



# BULLETIN

## INTERNATIONAL CENTER FOR MATHEMATICS

DECEMBER 2005

19

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### COMING EVENTS

#### **January 27-28: Follow-up Workshop Mathematics and the Environment**

##### ORGANIZERS

J. Videman (Technical University of Lisbon), J. M. Urbano (University of Coimbra).

##### AIMS

The objective of the Follow-up Workshop is to assess the impact of the Thematic Term "Mathematics and the Environment", two years after the event. Two

mini symposia are scheduled: "Oceanography, Lakes and Rivers", and "Atmospheric Sciences and Climate Dynamics".

We aim at a rather informal atmosphere to incite the discussion about the different perspectives on the development of the subject in Portugal.

The event will be held at the Observatório Astronómico of the University of Coimbra.

##### INVITED SPEAKERS

for the mini symposia *Oceanography, Lakes and Rivers*:

A. dos Santos (Technical University of Lisbon)

for the mini symposia *Atmospheric Sciences and Climate Dynamics*: J. Teixeira (NATO Undersea Research Centre, La Spezia, Italy)

For more information about the event, see

[www.cim.pt/wme2006](http://www.cim.pt/wme2006)

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## **April 10-12: Aveiro Workshop on Graph Spectra**

### ORGANIZERS

D. M. Cardoso (University of Aveiro) (Chairman), R. Cordovil (Technical University of Lisbon), A. L. Duarte (University of Coimbra), C. J. Luz (Politechnical Institute of Setúbal), A. G. de Oliveira (University of Porto).

### AIMS

The theory of graph spectra is now a well established field of research in mathematics and in several applied sciences (e.g. chemistry), and many results have been published over the last few decades. In recognition of the strong developments in the subject, this workshop has been organized as a forum for the many researchers around the world.

The main goals of the workshop are to bring together the leading researchers on graph spectra and related topics, to establish the state of the art, and to discuss recent achievements and challenges. The topics include applications of graph spectra to chemistry and other branches of science.

The members of the Scientific Committee are among the renowned specialists on spectral graph theory who will deliver 10 plenary presentations. Additionally, we have planned a problem session and a few parallel contributions where international experts will be able to present their most recent results.

The event will be held at the Department of Mathematics of the University of Aveiro.

### PLENARY PRESENTATIONS

*Old and new results on algebraic connectivity of graphs*  
N. Abreu (Federal Univ. of Rio de Janeiro, Brazil)

*Spectral radius of tournaments and bipartite graphs*  
R. A. Brualdi (Univ. of Wisconsin, Madison, USA)

*Signless Laplacians of finite graphs*

D. Cvetkovic (Univ. of Belgrade, Serbia & Montenegro)

*Graph Spectra and Graph Isomorphism*

C. Godsil (Univ. of Waterloo, Canada)

*The Laplacian and Cheeger inequalities for directed graphs*

F. C. Graham (Univ. of California, San Diego, USA)

*Generalized adjacency matrices*

W. H. Haemers (Tilburg Univ., The Netherlands)

*Constructing graphs with integral Laplacian spectra*

S. Kirkland (Univ. of Regina, Canada)

*Star complements in finite graphs*

P. Rowlinson (Univ. of Stirling, Scotland)

*Some extremal problems for the eigenvalues of simple graphs*

S. Simic (Univ. of Belgrade, Serbia & Montenegro)

*Spectral characterizations of distance-regular graphs*

E. van Dam (Tilburg Univ., The Netherlands)

For more information about the event, see

[ceoc.mat.ua.pt/conf/graph2006](http://ceoc.mat.ua.pt/conf/graph2006)

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## **June 28-30: Workshop From Lie Algebras to Quantum Groups**

### ORGANIZERS

H. Albuquerque (University of Coimbra), S. Lopes (University of Porto), J. Teles (University of Coimbra).

### AIMS

This workshop will bring together leading specialists in the topics of Lie algebras, quantum groups and related areas. It aims to present the latest developments in these areas as well as to stimulate the interaction between young researchers and established specialists in these fields.

