

Research Report 2008  
Department of Mathematics  
Instituto Superior Técnico  
Portugal

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## Preface

The Department of Mathematics regards the annual publication of this research report as an important instrument of scientific policy. On the eighteenth year of its publication we reassert the original goals. The report fulfills simultaneously two complementary purposes. Internally, it highlights the research publications by department members and their involvement in international scientific exchange as a public statement of the importance we attach to them. Externally, it provides information to interested people outside the department about our current research work. Reflecting the scientific activity developed by its members, the research report is a helpful way of assessing the level of achievement of the objectives embraced by the department. These include the pursuit of internationalization as a way to achieve recognition as a mathematics research department.

The Department of Mathematics has at present 107 members holding Ph.D. degrees and is the largest mathematics department in the country. All information regarding the department and its own graduate and undergraduate programs is available through the Internet (<http://www.math.ist.utl.pt>).

The department experienced a fast development since it embraced the goal of becoming a research department more than 20 years ago. Its members obtained Ph.D. degrees from a diversified group of leading universities in mathematics while their relative youth accounts for an energetic environment and provides a good opportunity for innovative and challenging research projects. New challenges and opportunities arose with the collaboration agreements between the Portuguese Government and the Carnegie Mellon University, University of Texas at Austin, École Polytechnique Fédérale de Lausanne of which the Mathematics Department is a partner. We believe that these agreements will increase the internationalization of research and post-graduate programs.

The research units associated with the Department of Mathematics are subjected regularly to external international reviews within the overall Research Units Assessment scheme established by the Science and Technology Foundation, the public agency responsible for promoting, funding and evaluating research in Portugal. These research units are highly rated, which is a recognition of the high international value of the research performed. The organization of this report reflects the activities of the research units associated with the department, and, therefore, we have decided to include in this Report, without any change, their annual reports. This is supplemented with a report describing the activities of members of the Department of Mathematics not currently members of these research units.

We would like to thank everyone who was involved in the organization of this issue. We are particularly grateful to Margarida Silva Carvalho for her work in the compilation of information and LATEX processing of this issue.

## 1 Organization and activities

The research activity of the Department of Mathematics is developed in the following scientific areas: Algebra and Topology; Differential Equations and Dynamical Systems; Geometry; Logic and Computation; Probability and Statistics; Mathematical-Physics; Numerical Analysis and Applied Analysis; Real Analysis and Functional Analysis.

### 1.1 Research units

There are four research units currently associated with the department:

- Security and Quantum Information Group of IT (SQIG), coordinated by Paulo Mateus.  
URL: <http://sqig.math.ist.utl.pt/>
- Center for Mathematical Analysis, Geometry, and Dynamical Systems, coordinated by Carlos Rocha.  
URL: <http://camgsd.math.ist.utl.pt/>
- Center for Mathematics and its Applications (CEMAT), coordinated by António Pacheco.  
URL: <http://cemat.ist.utl.pt/>
- Center for Functional Analysis and Applications (CEAF), coordinated by A. Ferreira dos Santos.  
URL: <http://ceaf.ist.utl.pt/>

### 1.2 Research seminars

During 2008 there were in the department regular sessions of the following seminars:

- Seminar on Algebra (7 sessions).  
Organizers: Gustavo Granja.
- Seminar on Analysis, Geometry, and Dynamical Systems (10 sessions).  
Organizer: Luís Barreira.
- Seminar on Applied Mathematics and Numerical Analysis (23 sessions).  
Organizer: Pedro Lima.
- Seminar on Functional Analysis and Applications (23 sessions).  
Organizer: Frank-Olme Speck.
- Seminar Geometria em Lisboa, (25 sessions).  
Organizer: Carlos Florentino.
- Seminar on Logic and Computation (16 sessions).  
Organizer: Carlos Caleiro and João Rasga
- Seminar on Mathematics, Systems and Robotics, in collaboration with ISR (2 sessions).  
Organizers: Diogo Gomes and João Xavier (ISR).
- Seminar on Probability and Statistics (11 sessions).  
Organizer: António Pacheco Pires.
- Seminar on Quantum Computation and Information (12 sessions), in collaboration with the Department of Physics.  
Organizer: Ana Maria Martins (Department of Physics) and Paulo Mateus.

- Seminar on Topological Quantum Field Theory Club (8 sessions).  
Organizers: José Mourão and Roger Picken.

**Colloquium:** the department also runs a Colloquium, jointly sponsored by the associated research units, with 4 sessions in 2008. The organizer was Margarida Baía.

### 1.3 Academic Degrees Awarded in 2008

#### Doutoramentos/Ph.D.'s

- Pedro Ricardo Simão Antunes, Doutoramento em Matemática, Instituto Superior Técnico, Universidade Técnica de Lisboa, 12.12.2008. Thesis: *The Method of Fundamental Solutions Applied to Eigenproblems*. Supervisor: Carlos José dos Santos Alves, D.M., I.S.T.
- João Paulo Vicente Janela, Doutoramento em Matemática, Instituto Superior Técnico, Universidade Técnica de Lisboa, 11.12.2008. Thesis: *Mathematical and Numerical Modelling in Hemodynamics and Hemorheology*. Supervisor: Adélia Sequeira dos Ramos Silva, D.M., I.S.T.
- Svilen Stanimirov Valtchev, Doutoramento em Matemática, Instituto Superior Técnico, Universidade Técnica de Lisboa, 5.12.2008. Thesis: *Numerical Analysis of Methods with Fundamental Solutions for Acoustic and Elastic Wave Propagation Problems*. Supervisor: Carlos José dos Santos Alves, D.M., I.S.T.
- Misha Clarence Lewis Protin, Doutoramento em Matemática, Instituto Superior Técnico, Universidade Técnica de Lisboa, 5.11.2008. Thesis: *Quantales de Grupóides Abertos*. Supervisor: Pedro Manuel Resende, D.M., I.S.T.
- Paulo José Fernandes Louro Ribeiro Doutor, Doutoramento em Matemática, Instituto Superior Técnico, Universidade Técnica de Lisboa, 31.10.2008. Thesis: *Formalismo Termodinâmico e Análise Multifractal*, Supervisor: Luís Manuel Gonçalves Barreira, D.M., I.S.T.
- Ricardo João Rodrigues Gonçalves, Doutoramento em Matemática, Instituto Superior Técnico, Universidade Técnica de Lisboa, 26.09.2008. Thesis: *Behavioral Algebraization of Logics*, Supervisor: Carlos Caleiro, D.M., I.S.T.

#### Mestrados/M.A's/M.S.c.'s

- Bartolomeu André Rodrigues Fernandes Rabaçal, Mestrado em Matemática e Aplicações, Instituto Superior Técnico, Universidade Técnica de Lisboa, 22.12.2008. Thesis: *Análise Discriminante com Restrições na Estrutura de Covariâncias*. Supervisor: Isabel Maria Alves Rodrigues, D.M., I.S.T.
- Carla Sofia Coelho Ribeiro Miranda, Mestrado em Matemática e Aplicações, Instituto Superior Técnico, Universidade Técnica de Lisboa, 15.12.2008. Thesis: *Regressão Linear Múltipla com Erros Arma*, Supervisor: Ana Maria Pires de Melo Parente, D.M., I.S.T.
- Ausenda Filipa Rosa Pires, Mestrado em Matemática e Aplicações, Instituto Superior Técnico, Universidade Técnica de Lisboa, 13.11.2008. Thesis: *Valor prognóstico da citometria de fluxo ADN no carcinoma do colo do útero*, Supervisor: Giovanni Loiola da Silva, D.M., I.S.T.
- Daniela Filipa Gonçalves Pamplona, Mestrado em Matemática e Aplicações, Instituto Superior Técnico, Universidade Técnica de Lisboa, 6.11.2008. Thesis: *Gaussian foveation*, Supervisor: Alexandre Jose Malheiro Bernardino, DEEC, I.S.T.

- Maria Raquel Bengelsdorff Regueiras Neto, Mestrado em Matemática e Aplicações, Instituto Superior Técnico, Universidade Técnica de Lisboa, 24.10.2008. Thesis: *O Conceito de Profundidade em Estatística*, Supervisor: João António Branco, D.M., I.S.T.
- Inês Estrela Oliveira, Mestrado em Matemática e Aplicações, Instituto Superior Técnico, Universidade Técnica de Lisboa, 23.10.2008. Thesis: *Um método de soluções fundamentais aplicado ao tratamento de imagem*, Supervisor: Carlos Alves, D.M., I.S.T.
- Teresa Maria Fazenda Risso, Mestrado em Estatística, Instituto Superior Técnico, Universidade Técnica de Lisboa, 13.10.2008. Thesis: *Regressão Logística Multinomial e ordinal*, Supervisor: Ana Pires Parente, D.M., I.S.T.
- Sílvia Quina Nobre, Mestrado em Estatística, Instituto Superior Técnico, Universidade Técnica de Lisboa, 24.07.2008. Thesis: *First Passage Times in Ito Processes Considering a Jump Scenario: Applications in Finance*, Supervisor: Claudia Rita Ribeiro Coelho Nunes Philippart, D.M., I.S.T.
- Rui Miguel Coutinho Palma, Mestrado em Matemática e Aplicações, Instituto Superior Técnico, Universidade Técnica de Lisboa, 18.07.2008. Thesis: *Produtos Cruzados  $C^*$ . Invertibilidade numa álgebra de Operadores Funcionais*, Supervisor: Maria Amélia Bastos, D.M., I.S.T.
- Eduardo Carrilho Jordão do Rosário Monteiro, Mestrado em Matemática e Aplicações, Instituto Superior Técnico, Universidade Técnica de Lisboa, 7.06.2008. Thesis: *Correspondência de Galois não-comutativa*, Supervisor: Paulo Jorge da Rocha Pinto, D.M., I.S.T.
- Maria Dolores Silvério Diogo, Mestrado em Matemática e Aplicações, Instituto Superior Técnico, Universidade Técnica de Lisboa, 24.3.2008. Thesis: *Teorema da Passagem da Montanha e suas Aplicações*, Supervisor: Maria João Simões Nunes Borges, D.M., I.S.T.

## New Positions

- Rui Loja Fernandes, Professor Catedrático

## 2 Appendices

- CAMGSD Research Report, see in <http://camgsd.math.ist.utl.pt/report2007.pdf>
- CEMAT Research Report
- CEAF Reserach Report
- SQIG Research Report
- Other Units



**Center for Mathematical Analysis,  
Geometry, and Dynamical Systems**

# **Report 2008**

**April 2009**

## Conteúdo

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# 1 Visitors

The following researchers visited the Center in 2008:

- L. Alvarez-Consul, CSIC, Spain, 26–28.5.08.
- T. Arnarson, KTH, Sweden, 22–24.05.08.
- J. Baez, Univ. California at Riverside, USA, 13–16.07.08.
- L. Bakker, Brigham Young Univ., Salt Lake City, USA, 23–29.06.08.
- J. Baptista, Univ. Amsterdam, The Netherlands, 22.07.08.
- J. Boehm, Univ. Saarland at Saarbrücken, Germany, 26.08–2.09.08.
- H. Bursztyn, IMPA, Brazil, 14.07–14.08.08.
- S. Calogero, Univ. Minho, Portugal, 28–29.02.08.
- B. Chorny, Australian National Univ., Australia, 25.02–1.03.08.
- L. Crane, Kansas State Univ., USA, 21–25.09.08.
- R. Czaja, Univ. Silesia, Katowice, Poland, 24.1–4.02.08.
- S. Elaydi, Trinity Univ., USA, 1–15.07.08.
- R. El Harti, Univ. Hassan I, Morocco, 23.05–6.06.08.
- M. Fernandez, Fac. Ciência y Tecnologia, Spain, 17–26.01.08.
- C. Fernández, Academia Militar, Portugal, 12.2.08.
- S. Ferreira, Instituto Politécnico de Leiria, Portugal, 8–13.09.08.
- O. García-Prada, CSIC, Madrid, Spain, 6–9.10.08.
- D. Gepner, Univ. Sheffield, UK, 15–22.07.08.
- T. Gharibyan, Armenian National Academy of Sciences, Armenia, 3.11–3.12.08.
- P. Gothen, Univ. Porto, Portugal, 6–9.10.08.
- S. Gutenberg, Athens, Greece, 13–21.09.08.
- J.-C. Hausmann, Univ. Genève, Switzerland, 16–18.7.08.
- R. Hepworth, Univ. Sheffield, UK, 12–18.07.08.
- R. Hric, Matej Bel Univ. and Slovak Academy of Sciences, Banská Bystrica, Slovakia, 3–20.06.08.
- D. Iglesias, CSIC, Madrid, Spain, 9–14.11.08.
- F. Incensi, Univ. Bologna, Italy, 3.4.08.
- A. Kapustin, California Institute Tech., USA, 7–14.09.08.
- L. Kauffman, Univ. Illinois at Chicago, USA, 12–16.07.08.
- M. Lawson, Heriot-Watt Univ., UK, 31.03–6.04.08.

