1
CIM News	5
<i>Profinite Structures and Dynamics</i> by Jorge Almeida	8
What's New in Mathematics	19
Interview: M. J. D. Powell	22
Gallery: José Tiago de Oliveira	26

### COMING EVENTS

#### THEMATIC TERM ON MATHEMATICS AND ENGINEERING

##### COORDINATOR

Isabel Maria Narra de Figueiredo (Uni. of Coimbra)

##### DATES

June-September 2003

The **Thematic Term** for 2003 will be dedicated to Mathematics and Engineering. The application of mathematics to engineering is crucial to knowledge and

the development of science. The main objective of the thematic term for 2003 is to improve and emphasize the interdependence between the most recent and important research fields in mathematics and the most important fields of contemporary engineering: informatics engineering, chemical engineering, mechanical engineering, civil engineering and electronics engineering.

The thematic term 2003 consists of four events. The first event is devoted to mathematics and informatics engineering and focuses on soft computing and complex

systems. The second event deals with modelling and simulation in chemical engineering. The third event is related to modelling and numerical simulation in continuum mechanics. The fourth event is concerned with mathematics and telecommunications.

Each one of these events is an Advanced School and Workshop, where short courses, lectures and invited talks will be given by well-known invited scientists. So it is expected that the thematic term 2003 will attract a large number of postgraduate students, mathematicians and engineers, interested in contributing to the development of mathematics and its applications to engineering.

The programme of events is the following:

### **23-27 June: Workshop on Soft Computing and Complex Systems**

#### ORGANIZERS

António Dourado Correia (Univ. Coimbra), Ernesto Jorge Costa (Univ. Coimbra), José Félix Costa (I. Superior Técnico - Lisbon), Pedro Quaresma (Univ. Coimbra).

#### AIMS

The main scientific goal of the workshop is to introduce recent developments in mathematical techniques applied to complex engineering problems. In particular, the workshop will focus on different aspects of the area called soft computing, including fuzzy and connexionist systems, evolutionary computation, artificial life and complex systems.

Harnessing complexity is an important aspect of today problem solving. Complexity may be due to the presence of uncertain information or because the regularities of a system, we are trying to understand, cannot be briefly described. We will discuss recent developments in dealing with complexity, by means of introducing the methods and their sound mathematical foundations, as well as through the work of some difficult problems.

The workshop will be held at the Mathematics Department - University of Coimbra.

#### LECTURES

##### *Multi-criteria Genetic Optimisation*

Carlos Fonseca, University of Algarve, Portugal

##### *Neural Computation and Applications in Time Series and Signal Processing*

Georg Dorffner, Department of Medical Cybernetics and Artificial Intelligence, University of Vienna, Austria

##### *Analog Computation*

José Félix Costa, Department of Mathematics, Technical University of Lisbon, Portugal

##### *Universal Learning Algorithms*

Juergen Schmidhuber, IDSIA- Instituto Dalle Molle di Studi sull'Intelligenza Artificiale, Switzerland

##### *Neuro-Fuzzy Modelling*

##### *Intelligent Control*

Robert Babuska, Delft University of Technology, Holland.

For more information on this event, please visit the site

<http://hilbert.mat.uc.pt/~softcomplex/>

### **30 June - 4 July: Workshop on Modelling and Simulation in Chemical Engineering**

#### ORGANIZERS

Alfrio Egídio Rodrigues (Univ. Porto), Paula Oliveira (Univ. Coimbra), José Almiro Meneses e Castro<sup>†</sup> (Univ. Coimbra), José Augusto Mendes Ferreira (Univ. Coimbra), Maria do Carmo Coimbra (Univ. Porto).

#### AIMS

The main objective is to bring together mathematicians and chemical engineers to improve the understanding of the problems encountered in process engineering and tools available to solve them. To reach that objective the Workshop is designed:

- To provide the basis for mathematical modelling of chemical engineering systems
- To present some numerical methods to solve model equations in particular in cases of steep moving fronts
- To stress the use of dynamic simulators
- To introduce optimization techniques

The workshop will be held at the CIM headquarters: Complexo do Observatório Astronómico - Universidade de Coimbra.

#### SHORT COURSES

##### *Modelling in Chemical Engineering*

S. Sotirchos and A. Rodrigues, University Rochester, USA and LSRE-FEUP, University of Porto, Portugal

##### *Numerical Simulations with Advection-Diffusion-Reaction Systems*

W. Hundsdorfer, Center for Mathematics and Computer Science, The Netherlands

##### *Optimization and Control of Chemical Processes*

N. Oliveira, University of Coimbra, Portugal

#### INVITED TALKS

##### *Adaptive finite element solutions of dependent partial differential equations using moving grid algorithms*

J. M. Baines, Department of Mathematics, University of Reading, United Kingdom

##### *Numerical analysis of the motion of glass under external pressure*

R. Mattheij, Department of Mathematics and Computer Science, Tech. University of Eindhoven, The Netherlands

##### *Adaptive numerical methods for sensitivity analysis of differential-algebraic equations and partial differential equations*

Linda Petzold, UC Santa Barbara, USA

##### *Splitting Methods for Advection-Diffusion-Reactions Problems*

J. G. Verwer, Center for Mathematics and Computer Science, CWI, Amsterdam, The Netherlands

##### *Numerical and Computational Challenges in Environmental Modelling*

Z. Zlatev, National Environmental Research Institute, Denmark

For more information on this event, please visit the site

<http://www.fe.up.pt/lsre/cim2msce/workshop.html>

#### **14-18 July: Advanced School and Workshop on Modelling and Numerical Simulation in Continuum Mechanics**

#### ORGANIZERS

Luís Filipe Menezes (Univ. Coimbra), Isabel Maria Narra de Figueiredo (Univ. Coimbra), Juha Videman (I. Superior Técnico - Lisbon).