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

### KEYNOTE SPEAKERS

H. Albuquerque (University of Coimbra)

G. Benkart (University of Wisconsin-Madison, USA)

A. Elduque (University of Zaragoza, Spain)

G. Lusztig (Massachusetts Institute of Tech., USA)

S. Majid (University of London, UK)

C. Moreno (University Complutense of Madrid, Spain)

M. Semenov-Tian-Shansky (Univ. Bourgogne, France)

For more information about the event, see

[www.cim.pt/wlaqg](http://www.cim.pt/wlaqg)

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## July 19-21: Mathematics in Chemistry

### ORGANIZERS

J.-C. Zambrini (Univ. of Lisbon), J. M. P. Paixão (Univ. of Lisbon), F. B. Pereira (Univ. of Lisbon).

### AIMS

To identify and discuss research problems in the area of the chemical sciences whose development is strongly dependent on mathematical techniques. To foster the collaboration between leading researchers in chemistry and mathematics.

Chemistry is an exact science since it relies on quantitative models that can be described and applied by using the mathematical language. For instance, the theory of chemical bonding and molecular structure, rates and equilibria of chemical reactions, molecular thermodynamics, relationships involving energy, structure and reactivity, modeling of solvation, are swarming with problems whose solutions require sophisticated mathematical techniques. Mathematics also plays a central role in many areas of “applied” chemistry and chemical engineering. Important examples include atmospheric chemistry, biochemistry, and the broad field of computer simulations. The development of faster and more accurate spectroscopic techniques, the design of molecular devices, biomolecular computers, and of new empirical methods to predict reliable chemical data, and the conception of more efficient chemical reactors are just a few of a vast number of other topics that have strong links to applied mathematics. A closer interaction between chemists and mathematicians may therefore lead to significant progress in many key problems in chemistry. The proposed workshop will foster that interaction since it will identify a number of important research issues which will benefit from a joint effort.

Intended Audience are Researchers and post-graduate students on mathematics or chemical sciences.

The event will take place at Complexo Interdisciplinar of the University of Lisbon

### INVITED SPEAKERS

S. Canuto (University of São Paulo, Brazil)

D. C. Clary (University of Oxford, UK)

I. Fonseca (Carnegie Mellon Univ., Pittsburgh, USA)

J. T. Hynes (Universities of Paris, France, and of Colorado, Boulder, USA)

C. Leforestier (University of Montpellier, France)

J. A. Perdew (University of New Orleans, USA)

P. Piecuch (University of Michigan, USA)

J.-L. Rivail (University of Nancy, France)

M. N. Berberan e Santos (University of Lisbon)

J. A. de Sousa (University of Lisbon)

A. Varandas (University of Coimbra)

M. Viana (IMPA, Rio de Janeiro, Brazil)

H.-J. Werner (University of Stuttgart, Germany)

J. H. Zhang (University of New York, USA)

For more information about the event, see

[www.math-chem.org/home.do](http://www.math-chem.org/home.do)

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## September 4-8: 3rd International Workshop on Mathematical Techniques and Problems in Telecommunications

### ORGANIZERS

A. Navarro (Univ. of Aveiro), C. Rocha (Tech. Univ. of Lisbon), C. Salema (Tech. Univ. of Lisbon).

### AIMS

The goals are three fold. Firstly, to identify and possibly find solutions for a number of mathematical problems in the field of Telecommunications. Secondly 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. Thirdly, to improve mutual understanding and recognition between mathematicians and telecommunication engineers, heavy

users of mathematical techniques in the field of engineering.

The intended audience includes telecommunications engineers, mostly those providing the problems and being introduced to new mathematical tools, and mathematicians, mainly providing solutions and being introduced to real life problems that may influence the direction of their research. A strong participation of young scientists, mainly those attending undergraduate degrees is also expected.

The event will take place at the Polytechnic Institute of Leiria.