K. Lesh, Union College, USA, 1–2.07.08.  
 C. Liedtke, Univ. Düsseldorf, Germany, 31.08–7.09.08.  
 P. Lima-Filho, Texas A&M Univ., USA, 6–18.07.08.  
 R. Loll, Utrecht Univ., The Netherlands, 9–12.07.08.  
 A. Lopes, Univ. Federal Rio Grande do Sul, Brazil, 29.12.08–19.01.09.  
 O. Lopes, IMECC, Univ. Campinas, Brazil, 10–22.02.08.  
 L. Macarini, Univ. Federal Rio de Janeiro, Brazil, 15.7.08.  
 D. Marciniak, Mathematical Institute of the Polish Academy of Sciences, Poland, 7–27.07.08.  
 D. Martinez Torres, Utrecht Univ., The Netherlands, 23–26.03.08.  
 J. Mohr, Univ. Federal do Rio Grande do Sul, Brazil, 3.01–1.02.08.  
 C. Mulvey, Univ. Sussex, UK, 3–15.11.08.  
 J. Nelson, Univ. Torino, Italy, 16–20.06.08, 19–25.09.08, 10–14.11.08.  
 A. Oliveira, Univ. Porto, Portugal, 8–13.09.08.  
 S. Pasquetti, CERN, Switzerland, 10–15.09.08.  
 R. Pardini, Univ. Pisa, Italy, 21–24.01.08.  
 I. Parissis, KTH, Stockholm, Sweden, 20.11–7.12.08.  
 G. Pezzini, Univ. Basel, Switzerland, 28–31.01.08.  
 R. Pignatelli, Univ. Trento, Italy, 7–17.06.08.  
 T. Porter, Univ. Wales, Bangor, UK, 23.11–6.12.08.  
 F. Presas, CSIC, Madrid, Spain, 24–29.11.08.  
 S. Ramanan, Chennai Math. Inst. India, 11–13.06.08.  
 R. Reis, Univ. of Aberdeen, UK, 29.7.08.  
 J. Rocha, CENTRA, Lisboa, Portugal, 17.11.09.  
 C. Rito, UTAD, Vila Real, Portugal, 2.12.08.  
 H. van Roessel, Univ. Alberta, Edmonton, Canada, 21–27.09.08.  
 N. Romão, Aarhus Univ., Denmark, 30.09–1.10.08.  
 S. Sabatini, MIT, USA, 10–13.11.08.  
 D. Salamon, ETH Zürich, Switzerland, 17–26.1.08.  
 B. Simões, Univ. Lisbon, Lisboa, Portugal, 9.12.08.  
 H. Shahgolian, KTH, Stockholm, Sweden, 22–26.11.08.  
 H. Soares, ISCTE, Lisboa, Portugal, 21.10.08.  
 R. Souza, Univ. Federal do Rio Grande do Sul, Brazil, 3.01–1.02.08.

J. Sparks, Univ. Oxford, UK, 7–13.09.08.  
 I. Stubbe, Univ. Antwerp, Belgium, 4–6.11.08.  
 I. Struchiner, Unicamp, Brazil, 29.06–23.07.08.  
 M. Szamotulski, Mathematical Institute of the Polish Academy of Sciences, Poland, 7–27.07.08.  
 T. Thiemann, Max-Planck Inst. für Gravitationsphysik, Golm, Germany, 9–13.07.08.  
 C. Tomei, PUC, Rio de Janeiro, Brazil, 10–16.02.08.  
 H. Uehara, Tokyo Metropolitan Univ. Japan, 21–26.07.08.  
 H. van Rosset, Univ. of Alberta, Edmonton, Canada, 21–27.09.08.  
 P. Vieira, Max-Planck Inst. für Gravitationsphysik, Germany, 23–25.11.08.  
 J. Wattis, Univ. Nottingham, UK, 20–25.04.08.  
 J. Wood, Univ. Leeds, UK, 8.05.08.  
 M. Zambon, Centre de Recerca Matemàtica, Spain, 27–30.7.08.  
 G. Zoupanos, National Tech. Univ., Greece, 4–13.03.08.

## 2 Seminars

**Analysis, Geometry, and Dynamical Systems Seminar.** This is the main seminar of the Center. It included the following talks in 2008:

- Ioannis Parissis (KTH, Stockholm) Logarithmic dimension bounds for the maximal function along a polynomial curve, 2/12/08.
- Henry van Roessel (Univ. Alberta, Edmonton), Some exact solutions to the coagulation equation, 23/9/08.
- Roman Hric (Matej Bel Univ. and Slovak Academy of Sciences, Banská Bystrica), Dense orbits and some misunderstandings around them, 17/7/08.
- Lennard Bakker (Brigham Young Univ., Salt Lake City), The conjugacy problem for torus automorphisms, 24/6/08.
- Rachid El Harti (Univ. Hassan I, Morocco), On Pro-C\*-algebras, 5/6/08.
- Jonathan Wattis (Univ. Nottingham), The effects of grinding chiral crystals and similarity solutions of Becker–Döring equations, 22/4/08.
- Orlando Lopes (IMECC, Univ. Campinas), Simetria radial de minimizadores de problemas variacionais com termos não locais, 15/2/08.

- Carlos Tomei (PUC, Rio de Janeiro), The subtle convergence of Wilkinson’s method, 12/2/08.
- Rafael Souza (Univ. Federal do Rio Grande do Sul), Stationary Markov chains on  $[0, 1]$  that maximize a potential: unicity and an L.D.P., 29/1/08.
- Joana Mohr (Univ. Federal do Rio Grande do Sul), Large deviation principle for the Mather measure, 24/1/08.

**Algebra Seminar.** This included the following talks in 2008:

- David Gepner (Univ. Sheffield), On the motivic spectra representing algebraic K-theory and algebraic cobordism, 21/7/08.
- Sean Lawton (CAMGSD), Algebraic independence in  $SL(3, \mathbb{C})$ -character varieties of free groups, 15/7/08.
- Paulo Lima-Filho (Texas A&M Univ.), Deligne cohomology and the Picard–Witt group of real varieties, 10/7/08.
- Kathryn Lesh (Union College), An interesting filtration of  $bu$  and an analogue of the Whitehead Conjecture, 2/7/08.
- Pedro Ferreira dos Santos (IST), A model for equivariant Eilenberg–Mac Lane spectra, 19/6/08.
- Stavros Papadakis (CAMGSD), An introduction to the McKay correspondence, 6/3/08.
- Boris Chorny (Australian National Univ.), Smallness in a model category and smallness in the homotopy category, 28/2/08.

**“Geometria em Lisboa” Seminar.** This included the following talks in 2008:

- Rosa Sena Dias (IST), Spectral measures and algebraic metrics on toric manifolds, 18/12/08.
- Bruno A. Simões (Univ. Lisbon), Explicit constructions of harmonic maps into the unitary group, 9/12/08.
- Carlos Rito (Univ. Trás-os-Montes e Alto Douro, Vila Real), Involutions on surfaces with  $p_g = q = 1$ , 2/12/08.
- Francisco Presas (CSIC, Madrid), Non-fillability versus non-squeezing in contact geometry, 25/11/08.

- David Iglesias (CSIC, Madrid), Courant morphisms and moment maps, 13/11/08.
- Silvia Sabatini (MIT), Equivariant cohomology of Hamiltonian  $T$ -spaces and equivariant fiber bundles, 11/11/08.
- Thomas Baier (IST), (Tropical) amoebas in moment polytopes, 4/11/08.
- Helena Soares (ISCTE, Lisboa), On the stability of some exceptional bundles, 21/10/08.
- Peter B. Gothen (Univ. Porto), Deformations of maximal representations of surface groups, 8/10/08.
- Oscar García-Prada (CSIC, Madrid), Higgs bundles and representations of surface groups, 7/10/08.
- Christian Liedtke (Düsseldorf Univ., Germany), Non-classical Godeaux surfaces, 4/9/08.
- Henrique Bursztyn (IMPA), Generalized reduction and super geometry, 17/7/08.
- Jean-Claude Hausmann (Univ. Genève), Simple Hamiltonian manifolds, 17/7/08.
- Leonardo Macarini (Univ. Federal Rio de Janeiro), Symplectically convex and non-convex hypersurfaces in cotangent bundles, 15/7/08.
- Richard Hepworth (Univ. Sheffield), Orbifold Morse theory, 8/7/08.
- Bruno de Oliveira (Univ., Miami), Symmetric differentials, webs and the geometry of surfaces, 17/6/08.
- Sundararaman Ramanan (Chennai Math. Inst.), Algebraic geometric understanding of the fundamental group through Higgs pairs, 12/6/08.
- Luís Álvarez-Cónsul (CSIC, Madrid), Moduli of sheaves from moduli of Kronecker modules, 27/5/08.
- John C. Wood (Univ. Leeds and Gulbenkian visiting Professor, Univ. Lisbon), Harmonic morphisms between Riemannian manifolds, 8/5/08.
- Francesca Incensi (Univ. Bologna), GIT quotients of products of projective planes, 3/4/08.
- David Martínez Torres (Utrecht Univ.), Boothby–Wang contact structures and hyperplane sections, 25/3/08.

- Margarida Mendes Lopes (IST), The algebraic fundamental group of surfaces with small  $c_1^2$ , 19/2/08.
- César Rodrigo Fernández (Academia Militar), First and second variation for variational problems with PDE constraints, Hamiltonian approach, 12/2/08.
- Guido Pezzini (Univ. Basel), Automorphisms of wonderful varieties, 29/1/08.
- Dietmar Salamon (ETH, Zürich), Nonlinear Hardy spaces and stable maps, 21/1/08.
- Rogier Bos (CAMGSD), A momentum map for symplectic fibrations, 15/1/08.

**Mathematical Physics Seminar.** This included the following talks in 2008:

- Pedro Girão (IST), Spherically symmetric self-gravitating scalar field, 29/2/08.
- Simone Calogero (Univ. Minho), Dynamics of Bianchi I elastic space-times, 29/2/08.

**Mathematics, Systems and Robotics Seminar.** In collaboration with Instituto de Sistemas e Robótica. It included the following talks in 2008:

- Ricardo Ferreira (IST), Reconstruction of a 2d flat manifold from isometrically embedded 3d features, 9/5/08.
- Margarida Mendes Lopes (IST), What is an algebraic surface?, 9/5/08.
- José Rodrigues (Instituto de Sistemas e Robótica), An analytic signature for permutation-invariant two-dimensional shape representation, 4/4/08.
- Gabriel Pires (IST), A geometric view of hybrid systems, 4/4/08.

**String Theory Seminar.** This included the following talks in 2008:

- *Video Talk:* Marcos Mariño, Phase transition in topological string theory, 15/12/08.
- Pedro Vieira (Max-Planck-Institut für Gravitationsphysik, Potsdam), Squeezed Integrability, 24/11/08.

- Jorge Rocha (CENTRA), Evaporation of large black holes in anti-de Sitter, 17/11/08.
- Marcel Vonk (CAMGSD), Field theory structures in string theory amplitudes, 10/11/08.
- *Video talk*: Robbert Dijkgraaf, Mathematics and the quantum universe, 3/11/08.
- Paulo Pires Pacheco (CAMGSD), (Exceptional) Generalised geometry, 27/10/08.
- *Video Talks*: Leonardo Rastelli / Wati Taylor, Progress in open string field theory / Computing tree and loop amplitudes in string field theory, 20/10/08.
- Daniel Gomez Vergel (Instituto de Estructura de la Materia, Madrid), Axiomatic structure of quantum mechanics, 13/10/08.
- *Video talks*: Hiroshi Ooguri / Sir Michael Atiyah, Worldsheet derivation of a large  $N$  duality / Twisted K-theory and physics, 6/10/08.
- Nuno Romão (Univ. Aarhus), Spectral data of singular monopoles, 1/10/08.
- Sebastian Guttenberg (Demokritos National Research Center, Greece), Pure spinor string in general background, 15/9/08.
- Sara Pasquetti (CERN), Modularity of the remodeled open topological string, 10/9/08.
- Rui Reis (Univ. Aberdeen), K-homology and  $D$ -branes, 29/7/08.
- João Baptista (Univ. Amsterdam), The quantum equivariant cohomology of toric manifolds, 22/7/08.