#### AIMS

The scientific goals of this event are the following:

- to present some of the most important recent fields of research in mathematics and its applications to civil and mechanical engineering
- to promote the interdisciplinary aspects of the field by establishing contacts between mathematicians and engineers
- to provide an opportunity for Portuguese scientists to present and discuss their research work.

This event will take place at the Department of Mechanical Engineering - University of Coimbra.

#### SHORT COURSES

##### *Numerical analysis of discrete schemes approximating grade-two fluid models. Recent results and open problems*

Vivette Girault (Université Pierre et Marie Curie, France)

##### *Shape optimization*

Patrick Le Tallec (École Polytechnique, France)

##### *Advances in the finite point method for meshless analysis of problems in solid and fluid mechanics*

Eugenio Oñate (CIMNE, Universitat Politècnica de Catalunya, Spain)

##### *Mathematics and numerics of shell problems*

Juhani Pitkäranta (Helsinki University of Technology, Finland)

##### *Computational mechanics of solid materials at large strains*

Cristian Teodosiu (Université de Paris Nord, France)

## INVITED PLENARY LECTURES

### *Finite element simulation of sheet metal forming*

Kjell Mattiasson (Volvo Car Corporation, Göteborg, Sweden)

### *A thermodynamic framework for dissipative processes*

K.R. Rajagopal (Texas A&M University, USA)

### *Virtual metal forming*

Karl Roll (Daimler Chrysler AG, Germany)

### *Analysis and simulation of non-newtonian models for blood flow microvessels*

Adélia Sequeira (Instituto Superior Técnico, Lisboa, Portugal)

### *Numerical analysis and simulation of some contact problems in visco-elasto-plasticity*

Juan Viaño (Universidade de Santiago de Compostela, Spain)

For more information on this event, please visit the site

<http://www.math.ist.utl.pt/wmns/cm/>

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## **8-12 September: Mathematical Techniques and Problems in Telecommunications**

### ORGANIZERS

Carlos Salema (I. Superior Técnico - Lisbon), Joaquim Júdice (Univ. Coimbra), Carlos Fernandes (I. Superior Técnico - Lisbon), Mário Figueiredo (I. Superior Técnico - Lisbon), Luís Merca Fernandes (I. P. Tomar).

## AIMS

The goals are three fold. Firstly we will try to identify and possibly provide solutions for a number of mathematical problems in the field of Telecommunications. Secondly we intend to disseminate among telecommunications engineers some mathematical techniques which are not widely known in this community even if they are being applied in modern communication techniques. Finally we would like to improve mutual understanding and recognition between mathematicians and telecommunication engineers, one of the heaviest users of mathematical techniques in the field of engineering.

This event comes in the follow-up of rather successful, even if less ambitious event, “Matemática em Telecomunicações: Que Problemas?” with similar objectives organized by IT in 1997.

This event will take place at the Instituto Politécnico de Tomar.

### INVITED LECTURES

#### *Combinatorial Optimization in Telecommunications*

Mauricio Resende, ATT, USA

#### *Transforms, Algorithms and Applications*

Joana Soares, U. Minho, Portugal

#### *Controllability of PDE's and its Discrete Approximations*

Enrique Zuazua, U. A. Madrid, Spain

#### *Evolutionary Computing*

Eckart Zitzler, SFIT, Switzerland

#### *Stochastic Processes in Telecommunications Traffic*

Ivette Gomes, CEAUL, Portugal

For more information on this event, please visit the site

<http://www.lx.it.pt/mtpt/>

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# THIRD DEBATE ON MATHEMATICAL RESEARCH IN PORTUGAL

Porto, 25 October 2003

ORGANIZERS: José Ferreira Alves (Univ. Porto), José Miguel Urbano (Univ. Coimbra).

This debate is a continuation of the two previous ones, held on December 1997 and April 2000, whose proceedings have been published by CIM.

Due to limitations of space, those interested in participating should register, by sending an e-mail to [jfalves@fc.up.pt](mailto:jfalves@fc.up.pt).

## THEMES

- **The Challenge of Excellence**

Jacob Palis (IMPA)

José Francisco Rodrigues (UL)

Rui Loja Fernandes (IST)

- **Evaluation**

Irene Fonseca (CMU)

José Basto Gonçalves (UP)

- **Mathematical Research in Industry**

Charles Tresser (IBM)

Pedro Lago (UP)

This event will take place at the Pure Mathematics Department, University of Porto.

For more information on this event, please visit the site

<http://www.fc.up.pt/cmup/jfalves/debate/>

## CIM NEWS

### CIM EVENTS FOR 2004

The CIM Scientific Committee, in a meeting held in Coimbra on February 8, approved the CIM scientific program for 2004.

The **Thematic Term** for 2004 will be dedicated to

Mathematics and the Environment. The Organizers- Coordinators are Juha Videman (IST, Lisbon, Portugal) and José Miguel Urbano (University of Coimbra, Portugal).

The list of events is the following:

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SCHOOL AND WORKSHOP ON DYNAMICAL SYSTEMS  
AND APPLICATIONS

3-8 May 2004

Organizers:

José F. Alves, Univ. Porto, Portugal

Marcelo Viana, IMPA, Rio de Janeiro, Brasil

WORKSHOP ON FOREST FIRES

3-5 June 2004

Organizers:

Jorge C. S. André, University of Coimbra, Portugal

José Miguel Urbano, University of Coimbra, Portugal