#### INVITED SPEAKERS

*Cross-Layer Issues in Wireless Networks*

V. Poor (Princeton University, USA)

*Encryption*

J. Rosenthal (Notre Dame University, USA)

*Mathematical Needs for Behavioural Modelling of Telecommunication Circuits and Systems*

J. C. Pedro (University of Aveiro)

*A multiobjective routing optimisation framework for multiservice networks - a heuristic approach*

J. Craveirinha (University of Coimbra)

*Signal Processing And Compression*

C. Guillemot (INRIA, France)

For more information about the event, see

[www.mtpt.it.pt](http://www.mtpt.it.pt)

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### **September 20-24: Summer School on Mathematics in Biology and Medicine**

#### ORGANIZERS

J. Carneiro, F. Dionísio, G. Gomes, I. Gordo (Gulbenkian Institute of Science, Oeiras).

#### AIMS

The aim of this event is to promote the use of mathematical modelling in biology and medicine. This will be accomplished by bringing some of international experts to give a short course on their area of expertise. The

lecturing team combines researchers with a diversity of backgrounds in mathematics, biology and medicine, who will share their experience with the participants.

The school is aimed at postgraduate students from mathematics, physics, biology or medicine, who are motivated to develop biomathematical research approaches.

The role of mathematical formalisms in providing insight into biological and medical processes became apparent at the beginning of the 20th century. The approach has since increased in popularity, especially during the past 10-20 years. This new phase of expansion is, to a large degree, stimulated by new developments in molecular biology and computation. Appropriate mathematical models are in great demand in many areas of biology.

Given the high stands of mathematical and biomedical research in Portugal, it is disappointing that only a few research groups integrate the two disciplines. This can be promoted by organizing interdisciplinary activities as proposed here.

The school will include a broad range of areas in biology and medicine where mathematical modelling is established. We plan to include six courses covering several research areas such as evolution, populations genetics, epidemiology, population biology, developmental biology and immunology. Each course will consist of three lectures.

The event will take place at the Gulbenkian Institute of Science, Oeiras.

#### SHORT COURSES

*Epidemiology and Population Biology*

S. Levin (Princeton University, USA)

*Immunology*

D. Coombs (University of British Columbia, Vancouver, Canada)

*Developmental Biology*

R. Azevedo (University of Houston, USA)

*Evolutionary Biology*

T. Day (Queens University, Ontario, Canada)

*Population Genetics and Disease Mapping*

G. McVean (University of Oxford, UK)

*Neurobiology*

C. Brody (Cold Spring Harbor, USA)

## OTHER CIM EVENTS IN 2006:

### WORKING AFTERNOONS SPM/CIM

CIM, Coimbra

A joint initiative of the Portuguese Mathematical Society (SPM) and the International Center for Mathematics (CIM). Programme for 2006:

7 January 2006 - [Dynamical Systems](#)

Organizer: José Ferreira Alves (Univ. Porto)

4 March 2006 - [Statistics](#)

Organizer: Paulo Teles (Univ. Porto)

6 May 2006 - [Optimization](#)

Organizer: Domingos Cardoso (Univ. Aveiro)

For more information, see

[www.spm.pt/investigacao/spmcim/spmcim.phtml](http://www.spm.pt/investigacao/spmcim/spmcim.phtml)

## CIM NEWS

### ANNUAL SCIENTIFIC COUNCIL MEETING 2006

Hotel Quinta das Lágrimas, Coimbra

The CIM Scientific Council will meet in Coimbra on February 11, to discuss the CIM scientific programme for 2007.

Timetable:

10:30-16:30 Scientific council working session (with lunch)

17:00 J. M. Martínez (State Univ. of Campinas, Brazil),  
*Lower-sum order-value optimization*

18:30 E. Zuazua (Univ. Autónoma de Madrid, Spain),  
*Propagation, dispersion, control, numerical approximation of waves*

20:00 Dinner

For the detailed programme and registration, see

[www.cim.pt/?q=cscam06](http://www.cim.pt/?q=cscam06)

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### MEETING OF THE GENERAL ASSEMBLY OF CIM

The General Assembly of CIM will meet on May 20, 2006 in the CIM premises at the Astronomical Observatory of the University of Coimbra. The members of the General Assembly will also have the opportunity to attend two talks in that same day. We shall report on this in the next number of the Bulletin.