**Topological Quantum Field Theory Club.** This included the following talks in 2008:

- Tim Porter (Univ. Wales, Bangor), The “crossed” technology and its applications IV, 4/12/08.
- Tim Porter (Univ. Wales, Bangor), The “crossed” technology and its applications III, 4/12/08.
- Tim Porter (Univ. Wales, Bangor), The “crossed” technology and its applications II, 3/12/08.

- Tim Porter (Univ. Wales, Bangor), The “crossed” technology and its applications I, 3/12/08.
- John Baez (Univ. California at Riverside), Topological 2-groups and their classifying spaces, 14/7/08.
- Louis Kauffman (Univ. Illinois at Chicago), Virtual knot theory, 14/7/08.
- George Zoupanos (National Tech. Univ., Athens), Dimensional reduction of gauge theories over continuous and fuzzy coset spaces, 12/3/08.
- Atle Hahn (Math. Phys. Group, Univ. Lisbon),  
From the Chern–Simons path integral to the Reshetikhin–Turaev invariant, 5/3/08.

**Working Seminar on Contact/Symplectic Topology/Geometry.** This included the following talks in 2008:

- Pedro Frejlich (CAMGSD), The  $h$ -principle, four sessions on 28/02/08, 6/03/08, 13/03/08 and 27/03/08.
- Miguel Abreu (IST), Toric Kähler and Sasakian geometries in action-angle coordinates, four sessions on 1/04/08, 8/04/08, 15/04/08 and 17/06/08.
- Flávio Cordeiro (Univ. Coimbra), The Maslov Index - linear and non-linear, three sessions on 22/04/08, 29/04/08 and 06/05/08.
- Bart Van Steirteghem (CAMGSD), Invariant Kähler structures on multiplicity free Hamiltonian manifolds and spherical varieties (after Woodward and Losev), 13/05/08.
- Oana Dragulete (CAMGSD), Quotients of Kähler and Sasakian manifolds, two sessions on 27/05/08 and 12/06/08.

**Working Seminar on Groupoids and Noncommutative Geometry.** This included the following talks in 2008:

- Olivier Brahic (CAMGSD), Extensions of Lie algebroids, two sessions on 23/10/08 and 30/10/08.
- Pedro Frejlich (CAMGSD), Classification of foliations on open manifolds, 11/6/08.
- Olivier Brahic (CAMGSD), Integration of coupling Dirac structures, two sessions on 8/4/08 and 15/4/08.
- Mark Lawson (Heriot-Watt Univ.), The category action approach to inverse semigroups, 1/4/08.



**Working Seminar on Topos/Quantum Theory.** This included the following talks in 2008:

- Pedro Resende (IST), Toposes as spaces, four sessions on 9/10/08, 14/10/08, 21/10/08, and 6/11/08.
- José Mourão (IST), Path integrals, 20/11/08.

**Other seminars.** The Center has also contributed to activities of the Department of Mathematics of IST and of other research centers, in particular providing partial support to the Colloquium of the Department of Mathematics and to the Quantum Information and Computation Seminar of the Security and Quantum Information Group of Instituto de Telecomunicações.

### 3 Conferences and short courses

The following Conferences and Short Courses were organized or co-organized by members of the Center in 2008:

#### **MIT Women in Mathematics: A Celebration**

*MIT, USA, April 12–13, 2008*

*Organizers:* Bonnie Berger, Lenore Blum, Susan Colley, Ana Cannas Da Silva, Susan Landau, Gigliola Staffilani, Katrin Wehrheim.

*Plenary speakers:*

- Bonnie Berger (MIT)
- Lenore Blum (Carnegie Mellon Univ.)
- Ioana Dumitriu (Univ. Washington)
- Tara Holm (Cornell Univ.)
- Margaret Murray (Univ. of Iowa and ACT, Inc.)
- Linda Rothschild (Univ. California at San Diego)
- Brooke Shipley (Univ. Illinois at Chicago)
- Lauren Williams (Harvard Univ.)

<http://math.mit.edu/womeninmath/>

## **First AMS-SBM Joint Meeting: Special Session “Low Dimensional Topology”**

*IMPA, Rio de Janeiro, Brazil, June 4–7, 2008*

*Organizers:* Louis Kauffman, Pedro Lopes.

*Main speakers:*

- Natália Bedoya (Univ. São Paulo)
- Rui Carpentier (IST)
- Scott Carter (Univ. South Alabama)
- Leonardo Carvalho (Univ. Federal Fluminense)
- Zsuzsanna Dancso (Univ. Toronto)
- Mohamed Elhamdadi (Univ. South Florida)
- Ji Gao (Community College of Philadelphia)
- Daciberg Lima Gonçalves (Univ. São Paulo)
- Hugh Hilden (Univ. Hawaii)
- Pedro Lopes (IST)
- Nathan Moreira dos Santos (Univ. Federal Fluminense)
- Fernando Souza (Univ. Federal Pernambuco)

<http://w3.impa.br/~amssbm/>

## **XVII<sup>th</sup> Oporto Meeting on Geometry, Topology and Physics**

*Oporto, Portugal, July 10–13, 2008*

*Organizers:* Miguel Costa, Carlos Herdeiro, Marco Mackaay, José Mourão, Roger Picken, João Nuno Tavares.

*Main speakers:*

- Ali Chamseddine (American Univ. Beirut & IHES)
- Steven Giddings (Univ. California, Santa Barbara)
- Renate Loll (Utrecht Univ.)
- Thomas Thiemann (Max-Planck Inst. für Gravitationsphysik, Golm)

<http://faraday.fc.up.pt/omgtp2008/textoom05.html>

## **GAP VI — Workshop on Geometry and Physics**

*CRM-Barcelona, 16–21 July, 2008*

*Coordinators:* Carlos Currás-Bosch, Rui Loja Fernandes, David Iglesias,  
Eva Miranda, San Vu Ngoc, Ping Xu.

*Plenary speakers:*

- Yves Colin de Verdière (Institut Fourier)
- Johannes Duistermaat (Univ. Utrecht)
- Hakan Eliasson (Institut de Mathématiques de Jussieu)
- San Vu Ngoc (Univ. Rennes)

<http://www.crm.cat/GAPVI/>

## **IX Lisbon Summer Lectures in Geometry**

*IST, Portugal, September 8–12, 2008*

*Organizing committee:* José Mourão, João P. Nunes, Ricardo Schiappa.

*Lecturers:*

- Anton Kapustin (California Institute Tech.)
- James Sparks (Mathematical Institute, Univ. Oxford)

<http://www.math.ist.utl.pt/galg/SummerLect08/>

## **1st ICTI Workshop CMU-Portugal Program in Mathematics — New Developments in PDE and Calculus of Variations**

*Kos, Greece, 16–20 September 2008*

*Organizers:* Ana Barroso, Irene Fonseca, Luísa Mascarenhas, José Matias.

*Speakers:*

- Irene Fonseca (Carnegie Mellon Univ.)
- David Kinderlehrer (Carnegie Mellon Univ.)
- Manuel Marques (Univ. Lisbon)
- Kavita Ramanan (Carnegie Mellon Univ.)
- Ana Bela Cruzeiro (IST)
- Luís Trabucho (Univ. Nova Lisboa)
- Adélia Sequeira (IST)

- Pedro Girão (IST)
- Filippo Cagnetti (Postdoc program CMU/Portugal)
- Milena Chermisi (Postdoc program CMU/Portugal)
- Rita Ferreira (PhD program CMU/Portugal)

<http://ferrari.dmat.fct.unl.pt/cva2008/>

### **Minisymposium on Computation and Analysis in Coagulation-Fragmentation Equations**

*Kos, Greece, 16–20 September 2008*

*Organizers:* Fernando P. da Costa, Michael Grinfeld.

*Speakers:*

- Hans Babovsky (Tech. Univ. Ilmenau)
- Luís Bonilla (Univ. Carlos III, Madrid)
- Francis Filbert (Villeurbanne)
- Michael Grinfeld (Univ. Strathclyde, Glasgow)
- Flavius Guias (Tech. Univ. Dortmund)
- Paul Man (Cambridge Univ.)
- Jitendra Kumar (Univ. Magdeburg)
- Rafael Sasportes (Univ. Aberta, Lisboa)
- Henry van Roessel (Univ. Alberta)
- Wilson Lamb (Univ. Strathclyde, Glasgow)

<http://www.maths.strath.ac.uk/~caas05/icnaam/>

### **Second Workshop on Quantum Gravity and Noncommutative Geometry**

*Lisbon, Portugal, September 22–24, 2008*

*Organizing committee:* Roger Picken, Aleksandar Mikovic, João Nuno Prata, Nuno Costa Dias, André Fonseca.

*Main speakers:*

- Orfeu Bertolami (IST)
- Louis Crane (Kansas State Univ.)
- Laurent Freidel (Perimeter Institute)
- Atle Hahn (Math. Phys. Group, Univ. Lisbon)

- Kirill Krasnov (Univ. Nottingham)
- Jerzy Lewandowski (Institute of Theoretical Physics, Warsaw)
- John Madore (Univ. Paris-Sud)
- Pierre Martinetti (Institute for Theoretical Physics, Göttingen)
- Rachel Martins (CAMGSD)
- Guillermo Mena Marugan (IEM, Madrid)
- Jeanette Nelson (Univ. and INFN Torino)
- Branislav Sazdovic (Institute of Physics, Belgrade)
- Harold Steinacker (Univ. Wien)
- Gheorghe Zet (Tech. Univ. Iasi)

<http://eventos.ulusofona.pt/quantum/index.html>

## 4 Invited lectures

The following invited lectures and short courses have been given by members of the Center:

- Miguel Abreu, Toric Kähler–Sasaki geometry in action-angle coordinates, Conference on Moment Maps, Centre de Recerca Matemàtica (CRM), Barcelona, June 25–28, 2008.
- Luís Barreira, Hyperbolicity and recurrence, Facultat de Matemàtiques i Estadística, Universitat Politècnica de Catalunya, Barcelona, April 22, 2008.
- Luís Barreira, Birkhoff’s ergodic theorem: old and new, Departament de Matemàtiques, Universitat Autònoma de Barcelona, September 8, 2008.
- Luís Barreira, Poincaré recurrence: from qualitative to quantitative, Facultat de Matemàtiques, Universitat de Barcelona, September 10, 2008.
- Ana Cannas da Silva, From hermitian matrices to symplectic geometry and back, Colloquium, Bryn Mawr College, February 18, 2008.
- Ana Cannas da Silva, From hermitian matrices to symplectic geometry and back, What’s Happening in Fine Hall? Princeton Univ., April 4, 2008.
- Diogo Gomes, Discrete time finite state space mean field games, Viscosity, Metric and Control Theoretic Methods in Nonlinear PDEs: Analysis, Approximations, Applications, Univ. Roma I, September 3–5, 2008.

- Diogo Gomes, Stationary ergodic Mather problem, ICTI Workshop in Applied Mathematics, FCT-UNL, Costa da Caparica, September 11, 2008.
- Rui Loja Fernandes, Hidden symmetries and Lie's third theorem, Colloquium Dep. de Matemàtiques, Universitat Autònoma de Barcelona, April 16, 2008.
- Rui Loja Fernandes, Stability of symplectic leaves, short course (3 lectures) at GESTA 2008 Meeting, CRM, Barcelona, May 2008.
- Rui Loja Fernandes, Stability of leaves, 9th Conference on Geometry and Topology of Manifolds, Kraków, July 3, 2008.
- Rui Loja Fernandes, Poisson structures of compact type, Poisson 2008, EPFL, Lausanne, July 7–11, 2008.
- Rui Loja Fernandes, Poisson geometry and topology, CSIC, Madrid, September 16, 2008.
- Rui Loja Fernandes, Stability of symplectic leaves, Geometry and Topology Seminar, Univ. Utrecht, November 3, 2008.
- Rui Loja Fernandes, Integrability of Lie algebroids, Department of Mathematics, Indian Institute of Technology, Mumbai, November 21, 2008.
- Rui Loja Fernandes, Stability of symplectic leaves, short course (6 lectures) at Workshop on Topology and Geometry of Foliations, Indian Statistical Institute, Kolkata, November–December 2008.
- Marco Mackaay, The 1,2-coloured HOMFLY-PT link homology, Columbia Symplectic Geometry and Gauge Theory Seminar, Columbia Univ., October 3, 2008.
- Margarida Mendes Lopes, The algebraic fundamental group of surfaces with  $K^2 < 3d$  symplectic 4-manifolds, Univ. Warwick, February 12, 2008.
- Margarida Mendes Lopes, Campedelli surfaces with large fundamental group, WAG Concluding Conference, Univ. Warwick, June 22, 2008.
- Margarida Mendes Lopes, Superfícies algébricas: taxonomia (plenary session), Encontro Nacional da Sociedade Portuguesa de Matemática, Coimbra, June 25–28, 2008.
- Margarida Mendes Lopes, On surfaces with  $p_g = 2q - 3$ , Workshop on Algebraic Surfaces, Centro De Giorgi, Scuola Normale Superiore, Pisa, October 30, 2008.

- Waldyr Oliva, Rolling ball problems, ICMC Summer Meeting in Differential Equations, Univ. São Paulo, São Carlos, January 28, 2008.
- Roger Picken, A quantum Goldman bracket in  $2 + 1$  quantum gravity, Encontro Nacional da Sociedade Portuguesa de Matemática, Coimbra, June 25–28, 2008.
- Roger Picken, A quantum Goldman bracket in  $2 + 1$  quantum gravity, QG2 2008 Quantum Geometry and Quantum Gravity Conference, Nottingham, June 30 – July 4, 2008.
- Roger Picken, Mini-course on gerbes, Univ. Oporto, December 10 and 17, 2008.
- Paulo Pinto,  $C^*$ -algebras irreps from interval maps, International Conference on Operator Algebras and Applications, Marrakesh, Morocco, 14–18 April, 2008.
- Pedro Resende, Noncommutative geometry and Bohr’s doctrine of classical concepts, Applications of Noncommutative Geometry, Minisymposium at 5ecm, Amsterdam, July 17, 2008.
- Pedro Resende, Sheaves on groupoids and quantales (2 lectures), Workshop on Sheaves in Geometry and Quantum Theory, Radboud Univ., Nijmegen, September 3–5, 2008.
- Carlos Rocha, Global attractors for semilinear parabolic equations on the circle, ICMC Summer Meeting in Differential Equations, Univ. São Paulo in São Carlos, January 29, 2008.
- Carlos Rocha, Morse–Smale attractors for semilinear parabolic equations on the circle, Silesian Univ. in Katowice, May 6, 2008. Conference, EPFL, Lausanne, July 8, 2008.
- Carlos Rocha, Morse–Smale attractors for semilinear parabolic equations on the circle, Dynamics & Applications, Univ. Minho, September 11, 2008.
- Carlos Rocha, Semilinear Parabolic Equations on the Circle, Dynamics of Patterns, Oberwolfach, December 18, 2008.
- Ricardo Schiappa, Instantons and matrix models, Centro de Física Teórica e Computacional, Faculdade de Ciências, Lisbon, June 11, 2008.
- Ricardo Schiappa, Instantons and matrix models, National Meeting of Sociedade Portuguesa de Matemática, Coimbra, June 27, 2008.

- Ricardo Schiappa, Instantons and matrix models, Centro de Física do Porto, Faculdade de Ciências, Porto, December 5, 2008.
- Ricardo Schiappa, Greybody factors for  $d$ -dimensional black holes, Black Holes Workshop, Oporto (Portugal), December 23, 2008.

## 5 Postdoctoral program

The Center started a postdoctoral program in the academic year 1998/99. Positions are for one year, with the possibility of extension for a second year upon mutual agreement. Applicants must have earned a Ph.D. in mathematics preferably within a 2-year period before the opening date of the position. To be selected an applicant must show very strong research promise in one of the areas in which the members of the Center are currently active. There are no teaching duties associated with these positions. They are announced internationally including in the Notices and in the Data Base of the American Mathematical Society. In addition, the Center hosts postdoctoral fellows supported directly by the FCT or by other research projects.

The following fellows have stayed in the Center during the whole or part of 2008:

- José Agapito, PhD in Mathematics, Univ. California, Santa Cruz, USA, 2004. Research areas: symplectic geometry, discrete mathematics. Supported by an FCT postdoctoral grant (Jan. 2005–present).
- Rogier Bos, PhD in Mathematics, Radboud Univ., Nijmegen, The Netherlands, 2007. Research areas: representations of groupoids, geometric quantization,  $K$ -theory. Supported by CAMGSD (Sep. 1, 2007–Aug. 31, 2008) and an FCT postdoctoral grant (Sep. 2008–Dec. 2008).
- Olivier Brahic, PhD in Mathematics, Univ. Montpellier II, France, 2004. Research areas: Poisson geometry, Lie groupoids and algebroids, representation theory. Supported by an FCT postdoctoral grant (Jan. 2006–present).
- Rachel Dawe Martins, PhD in Mathematical Physics, Nottingham Univ., 2006. Research areas: Noncommutative geometry, spectral triples, standard model of particle physics,  $K$ -theory. Supported by an FCT postdoctoral grant (Oct. 2006–present).
- Oana Dragulete, PhD in Mathematics, Ecole Polytechnique Fédérale de Lausanne, 2007. Research areas: Contact geometry, symplectic geometry. Supported by an FCT research grant (Nov. 2007–Sep. 2008).



- João Faria Martins, PhD in Mathematics, Nottingham Univ., UK, 2004. Research areas: quantum topology, quantum groups, knot theory, applications of categorical groups to low dimensional topology. Supported by an FCT postdoctoral grant (Jan. 2005–May 2008).
- Sharon Hollander, PhD in Mathematics, MIT, 2001. Research areas: algebraic topology and algebraic geometry. Supported by CAMGSD (Nov. 1, 2006–Dec. 31, 2008), and by the CIÊNCIA 2007 Program (Jan. 1, 2008–Dec. 31, 2012).
- Sang Seon Kim, PhD in Mathematics, Stanford Univ., USA, 2001. Research areas: symplectic and contact geometry. Supported by an FCT postdoctoral grant (Jul. 2005–Nov. 2008).
- Sean Lawton, PhD in Mathematics, Univ. Maryland, USA, 2006. Research areas: algebraic geometry, invariant theory, moduli theory. Supported by an FCT postdoctoral grant (Aug. 2007–Jul. 31 2008, to be resumed).
- Nuno Luzia, Doutorado em Matemática, IMPA, Brazil, 2004. Research areas: dynamical systems. Supported by an FCT postdoctoral grant (May 2005–Apr. 2008).
- Michal Málek, PhD in Mathematics, Silesian Univ., Opava, Czech Republic, 2002. Research areas: discrete dynamical systems. Supported by CAMGSD (Sep. 1, 2008–Aug. 31, 2009).
- Alessia Mandini, PhD in Mathematics, Univ. Bologna, Italy, 2007. Research areas: symplectic geometry. Supported by the CAMGSD funding (Sep. 1, 2007–Aug. 31, 2009).
- David Martínez Torres, PhD in Mathematics, Univ. Carlos III de Madrid, 2003. Research areas: symplectic, contact and Poisson geometry. Supported by the CIÊNCIA 2007 Program (Jul. 1, 2008–Jun. 30, 2013).
- Dmitry Matsnev, PhD in Mathematics, Penn State Univ., 2005. Research areas: operator algebra  $K$ -theory, noncommutative geometry, coarse geometry, Baum–Connes conjecture. Supported by CAMGSD (Sep. 1, 2006–Jul. 31, 2008).
- Elismar Oliveira, Doutorado em Matemática, Univ. Federal do Rio Grande do Sul, Brazil, 2007. Research areas: dynamical systems, Aubry–Mather theory. Supported by an FCT postdoctoral grant (Nov. 2007–Feb. 2008).

- Mahendra Panthee, Doutorado em Matemática, IMPA, Brazil, 2004. Research areas: partial differential equations, harmonic analysis. Supported by CAMGSD (Dec. 15, 2004–Jan. 14, 2006) and an FCT postdoctoral grant (Jan. 15, 2006–Dec. 2008).
- Stavros Papadakis, PhD in Mathematics, Warwick Univ., UK, 2002. Research areas: birational geometry, commutative algebra, computer algebra methods in algebraic geometry, algebraic surfaces, unprojection. Supported by an FCT postdoctoral grant (Jul. 2006–present).
- Paulo Pires Pacheco, PhD in Physics, Imperial College, London, UK, 2007. Research areas: string theory. Supported by an FCT postdoctoral grant (Oct. 2008–present).
- Radu Popescu, Doctorat de Mathématiques, Univ. Claude Bernard, Lyon 1, France, 2000. Research areas:  $C^*$ -algebras, bivariant  $K$ -theory, groupoids, foliations, quantales. Supported by an FCT postdoctoral grant (since Apr. 2005, suspended since Jul. 2008).
- Nuno Sousa, PhD in Physics, Katholieke Univ. Nijmegen (now Radboud Univ.), The Netherlands, 2003. Research areas: string theory, conformal field theory, topological string theory, geometric quantization, matrix models. Supported by an FCT postdoctoral grant (Mar. 2006–May 2008).
- Gláucio Terra, Doutorado em Matemática Aplicada, Univ. São Paulo, Brazil, 2003. Research areas: geometric mechanics, nonholonomic mechanics, variational mechanics, vakonomic mechanics. Supported by a CAPES (Brazil) grant (Feb. 10, 2008–Feb. 10, 2009).
- Gabrielle Terrone, PhD in Mathematics, Univ. Padova, 2008. Research areas: Viscosity solutions of Hamilton–Jacobi equations. Supported by UTAustin-Portugal program (Sep. 1, 2008–Sep. 1, 2011).
- Claudia Valls, Doctor in Mathematics, Univ. Barcelona, Spain, 1999. Research areas: dynamical systems. Supported by two FCT postdoctoral grants (Oct. 2003–Jan. 2008) and by the CIENCIA 2007 Program (Feb. 1, 2008–Jan. 31, 2013).
- Bart Van Steirteghem, PhD in Mathematics, Columbia Univ., USA, 2004. Research areas: algebraic groups, symplectic geometry. Supported by CAMGSD (Nov. 1, 2004–Jan. 31, 2006) and an FCT postdoctoral grant (Feb. 1, 2006–Sep. 2008).
- Marcel Vonk, PhD in Physics, Univ. Amsterdam, The Netherlands, 2003. Research areas: string theory. Supported by CAMGSD (Sep. 1, 2008–Aug. 31, 2009).

## 6 Doctoral supervision

The following doctoral degrees have been obtained under supervision of members of the Center:

- Paulo Doutor, Univ. Técnica Lisboa, October 31, 2008. Thesis title: Thermodynamic formalism and multifractal analysis. Supervised by Luís Barreira.
- Misha Protin, Univ. Técnica Lisboa, November 5, 2008. Thesis title: Quantaes of open groupoids. Supervised by Pedro Resende.
- Carlos Rito, Univ. Trás-os-Montes e Alto Douro, January 25, 2008. Thesis title: On surfaces with  $p_g = q = 1$  and an involution. Supervised by Margarida Mendes Lopes.
- Rafael Silva Sasportes, Univ. Aberta, April 24, 2008. Thesis title: Dynamical problems in coagulation equations. Supervised by Fernando Pestana da Costa.
- Pedro Vaz, Univ. Algarve, July 8, 2008. Thesis title: A categorification of the quantum  $sl(N)$ -link polynomials using foams. Supervised by Marco Mackaay.

## 7 Publications in 2008

### Publications which appeared in 2008

#### Books

L. Barreira (editor), Special issue dedicated to Yakov Pesin on the occasion of his 60th birthday, *Discrete Contin. Dyn. Syst.* **22** (2008), 1–464.

L. Barreira, *Dimension and Recurrence in Hyperbolic Dynamics*, Progress in Mathematics, vol. 272, Birkhäuser, 2008.

L. Barreira and C. Valls, *Stability of Nonautonomous Differential Equations*, Lecture Notes in Mathematics, vol. 1926, Springer, 2008.