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## RESEARCH IN PAIRS AT CIM

CIM has facilities for research work in pairs and welcomes applications for their use for limited periods.

These facilities are located at Complexo do Observatório Astronómico in Coimbra and include:

- office space, computing facilities, and some secretarial support;
- access to the library of the Department of Mathematics of the Univ. of Coimbra (30 minutes away by bus);
- lodging: a two room flat.

At least one of the researchers should be affiliated with an associate of CIM, or a participant in a CIM event.

Applicants should fill in the electronic application form in [www.cim.pt/?q=research](http://www.cim.pt/?q=research)

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## PAST EVENTS - SCIENTIFIC REPORTS

### CIM THEMATIC TERM ON OPTIMIZATION

#### Scientific Report

##### **Workshop on Optimization in Finance (Coimbra, July 5-8, 2005)**

The Workshop on Optimization in Finance was the first of four optimization events of the CIM 2005 Thematic Term on Optimization. It took place in the Faculty of Economics of the University of Coimbra, during July 5–8, 2005. The total number of participants was 84 (and among those there were 22 Portuguese).

Optimization is one of the mathematical tools most frequently used by practitioners in Finance. Also, Optimization in Finance is an area of intense academic research. This workshop has covered most of the relevant topics in Optimization in Finance and brought to Coimbra a significant number of the best researchers in the field.

The workshop started with a short course in the first day, consisting of two lectures:

- *Optimization Problems in Pricing and Hedging Options*, by S. Herzel (Univ. Perugia, Italy) — 2h30m,
- *Robust Optimization in Finance*, by R. H. Tütüncü (Carnegie Mellon Univ., USA) — 2h30m.

There were six plenary lectures of 45m given by the following invited speakers:

- J. R. Birge (Northwestern Univ., USA),
- J. M. Mulvey (Princeton Univ., USA),
- R. T. Rockafellar (Univ. of Washington, USA),
- N. Touzi (CREST, France),
- S. Uryasev (Univ. of Florida, USA),
- S. A. Zenios (Univ. of Cyprus, Cyprus).

For a meeting of this type, there was a large number (42) of 30m contributed talks, divided in two streams

of parallel sessions. The number of submissions was so high and unexpected that a considerable number of talks had unfortunately to be rejected. Among the overall 14 sessions, 6 were especially organized by A. Consiglio (Univ. Palermo, Italy), R. H. Tütüncü (Carnegie Mellon Univ., USA), H. Pham (Univ. Paris 7, France), M. Pinar (Univ. Bilkent, Turkey), and L. Zuluaga (Univ. New Brunswick, Canada).

The organizing committee was formed by A. M. Monteiro (Fac. de Economia, Univ. Coimbra, Portugal), R. H. Tütüncü (Carnegie Mellon Univ., USA), and L. N. Vicente (Dep. Matemática, Univ. Coimbra, Portugal).

##### **Summer School on Algebraic and Geometric Approaches to Integer Programming (Lisbon, July 11-15, 2005)**

The second event of the CIM 2005 Thematic Term on Optimization was the Summer School on Algebraic and Geometric Approaches to Integer Programming, which took place in the campus of the Faculty of Sciences of the University of Lisbon, during July 11–15, 2005.

The school was composed by 5 short courses (reaching a total of 33h), given by the following well-known invited lecturers:

- Alexander Barvinok (Univ. Michigan, USA): *Generating Functions for Lattice Points* (6h).
- Gerard Cornuéjols (Carnegie Mellon Univ., USA): *Geometric Approaches to Cutting Plane Theory* (8h).
- Friedrich Eisenbrand (Max-Planck-Institut, Germany): *Fast Algorithms for Integer Programming in Fixed Dimension* (6h).
- Jesus De Loera (Univ. California, Davis, USA): *Experimenting and Applying the Rational Function Method: A LattE Tutorial* (1,5h) and *Transportation Polytopes: Structure, Algorithms, and Applications to Optimization and Statistics* (4,5h).