#### Proceedings

R. Loja Fernandes and R. Picken (editors), Geometry and Physics: XVI International Fall Workshop, AIP Conference Proceedings volume 1023, American Institute of Physics, 2008.

### Articles in refereed international journals

M. Abreu, A personal tour through symplectic topology and geometry, *São Paulo J. Math.* (2008), no. 2, 175–202.

M. Abreu, E. Dryden, P. Freitas, and L. Godinho, Hearing the weights of weighted projective planes, *Ann. Global Anal. Geom.* (2008), no. 33, 371–395.

J.-F. Babadjian, M. Baía, and P.M. Santos, Characterization of two-scale gradient Young measures and applications to homogenization, *Appl. Math. Optim.* (2008), no. 1, 69–97.

L. Barreira and G. Iommi, Partial quotients of continued fractions and  $\beta$ -expansions, *Nonlinearity* **21** (2008), 2211–2219.

L. Barreira and V. Saraiva, Multifractal nonrigidity of topological Markov chains, *J. Statist. Phys.* **130** (2008), 387–412.

L. Barreira, C. Silva, and C. Valls, Integral stable manifolds in Banach spaces, *J. London Math. Soc. (2)* **77** (2008), 443–464.

L. Barreira, C. Silva, and C. Valls, Regularity of invariant manifolds for nonuniformly hyperbolic dynamics, *J. Dynam. Differential Equations* **20** (2008), 281–299.

L. Barreira and C. Valls, Analytic invariant manifolds for sequences of diffeomorphisms, *J. Differential Equations* **245** (2008), 80–101.

L. Barreira and C. Valls, Asymptotic behavior of distribution of frequencies of digits, *Math. Proc. Cambridge Philos. Soc.* **145** (2008), 177–195.

L. Barreira and C. Valls, Characterization of stable manifolds for nonuniform exponential dichotomies, *Discrete Contin. Dyn. Syst.* **21** (2008), 1025–1046.

L. Barreira and C. Valls, Conjugacies between linear and nonlinear nonuniform contractions, *Ergodic Theory Dynam. Systems* **28** (2008), 1–19.

L. Barreira and C. Valls, Delay equations and nonuniform exponential stability, *Discrete Contin. Dyn. Syst.* **1** (2008), 219–223.

L. Barreira and C. Valls, Growth rates and nonuniform hyperbolicity, *Discrete Contin. Dyn. Syst.* **22** (2008), 509–528.

L. Barreira and C. Valls, Hausdorff dimension and quadratic relations between frequencies of digits, *São Paulo J. Math.* **2** (2008), 161–173.

- L. Barreira and C. Valls, Optimal estimates along stable manifolds of nonuniformly hyperbolic dynamics, *Proc. Roy. Soc. Edinburgh Sect. A* **138** (2008), 693–717.
- L. Barreira and C. Valls, Robustness of nonuniform exponential dichotomies in Banach spaces, *J. Differential Equations* **244** (2008), 2407–2447.
- F. Bogomolov and B. de Oliveira, Symmetric tensors and geometry of  $\mathbb{P}^N$  subvarieties, *Geom. Funct. Anal.* **18** (2008), no. 3, 637–656.
- O. Brahic and R. Loja Fernandes, Poisson fibrations and fibered symplectic groupoids, *Contemp. Math.* **450** (2008).
- A. Calabri, M. Mendes Lopes, and R. Pardini, Involutions on numerical Campedelli surfaces, *Tohoku Math. J. (2)* **60** (2008), no. 1, 1–22.
- F. Camilli, D. Capuzzo and D. Gomes, Error estimates for the approximation of the effective Hamiltonian, *Appl. Math. Optim.* **57** (2008), no. 1, 30–57.
- X. Carvajal and M. Panthee, Well-posedness for some perturbations of the *KDV* equation with low regularity data, *Electron. J. Differential Equations* **2008** (2008), no. 2, 1–18.
- J. Cholewa, R. Czaja, and G. Mola, Remarks on the fractal dimension of bi-space global and exponential attractors, *Boll. Unione Mat. Ital. Sez. A Mat. Soc. Cult. (8)* **9** (2008), no. 1, 121–145.
- C. Correia Ramos, N. Martins, P. Pinto, and J. Sousa Ramos, Cuntz–Krieger algebras representations from orbits of interval maps, *J. Math. Anal. Appl.* **341** (2008), 825–833.
- R. Czaja and M. Efendiev, A note on attractors with finite fractal dimension, *Bull. London Math. Soc.* **40** (2008), 1–8.
- R. Czaja and C. Rocha, Transversality in scalar reaction-diffusion equations on a circle, *J. Difference Equ. Appl.* **245** (2008), no. 3, 692–721.
- P. Damianou and R. Loja Fernandes, Integrable hierarchies and the modular classes, *Ann. Inst. Fourier (Grenoble)* **58** (2008), no. 1, 107–137.
- J. Duarte, C. Januário, and N. Martins, Chaos in Ecology: the topological entropy of a tritrophic food chain model, *Discrete Dyn. Nat. Soc.* **2008** (2008), 1–12.
- J. Duarte, C. Januário, and N. Martins, Topological invariants in the study of a chaotic food chain system, *Chaos* **18** (2008).

- J. Faria Martins and A. Mikovic, Invariants of spin networks embedded in three-manifolds, *Comm. Math. Phys.* **279** (2008), no. 2, 381–399.
- B. Fiedler and C. Rocha, Connectivity and design of planar global attractors of Sturm type. II: Connection graphs, *J. Differential Equations* **244** (2008), 1255–1286.
- D. Gomes, Generalized Mather problem and selection principles for viscosity solutions and Mather measures, *Adv. Calc. Var.* **1** (2008), no. 3, 291–307.
- D. Gomes and A. Lopes, Exponential decay of correlation for the stochastic process associated to the entropy penalized method, *São Paulo J. Math.* **2** (2008), no. 1, 21–28.
- D. Gomes and A. Oberman, Viscosity solutions methods for converse KAM theory, *M2AN Math. Model. Numer. Anal.* **42** (2008), no. 6, 1047–1064.
- D. Gomes and J. Silva, Wigner transform and estimates for Schrödinger equation, *São Paulo J. Math.* **2** (2008), no. 1, 85–98.
- G. Granja and S. Hollander, Realizing modules over the homology of a DGA, *J. Pure Appl. Algebra* **212** (2008), 1394–1414.
- S. Hollander, A homotopy theory for stacks, *Israel J. Math.* **163** (2008), 93–124.
- S. Hollander, Characterizing algebraic stacks, *Proc. Amer. Math. Soc.* **136** (2008), no. 4, 1465–1476.
- S. Hollander, Diagrams indexed by Grothendieck constructions, *Homology Homotopy Appl.* **10** (2008), no. 3, 193–221.
- L. Kauffman and P. Lopes, On the minimum number of colors for knots, *Adv. in Appl. Math.* **40** (2008), no. 1, 36–53.
- L. Kauffman and J. Faria Martins, Invariants of welded virtual knots via crossed module invariants of knotted surfaces, *Compos. Math.* **144** (2008), no. 4, 1046–1080.
- K. Konno and M. Mendes Lopes, The base components of the dualizing sheaf of a curve on a surface, *Arch. Math. (Basel)*, **90** (2008), no. 5, 395–400.
- S. Lawton, Minimal affine coordinates for  $SL(3, C)$  character varieties of free group, *J. Algebra* **320** (2008), 3773–3810.
- J. Llibre and C. Valls, Analytic integrability of a Chua system, *J. Math. Phys.* **49** (2008), no. 10.

- J. Llibre and C. Valls, Centers for a 6-parameter family of polynomial vector fields of arbitrary degree, *Bull. Sci. Math.* **132** (2008), 40–53.
- J. Llibre and C. Valls, Darboux integrability and algebraic invariant surfaces for the Rikitake system, *J. Math. Phys.* **49** (2008), no. 3.
- J. Llibre and C. Valls, Integrability of a SIS model, *J. Math. Anal. Appl.* **344** (2008), 574–578.
- R. Luís, S. Elaydi, and H. Oliveira, An economical model with Allee effect, *J. Difference Equ. Appl.* (2008), 1–17.
- M. Mackaay and P. Vaz, The foam and the matrix factorization  $sl(3)$  link homologies are equivalent, *Algebr. Geom. Topol.* (2008), 309–342.
- S. Marcelino and P. Resende, An Algebraic generalization of Kripke structures, *Math. Proc. Cambridge Philos. Soc.* **145** (2008), 549–577.
- M. Mariño, R. Schiappa and M. Weiss, Nonperturbative effects and the large-order behavior of matrix models and topological strings, *Commun. Number Theory Phys.* **2** (2008), 349–419.
- J. Matias, Necessary and Sufficient conditions for existence of solutions of a Divergence-type problem, *São Paulo J. Math.* **2** (2008), no. 2.
- D. Matsnev, Asymptotic dimension of one relator groups, *Colloq. Math.* (2008), no. 1, 85–89.
- F. Mena, J. Natário, and P. Tod, Gravitational collapse to toroidal and higher genus asymptotically *Ads* black holes, *Adv. Theor. Math. Phys.* **12** (2008), 1163–1181.
- F. Mena, J. Natário, and P. Tod, Avoiding closed timelike curves with a collapsing rotating null dust shell, *Classical Quantum Gravity* **25** (2008).
- M. Mendes Lopes and R. Pardini, Numerical Campedelli surfaces with fundamental group of order 9, *J. Eur. Math. Soc. (JEMS)* **10** (2008), no. 2, 457–476.
- J. Natário, Tangent Euler top in general relativity, *Comm. Math. Phys.* **281** (2008), 387–400.
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- W. Oliva and C. Rocha, Reducible Volterra retarded equations with infinite delay, *São Paulo J. Math.* **2** (2008), no. 1, 37–53.

- M. Paluch, Cap pairing and spectral sequences, *J. Pure Appl. Algebra* **212** (2008), 2583–2593.
- M. Panthee and M. Scialom, On the Cauchy problem for a coupled system of *KDV* equations: critical case, *Adv. Differential Equations* **13** (2008), no. 1-2.
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## 8 Partnership and outreach

In October 2004 the Center submitted to the Minister of Science, Innovation and Higher Education a request for the Statute of Associate Laboratory, with a strategic project entitled “Internationalization of the Research and Promotion of Mathematics in Portugal”. Besides pursuing the strategy of further development and internationalization of the research activities, in particular through the Postdoctoral Program and a Program for career development and employment of new researchers, the Center signed partnership protocols with the Institute for Systems and Robotics - Lisbon (Instituto de Sistemas e Robótica-Lisbon) and with the Institute of Telecommunications (IT) regarding interdisciplinary research cooperation, and also signed partnership protocols with 44 secondary and primary schools, which together enroll more than 38000 students, aiming at the promotion of Mathematics at these education levels through a set of activities oriented towards students and teachers.

While the evaluation of the request for the Statute of Associate Laboratory is still in progress, the Center has nevertheless started to develop various activities in collaboration with the secondary schools and it has also pursued its past collaboration with the “Ciência Viva” Program and with the “Programa Gulbenkian Novos Talentos em Matemática”. Some of these activities are listed below.

**Summer Course on Topology.** “Topologia - Estágio de iniciação científica para alunos do 11<sup>o</sup>ano”, July 15–18, 2008.

<http://www.math.ist.utl.pt/~rpicken/estagio/>.

**Summer school for undergraduates.** “Escola Diagonal 2008”, Lisbon, September 1–5, 2008.

<http://www.mat.uc.pt/~jmurb/ed2008>.

**Mathematics conference for undergraduates.** “Encontro Nacional do Programa Gulbenkian Novos Talentos em Matemática”, Lisbon, September 5–6, 2008.

<http://www.math.ist.utl.pt/talentos/edicao8.html#encontro>.

**Science exhibition.** Participation in “Fórum Ciência Viva”, Lisbon, 22–23 Nov., 2008.

<http://forum.cienciaviva.pt/>.

## 9 Personal notes

- Luís Barreira was awarded the Ferran Sunyer i Balaguer Prize, Spain, 2008.
- Luís Barreira is a member of the Editorial Board of *Dynamical Systems*.
- Luís Barreira is a member of the Editorial Board of *Revista Matemática Iberoamericana*.
- Rui Loja Fernandes is editor-in-chief of *Portugaliae Mathematica*.
- Rui Loja Fernandes is a member of the Editorial Board of *Journal of Geometric Mechanics*.
- Paulo Pinto received an honorable mention of the Prémio Científico UTL/Santander Totta em Matemática, Portugal, 2008.
- Pedro Resende is a member of the Editorial Board of *Surveys in Mathematics and Applications*.
- Claudia Valls was awarded the Prémio Científico UTL/Santander Totta em Matemática, Portugal, 2008.

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# 1 Introduction

## 1.1 Main goals and scientific activities

The main purpose of CEMAT (Centre for Mathematics and its Applications) is to engage in high quality research and graduate studies in applied mathematics, focusing on applications of statistics, stochastic processes, and numerical analysis, while promoting the scientific enrichment of its members and collaborators.

One of the main goals of CEMAT is to promote the interplay between Mathematics and its Applications as a way to foster the dissemination of results in applied mathematics derived by the research center members, and, at the same time, to find continuous motivation from the applications to formulate and answer stimulating mathematical questions. In 2008, CEMAT carried out integrative/multidisciplinary activities in the following areas:

- Modelling and Scientific Computing in Medicine
- Numerical Methods in Engineering
- Modelling and Simulation of Geophysical Flows
- Statistics and Biology
- Statistics in Medicine
- Stochastic Modelling in Telecommunications

These activities, which are reported in Section 3, were supported by several international and national projects, listed in Section 4.

CEMAT is strongly committed to the dissemination of its scientific achievements to the mathematics community and, at large, to the researchers and professionals that apply contemporary tools from mathematics in their work. The publication record of CEMAT members in 2008 is reported in sections 5 and 6. The dissemination activity is also promoted through: the regular participation of members of CEMAT in international workshops and conferences, complemented by the presentation of research lectures, as reported in Section 7; the organization of: seminars, as presented in Section 8; and the organizations of the scientific events, as shown in Section 9.

The previous goal is complemented by the objective of disseminating the interest for mathematics, and science in general, to the society at large and, in particular, to private or public institutions and schools. The first are usually reached by CEMAT through internships of undergraduate and M.Sc. students under the supervision of CEMAT members.

High international quality, postgraduate, postdoctoral and visitors programs are envisaged at CEMAT. In 2008, the postgraduate program was based on the following two MSc degrees

- MSc in Mathematics of IST
- MSc in Statistics of IST

and six PhD degrees with involvement of CEMAT members:

- PhD in Mathematics of IST
- PhD in Statistics and Stochastic Processes of IST
- Lisbon-Carnegie Mellon University PhD in Mathematics
- UT Austin-Lisbon PhD in Computational Engineering
- UT Austin-Lisbon PhD in Mathematics
- IST-EPFL Phd in Computational and Stochastic Mathematics

The last four PhD degrees are relative to collaborations with top international universities will serve to enhance the capability of CEMAT to be involved in successful international PhD programs. During the year, 4 PhD and 11 MSc theses were concluded or supervised by CEMAT members, as listed in Section 10.

In addition, CEMAT runs an attractive postdoctoral program in Computational and Stochastic Mathematics, a strong visitors program, and active seminar series. The visitors program is vital for the high quality of the doctoral and postdoctoral programs of CEMAT and, moreover, visitors collaborate in the vast majority of the seminars organized by CEMAT, reported in Section 7. During 2008, the following fellows hold postgraduate positions at CEMAT: Abdel Artoli, Alberto Gambaruto, Alexandra Moura, Euripides Sellountos, and João Costa e Silva.

## 1.2 List of members

At the end of 2008, CEMAT had a total of 49 members, of which 33 with a PhD degree, and several collaborators. The full list of CEMAT members is given below.

### *PhD members:*

- Adélia Sequeira (IST)
- Alberto Gambaruto (IST)
- Alexandra Moura (IST)
- Ana Leonor Silvestre (IST)
- Ana Pires (IST)
- António Pacheco (IST)
- Carla Pereira (UPorto)
- Carlos Alves (IST)
- Cláudia Nunes (IST)
- Conceição Amado (IST)
- Euripides Sellountos (IST)
- Helena Ribeiro (IPLeiria)
- Isabel Rodrigues (IST)
- João Amaral (IST)
- João Branco (IST)
- João Janela (ISEG)
- João Costa e Silva (IST)
- João Soares (Poli. Torino)
- Juan Acebrón (IST)
- Juha Videman (IST)
- Luísa Morgado (UTAD)
- Luís Borges (ISEL)

- Manuel Cabral Morais (IST)
- Nelson Antunes (UAlgarve)
- Nuno Diniz dos Santos (GLAIZER Group)
- Pedro Antunes (INE)
- Pedro Lima (IST)
- Pedro Serranho (IPLeiria)
- Rafael Santos (UAlgarve)
- Rosário Oliveira (IST)
- Svilen Valtchev (IP Leiria)
- Teresa Diogo (IST)
- Vladas Pipiras (IST and UNC at Chapel Hill)

***Post-graduate students:***

- Ana Freitas (IST)
- Angel Rodríguez Rozas (IST)
- Bruno Pereira (ISEL)
- Celestino Coelho (UAlgarve)
- Cláudia Pascoal (IST)
- Elena Almaraz-Luengo (UComplutense)
- Elisabete Fernandes (IST)
- Euclides Luís (IST)
- Filipa Encarnação (IST)
- Filomena Teodoro (IPSetúbal)
- Magda Rebelo (FCT/UNL)
- Nuno Martins (FCT/UNL)
- Patrícia Ferreira (IST)
- Pedro Gonçalves (IST)
- Sílvia Nobre (IST)
- Vanda Lourenço (FCT/UNL)

### 1.3 Management structure

CEMAT has the following ruling bodies:

- Executive Board
- Scientific Council Board
- Scientific Council

The Center is managed by the Executive Board, constituted by:

- António Pacheco (President)
- Adélia Sequeira (Vice-President)
- Ana Pires

The Scientific Council is constituted by the PhD members of CEMAT and: elects the President; ratifies the Executive Board; approves changes to the statutes and to the creation and dissolution of research lines. The Scientific Council Board is constituted by the members of the Executive Board and the coordinators of research lines. It approves the annual activity reports and collaborates with the Coordinator in the definition of research policies.

In addition, CEMAT has an International Advisory Committee constituted by:

- Alfio Quarteroni (EPFL, Switzerland, and Politecnico di Milano, Italy)
- Guy Latouche (Université Libre de Bruxelles, Belgium)
- J. George Shanthikumar (UC Berkeley, USA)
- Peter Rousseeuw (University of Antwerp, Belgium)
- Ivan Graham (University of Bath, UK)

## 2 Main achievements

CEMAT achieved the research goals defined for 2008, leading to the publication of more than sixty papers and three books or journal special issues. In addition to the publication activities, the research carried out at CEMAT was presented to the international community in more than fifty communications and invited lectures. Its members were involved in the organization and scientific coordination of many conferences and workshops, and have refereed papers for several conferences and belong to the Reviewer Board of more than two dozen international peer reviewed journals.

CEMAT doctoral and post-doctoral programs stayed very active in 2008, involving the activity of 5 postdoctoral fellows (Abdel Artoli, João Costa e Silva, Alberto Gambaruto, Alexandra Moura, and Euripides Sellountos) and led to the completion of 4 Ph.D. (Pedro Antunes, João Janela, M. Luísa Morgado, and Svilen Valtchev) and 11 M.Sc. (Carla Miranda, Maria Raquel Neto, Sílvia Nobre, Inês Oliveira, Daniela Pamplona, Helena Pereira, Sofia Pinto, Bartolomeu Rabaçal, Teresa Risso, Angel Rodriguez-Rozas, and Teresa Sampaio).

CEMAT was very successful in the Ciência program, having launched two calls that attracted very good candidates. During 2008, the two candidates recruited in the Ciência 2007 program, Juan Acebrón

(from Spain) and Vldas Pipiras (from Lituania), joined CEMAT. Moreover, CEMAT selected under the Ciência 2008 program three candidates: Euripides Sellountos (from Greece), Phan Thanh An (from Vietnam), and Gennady Kulikov (from Russia).

In addition, some CEMAT members received scientific awards in 2008:

- Adélia Sequeira and Ana Leonor Silvestre received Honorable Mentions in Pure and Applied Mathematics from the UTL/Santander Totta Scientific Prizes 2008.
- Euripides J. Sellountos received the “Outstanding Young Investigator Award”, presented on behalf of the Scientific Committee by Satya N. Atluri, for his paper “Meshless LBIE - RBF Velocity - Vorticity Formulation for 2d Fluid Flows” at ICCES Meshless Mini-Symposium '08, 13-17 October 2008, Suzhou, China.
- Carla Santos Pereira received the FEUP Teaching Prize 2007/08.

### 3 Integrative/multidisciplinary activities

In 2008, CEMAT carried out integrative/multidisciplinary activities in the following areas:

1. Modelling and Scientific Computing in Medicine
2. Numerical Methods in Engineering
3. Modelling and Simulation of Geophysical Flows
4. Statistics and Biology
5. Statistics in Medicine
6. Stochastic Modelling in Telecommunications

These activities were supported by several international and national projects, reported in Section 4, and led to joint supervisions, publications, and communications. We next report on the activities in each of the listed areas.

1. CEMAT collaborated with bioengineers and medical researchers:
  - a) In new models of blood rheology - Dept of Mech Eng and McGowan Inst for Regenerative Medicine, U. Pittsburgh, USA (A.M. Robertson, M. Kameneva);
  - b) In numerical simulations of blood flow models – CMSC-EPFL, Switzerland and MOX, Poli Milano, Italy (groups of A. Quarteroni), Imperial College, UK (J. Peiró, S. Sherwin);
  - c) In cardiovascular simulations and visualization – ICES – UTAustin (T. Hughes, C. Bajaj);
  - d) In experimental validation studies of microcirculation rheologic parameters – Vascular Biopathology Unit - IMM/FML (C. Saldanha);
  - e) Cerebrovascular imaging in vivo – Imagiology Unit – FML (J. Campos)
2. CEMAT collaborated with civil and mechanical engineers from:
  - a) ICIST (Instituto de Engenharia de Estruturas, Território e Construção, IST), V. Leitão, C. Tiago, and (CICC, Centro de Investigação em Ciências da Construção, U. Coimbra); A. Tadeu, J. António, on numerical methods for crack analysis and elastic wave propagation in stratified media;
  - b) COPPE/UFRJ (Universidade Federal do Rio de Janeiro); Mech Eng Dept (group of Helcio Orlande) and Nuclear Eng Dept. (N. Roberty), and IME/RJ (Instituto Militar de Engenharia do Rio de Janeiro); (M. Colaço), on numerical methods for the study of inverse problems in engineering.

3. CEMAT collaborated with the following Marine research units:
  - a) Marine and Environmental Technology Center (MARETEC - IST) - (Aires dos Santos) on baroclinic and barotropic instabilities in geophysical flows;
  - b) Centre for Marine and Environmental Research (CIMAR - U Porto) - (Rui Caldeira) on computational simulation of deep water island wakes;
  - c) Jet Propulsion Laboratory (NASA/CalTec – Pasadena, USA) - (João Teixeira) on numerical cloud modelling; and d) Centre for Subsurface Modeling (University of Texas at Austin, USA – (Clint Dawson) on numerical analysis of shallow-water equations.
4. CEMAT collaborated with the following Biology research units:
  - a) IBET (Inst. Biologia Experimental e Tecnológica) on the analysis of genetic/genomic data (C. Marques and M. Rocheta);
  - b) IGC (Instituto Gulbenkian de Ciência), on the modeling of quantitative trait loci (C.P. Gonçalves).
5. CEMAT collaborated with the Epidemiology and Biostatistics Unit of IHMT (Inst Higiene e Medicina Tropical, UN Lisboa) on the study of Leishmanioses (L. Gonçalves).
6. CEMAT collaborated with telecommunications engineers from:
  - a) Many European telecommunications research units, mainly in the organization of international scientific meetings, within the framework of the EU Network of Excellence Euro-FGI;
  - b) IT (Inst Telecommunications) in the modelling and analysis of IP traffic, pursued in an FCT project (A. Nogueira, P. Salvador, R. Valadas).

## 4 Participation in research projects

During 2008, CEMAT members were involved in the following R&D projects:

- GenEglobwq: Pesquisa de genes candidatos subjacentes a um QTL para o rendimento em pasta em *Eucalyptus globulus*, FCT Project PTDC/AGR-GPL/66564/2006. Participant: A. M. Pires.
- LATENTROP: Latent Class Analysis in Tropical Health, Project PTDC/SAU-ESA/81240/2006, 2008-2011, Coordinator: Luzia Gonçalves (IHMT). Participants: F. Encarnação, A. Pacheco, and M.R. Oliveira.
- HeteroCONTROL: Enhancing Stochastic Modelling and Analysis of Congestion Control Mechanism and Maintaining Specified Quality of Service Constraints for Heterogeneous Internet Traffic with Long-Range Dependence, financed by the Treaty of Windsor Programme, joint project with the Department of Computer Science, Loughborough University (Dr. Lin Guan + Dr. Iain Phillips), 01/01/2008 - 30/04/2009. Local Coordinator: A. Pacheco. Participants: F. Ferreira, H. Ribeiro.
- Multiscale Mathematical Models in Biomedicine. FCT Project PTDC/MAT/68166/2006, June 2007 - May 2010. Joint project with IMM/FML (Carlota Saldanha). A. Sequeira: PI. CEMAT Participants: A. Artoli, L. Borges, A. Gambaruto, J. Janela, A. Moura, R. Santos, and E.J. Sellountos.
- Fluid-structure interactions in the blood circulation: mathematical and numerical modelling, FCT-CNRST, Portugal- Morocco, Jan 2008 – Dec 2009. Coordinator: A. Sequeira.
- Quality Control of Computational Simulations in Some Models of Medical and Environmental Sciences, financed by the Treaty of Windsor Program (Acções Integadas Luso-Britânicas), April 2008 – April 2009. Local Coordinator: P Lima.

- Multiscale analysis and numerical simulation of mathematical models in hemodynamics and hemorheology. Bilateral Project Portugal/Italy, CEMAT/IST and IAC/CNR, March 2007 - December 2008. A. Sequeira: PI. CEMAT Participants: A.M. Artoli, J. Janela, and A. Moura.
- EURO-FGI Network of Excellence, Design and Engineering of the Future Generation Internet, December 2006 – May 2008. Local Coordinator: A Pacheco. Participants: N. Antunes, C. Nunes, F. Ferreira, H. Ribeiro, and M.R. Oliveira
- Análise de problemas de interação fluido-estrutura, Bilateral Project GRICES/EGIDE - Programme Pessoa 2007 - Portugal/France, (CEMAT/IST and Institut Élie Cartan Nancy, Université Henry Poincaré, Nancy 1), 2007-2008. Coordinator: A. L. Silvestre
- QUAL+: Gestão da Qualidade de Serviço e do Desempenho do Atendimento, NITEC Project, financed by the 'Agência de Inovação', for R&D transfer. Joint project with the multinational company NEWVISION, 01/06/2006-30/06/2008. Local Coordinator: A. Pacheco. Participants: C. Pascoal, M. R. Oliveira.
- Inverse problems and meshless methods in PDEs, FCT Project POCTI/MAT/60863/2004,2005/06/01 - 2008/12/31. Coordinator: C. Alves.
- MONSAIT: Internet Traffic Measurements, Modelling and Statistical Analysis, FCT Project POSC/EIA/60061/2004, Coordinated by Rui Valadas (Institute of Telecommunications), 01/01/2005 - 30/09/2008. Local Coordinator: A. Pacheco. Participants: A. Pacheco, C. Nunes, R. Oliveira, N. Antunes, F. Ferreira, H. Ribeiro.
- Propagação tridimensional de ondas em meios estratificados contendo fissuras ou inclusões finas - modelação computacional e detecção experimental. Project FCT Project POCTI/ECM/58940/2004. Coordinator: Julieta António (FCT-UC), Local Coordinator: C. Alves.
- Analysis of mathematical models for the motion of rigid bodies in incompressible fluids, FCT Project POCI/MAT/61792/2004, 2005-2008. Coordinator: A. L. Silvestre.

## 5 Publications in 2008

The following publications involving CEMAT members were published in 2008.

### 5.1 Books and Special Journal Issues (authored or edited)

- C.J.S. Alves (Ed.). Engineering Analysis with Boundary Elements 32(6), 2008. (Special issue on Meshless Methods, pp. 439-532, June 2008).
- C.J.S. Alves, P.M. Pardalos, and L.N. Vicente (Eds.). Optimization in Medicine, Springer Optimization and its Applications Series, Vol. 12. Springer, New York, 2008 (195 pp).
- A. Pacheco, L.C. Tang, and N.U. Prabhu. Markov-Modulated Processes and Semiregenerative Phenomena. World Scientific, Singapore, 9 chaps, 2008 (224 pp).

### 5.2 Chapters/articles in books with refereeing

- J.A. Acebron, S. Lozano, and A. Arenas. Enhancement of signal response in complex networks induced by topology and noise. In P. Longhini and A. Palacios, editors, Applications of Nonlinear Dynamics Model and Design of Complex Systems, Springer-Verlag, pp. 201-210, 2009.
- C.J.S. Alves and N.F.M. Martins, Reconstruction of inclusions or cavities in potential problems using the MFS. In C.S. Chen et al., eds., The Method of Fundamental Solutions - A Meshless Method, Dynamic Publishers, 2008.

- F. Ferreira, A. Pacheco, and H. Ribeiro, Analysis of finite oscillating GIX/M(n)//N queueing systems. In T. Dohi, S. Osaki, and K. Sawaki, editors, *Recent Advances in Stochastic Operations Research*, World Scientific, Singapore. In press.
- A.M. Robertson, A. Sequeira, and M. Kameneva. Hemorheology. In G.P. Galdi, R. Rannacher, A.M. Robertson, and S. Turek, eds., *Hemodynamical Flows: Modeling, Analysis and Simulation*, Series: Oberwolfach Seminars, Vol. 37, pp. 63-120. Birkhauser, 2008.

### 5.3 Articles in international journals

- J.A. Acebron and R. Spigler. Scalability and performance analysis of a probabilistic domain decomposition method. *Lecture Notes in Computer Science* 4967:1257-1264, 2008.
- C.J.S. Alves, M.J. Colaço, V.M.A. Leitão, N.F.M. Martins, H.R.B. Orlande, and N.C. Roberty. Recovering the source term in a linear diffusion problem by the method of fundamental solutions. *Inv. Probl. Sc. Eng.* 16(8):1005-1021, 2008.
- C.J.S. Alves and A. B. Cruzeiro. Monte-Carlo simulation of stochastic differential systems – a geometrical approach. *Stoch. Proc. and their Appl.* 118(3):346–367, 2008.
- N. Antunes, G. Jacinto, and A. Pacheco. On the minimum hop count and connectivity in one-dimensional ad hoc wireless networks. *Telecommunication Systems* 39:137–143, 2008.
- N. Antunes, C. Fricker, P. Robert, D. Tibi. Stochastic networks with multiple stable points. *Annals of Probability*, 36(1):255-278, 2008.
- P. Antunes and P. Freitas. A numerical study of the spectral gap. *J. Physics A: Mathematical Theory* 41:055201 (19pp), 2008.
- A.M. Artoli, A. Sequeira, A.S. Silva, and C. Saldanha. Localized hydrodynamics of clustering leukocytes. *Clinical Hemorheology and Microcirculation* 39(1-4):375-380, 2008.
- A. Bianco, G. Boente, A.M. Pires, and I.M. Rodrigues. Robust discrimination under a hierarchy on the scatter matrices. *Journal of Multivariate Analysis* 99:1332-1357, 2008.
- T. Bodnár and A. Sequeira. Numerical simulation of the coagulation dynamics of blood. *Computational and Mathematical Methods in Medicine* 9(2):83-104, 2008.
- G. Boente, A.M. Pires, and I.M. Rodrigues. Estimators for the common principal components model based on reweighting: Influence functions and Monte Carlo study. *Metrika* 67:189-218, 2008.
- L. Borges and A. Sequeira. Numerical simulation of a viscoelastic fluid with a preconditioned Schwarz method. *Banach Center Publ., Inst. Math, Polish Acad. Sc.* 81:65-80, 2008.
- F. Carapau and A. Sequeira. 1D dynamics of a second-grade viscous fluid in a constricted tube. *Banach Center Publ., Inst. Math, Polish Acad. Sc.* 81:95-103, 2008.
- J. Costa e Silva, N.M.G. Borralho, J.A. Araújo, R.E. Vaillancourt, and B.M. Potts. Genetic parameters for growth, wood density and pulp yield in *Eucalyptus globulus*. *Tree Genetics & Genomes*, 2008.
- J. Costa e Silva and L. Graudal. Evaluation of an international series of *Pinus kesiya* provenance trials for growth and wood quality traits. *Forest Ecology and Management* 255:3477–3488, 2008.
- G. Didier and V. Pipiras. Gaussian stationary processes: adaptive wavelet decompositions, discrete approximations and their convergence. *Journal of Fourier Analysis and Applications* 14:203-234, 2008.
- N. Diniz Dos Santos, J.-F. Gerbeau, and J.F. Bourgat. A partitioned fluid-structure algorithm for elastic thin valves with contact. *Comp. Meth. Appl. Mech. Engng.* 197(19-20):1750-1761, 2008.



- T. Diogo and P. Lima. Superconvergence of collocation methods for a class of weakly singular Volterra integral equations. *Journal of Computational and Applied Mathematics* 218:307-316, 2008.
- D.J. Doorly, D.J. Taylor, A.M. Gambaruto, R.C. Schroter, and N. Tolley. Nasal Architecture: Form and Flow. *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences* 366(1879):3225-46, 2008.
- A. Estepa, R. Estepa, and A. Pacheco. Accurate resource estimation for generalized VoIP sources. *Telecommunication Systems* 39(1):37-50, 2008.
- F. Ferreira and A. Pacheco. Analysis of  $GI^X/M(n)//N$  systems with stochastic customer acceptance policy. *Queueing Systems*, 58(1):29-55, 2008.
- A.M. Gambaruto, J. Peiró, D.J. Doorly, and A.G. Radaelli. Reconstruction of Shape and its Effect on Flow in Arterial Conduits. *International Journal for Numerical Methods in Fluids* 57(5):473-692, 2008.
- J. Janela and A. Sequeira. On a constrained minimization problem arising in hemodynamics. *Banach Center Publ., Inst. Math, Polish Acad. Sc.* 81:227-241, 2008.
- N.B. Konyukhova, P.M. Lima, M.L. Morgado, and M.B. Soloviev. Bubbles and droplets in nonlinear physics models: analysis and numerical simulation of singular nonlinear boundary value problems. *Comp. Maths. Math. Phys.* 48(11):2018-2058.
- P. Lima and L. Morgado, Analytical-numerical investigation of a singular boundary value problem for a generalized Emden-Fowler equation, *J. Comput. Appl. Math.*, in press.
- N.F.M. Martins and A.L. Silvestre. An iterative MFS approach for the detection of immersed obstacles. *Eng. Anal. Bound.* 32(6):517-524, 2008.
- M.C. Morais, Y. Okhrin, A. Pacheco, and W. Schmid. EWMA charts for multivariate output: Some stochastic ordering results. *Communications in Statistics - Theory and Methods* 37(16):2653-2663, 2008.
- S.A. Nazarov, A. Sequeira, M. Specovius-Neugebauer, and J.H. Videman. Artificial Boundary Conditions for Viscoelastic Flows. *Mat. Meth. Appl. Sci.* 31(8):937-958, 2008.
- A. Pacheco and H. Ribeiro. Consecutive customer losses in regular and oscillating  $M^X/G/1/n$  systems. *Queueing Systems. Theory and Applications* 58(2):121-136, 2008.
- A. Pacheco and H. Ribeiro. Consecutive customer losses in oscillating  $GI^X/M//n$  systems with state dependent services rates. *Annals of Operations Research* 162(1):143-158, 2008.
- A. Pacheco and H. Ribeiro. Moments of the duration of busy periods of  $M^X/G/1/n$  systems. *Probability in the Engineering and Informational Sciences* 22(3): 347-354, 2008.
- V. Pipiras and M.S. Taqqu. Identification of periodic and cyclic fractional stable motions. *Annales de L'Institute Henry Poincare* 44:612-637, 2008.
- V. Pipiras and M. S. Taqqu. Small and large scale asymptotics of some Levy stochastic integrals. *Methodology and Computing in Applied Probability* 10:299-314, 2008.
- A.M. Pires and C. Amado. Interval estimators for a binomial proportion: comparasion of twenty methods. *REVSTAT* 6(2):165-197, 2008.
- N. C. Roberty and C. J. S. ALves. On the identificationf star shape sources from boundary measurements using a reciprocity functional. *Inv. Probl. Sc. Eng.*, in press.
- E.J. Sellountos and A. Sequeira. A hybrid multi-region BEM / LBIE-RBF velocity-vorticity scheme for the two-dimensional Navier-Stokes equations. *CMES: Computer Modelling in Engineering and Sciences* 23(2):127-148, 2008.

- E.J. Sellountos and A. Sequeira. An advanced meshless LBIE/RBF method for solving two dimensional incompressible fluid flows. *Computational Mechanics* 41(5):617-631, 2008.
- A. Sequeira, A. M. Artoli, A.S. Silva and C. Saldanha, Leukocytes dynamics in microcirculation under shear-thinning blood flow, *International Journal of Computational Fluid Dynamics*, to appear.
- S. S. Valtchev and N. C. Roberty. A time-marching MFS scheme for heat conduction problems. *Eng. Analysis Bound. Elements* 32:480–493, 2008
- J. H. Videman and S.A. Nazarov. An Improved Nonlinear Reynolds Equation for a Thin Flow of a Viscous Incompressible Fluid. *Vestnik St. Petersburg University: Mathematics* 41:171-175, 2008.

#### 5.4 Articles in proceedings of conferences

- C.J.S. Alves. Enrichment techniques and the method of fundamental solutions. *Procs. of LSAME'08: Leuven Symposium on Appl. Mech. Eng. (Editors: B Bergen et al.) in CD-ROM, Leuven, 2008.*
- C.J.S. Alves. RBF as MFS Approximations in Higher Dimension. *Procs. of the VIII World Congress on Computational Mechanics, WCCM'08 - Venice, Springer, 2008.*
- A.M. Artoli, A. Sequeira, A.M. Gambaruto, and E. Sellountos. Computational aspects in modelling shear thinning fluids, *Proc. ICMES, Amsterdam, 2008.*
- A. M. Artoli, A. Sequeira, E. Sellountos, and J. Janela. Advances in computational hemorheology. In: *Vascular Wall and Endothelium, Actas de Bioquímica*, 9, pp. 131-136, 2008 (eds. J. Martins e Silva, Carlota Saldanha).
- A.M. Gambaruto. Physiological morphology of the right nasal cavity for three patient cases. *Proc. Portugal-UT Austin CFD 2008, 1st Workshop on Computational Engineering: Fluid Dynamics. IST, Lisbon, Portugal, 2008.*
- A.M. Gambaruto and D.J. Doorly. Modelling Nasal Airways Using Fourier Descriptors, *Proc. 8th International Symposium on Computer Methods in Biomechanics and Biomedical Engineering, Porto, 2008.*
- A.M. Gambaruto, D.J. Taylor, D.J. Doorly, and V. Franke. Nasal Cavity Flow in Restful Inspiration, *Proc. 16th Congress European Society of Biomechanics, Luzern, 2008.*
- A.M. Gambaruto, D.J. Doorly, and P. Franke. Peripheral Bypass Graft Atherogenesis Study Using Near-Wall Convective Transport Normal To The Wall, Given By A Series Expansion Of Lagrangian Dynamics, *Proc. 8th. World Congress on Computational Mechanics.*
- N.B. Konyukhova, P.M. Lima, M.L. Morgado, and M.B.Soloviev. Singular Nonlinear Boundary Value Problem for the Bubble-type or Droplet-type solutions in Nonlinear Physics Models. *Spectral and Evolution Problems* 18:160-170, 2008. (Proceedings of the XVIII Crimean Autumn Mathematical School-Symposium, Simferopol, 2007).
- C. Nunes, A. Pacheco, and T. Silva. Statistical models to predict electricity prices. *Procs. European Electricity Market 2008 (EEM 2008), 28-30 May 2008, ISEL, Lisboa, pp. 1-6, 2008.*
- D. Nunes, S. Ramalho, A. Moura, and A. Sequeira, Comparing the 1D hyperbolic and the Windkessel-Wave models for blood flow in arteries' in the First Workshop IST/UT Austin in Computational Engineering: Fluid Dynamics, July 10-11, 2008, Lisbon, Portugal.
- C. Pascoal, M.R. Oliveira, A. Pacheco, R. Valadas, and P. Salvador. On the dependencies between Internet flow characteristics. *Procs. of FITraMEN 08: International Workshop on Traffic Management and Traffic Engineering for the Future Internet, December 11-12, 2008, Porto, Portugal.*

- A.M.M.O. Pisco, N.J.G. Santos, A.M. Gambaruto, and A. Sequeira. The impact of uncertainty in medical image segmentation on vascular disease. Proc. Portugal-UT Austin CFD 2008, 1st Workshop on Computational Engineering: Fluid Dynamics. IST, Lisbon, Portugal, 2008.
- A.M.M.O. Pisco, N.J.G. Santos, A.M. Gambaruto, and A. Sequeira. Segmentation as Path to Tumour Identification on Medical Images. Proc. Lectures on Modelling Cancer Growth and Treatments. Estoril, Portugal, 2008.
- F. Teodoro, N. Ford, P.M. Lima, and P. Lumb. Numerical modelling of a functional differential equation with deviating arguments using a collocation method. AIP Conference Proceedings 1048, 2008, pp. 553-557.
- G. Silva, F. Anselmi, and A.M. Gambaruto, A. Sequeira. Characterizing the flow field using critical point theory with relation to typical atherosclerosis location. Proc. Portugal-UT Austin CFD 2008, 1st Workshop on Computational Engineering: Fluid Dynamics. IST, Lisbon, Portugal, 2008.
- A. Sequeira and T. Bodnár. Computational hemorheology: progress in blood coagulation modelling. In: Vascular Wall and Endothelium, Actas de Bioquímica, 9, pp. 31-42, 2008 (eds. J. Martins e Silva, Carlota Saldanha).

### 5.5 Reports & Other Publications

- J. Costa e Silva. Genetic analysis of a sample of trees from the breeding population of Eucalyptus globulus in Portugal. Technical Report, RAIZ Forest and Paper Research Institute, Portugal, 22 pp., 2008.
- A. Sequeira, A Gambaruto, J. Janela and J. Soares (Eds.). Lectures on Modelling Cancer Growth and Treatments (International Workshop, December 8-9, 2008, Estoril, Portugal): Book of Abstracts, 2008.
- A. Sequeira, J. Janela, C. Silva, and J.C. Pereira (Eds.). Portugal - UT Austin CFD 2008 (1st Workshop on Computational Engineering: Fluid Dynamics, July 10-11, 2008, IST, Lisbon, Portugal): Book of Abstracts, 2008.
- J. Costa e Silva. Evaluation of an international series of Pinus kesiya provenance trials for adaptive, growth and wood quality traits. Forest & Landscape Working Papers No. 22-2007, Forest & Landscape, Faculty of Life Sciences, University of Copenhagen, Denmark, 41 pp., 2007.

## 6 Publications accepted in 2008

The following works involving CEMAT members were accepted for publication in 2008:

- C.J.S. Alves and P.R.S. Antunes. The method of fundamental solutions applied to the calculation of eigensolutions for 2D plates. Int. J. Num. Meth. Eng. 77:177-194, 2009.
- C.J.S. Alves and N.F.M. Martins, The direct method of fundamental solutions and the inverse Kirsch-Kress method for the reconstruction of elastic inclusions or cavities. Journal of Integral Equations and Applications. In press.
- C.J.S. Alves and N.F.M. Martins. On the Determination of a Robin Boundary Coefficient in an Elastic Cavity using the MFS; in Progress on Meshless Methods (Editors: AJM Ferreira et al.) Computational Meth. Appl. Sciences 11. Springer, New York, 2009.
- C.J.S. Alves, A.L. Silvestre, T. Takahashi, and M. Tucsnak. Solving inverse source problems using observability. Applications to the Euler-Bernoulli plate equation. SIAM J. Control and Optimization. In press.

- A.M. Artoli, A. Sequeira, A.S. Silva, and C. Saldanha, Shear-thinning dependent mechanisms of Leukocyte recruitment to the endothelial wall. In: *Vascular Wall and Endothelium*, Lisboa, 2007, *Actas de Bioquímica*, 7 (eds: J. Martins e Silva, Carlota Saldanha and J.F. Stoltz), in press.
- A.M. Artoli, A. Sequeira, A.S. Silva-Herdade, and C. Saldanha. Leukocytes dynamics in micro-circulation under shear-thinning blood flow. *Computers & Mathematics with Applications*. In press.
- C. Baek and V. Pipiras. Long range dependence, unbalanced Haar wavelet transformation and changes in mean level. *Int. J. of Wavelets, Multiresolution and Information Processing*. In press.
- C. Baek, V. Pipiras, H. Wendt, and P. Abry. Second order properties of distribution tails and estimation of tail exponents in random difference equations. *Extremes*. In press.
- C. Baker, T. Diogo, G. Flessas, P. Lima, A. Makroglou, and J. Shen, J.( Eds.). *Journal of Computational and Applied Mathematics (Selected papers based on the presentations at the Second international workshop on analysis and numerical approximation of singular problems, September 6-8, 2006, Samos, Greece.)* In press.
- G. Boente, A.M. Pires, and I.M. Rodrigues. Robust tests for the common principal components model. *Journal of Statistical Planning and Inference*. In press.
- T. Diogo. Collocation and iterated collocation methods for a class of weakly singular Volterra integral equations. *J. Comput. Appl. Math.* In press; available online.
- G.P. Galdi and A. L. Silvestre. On the motion of a rigid body in a Navier-Stokes liquid under the action of a time-periodic force. *Indiana Univ. Math. Journal*. In press
- A.M. Gambaruto, D.J. Taylor, and D.J. Doorly. Modelling nasal airflow using a Fourier descriptor representation of geometry. *International Journal for Numerical Methods in Fluids*. In press.
- S. Knoth, M.C. Morais, A. Pacheco, and W. Schmid. Misleading signals in simultaneous residual schemes for the mean and variance of a stationary process. *Communications in Statistics - Theory and Methods's Special Issue 'Celebrating 50 Years in Statistics Honoring Professor Shelley Zacks'*. In press.
- A. Moura, Coupling multiscale uid-structure interaction models for blood ow simulations. In: *Vascular Wall and Endothelium*, Lisboa, 2007, *Actas de Bioquímica*, 7 (eds. J. Martins e Silva, Carlota Saldanha and J.F. Stoltz), in press.
- A.M. Robertson, A. Sequeira, and R. Owens. Rheological models for blood. In L. Formaggia, A. Quarteroni, and A. Veneziani, eds., *Cardiovascular Mathematics*. Springer-Verlag, 2009.
- N.C. Roberty and C.J.S. Alves. On the identification of star shaped sources from boundary measurements using a reciprocity functional. *Inv. Probl. Sc. Eng.* In Press.
- M.R. Oliveira, A. Pacheco, C. Pascoal, R. Valadas, and P. Salvador. On the dependencies between Internet flow characteristics. *Lectures Notes in Computer Science*. In press.
- A. Sequeira and T. Bodnár. Numerical study of some viscoelastic blood flow models. In A. Sequeira and R. Rannacher, eds., *Advances in Mathematical Fluid Mechanics - dedicated to G.P. Galdi on his 60th birthday*. Springer Verlag, 2009. In press.
- A. Sequeira and J. Janela, A note on computational blood rheology, PAMM - Proceedings in Applied Mathematics and Mechanics, ICIAM 07, Zurich 2007, to appear.
- A. Sequeira, A. Moura, and J. Janela. Towards a geometrical multiscale approach to non-Newtonian blood flow simulations. In A. Sequeira and R. Rannacher, eds., *Advances in Mathematical Fluid Mechanics - dedicated to G.P. Galdi on his 60th birthday*. Springer Verlag, 2009. In press.

- A. Sequeira and R. Rannacher (Eds.). *Advances in Mathematical Fluid Mechanics (Dedicated to G.P. Galdi on his 60th birthday)*. Springer Verlag, 2009. In press.
- M.F.Teodoro, P.M. Lima, N. Ford, and P. Lumb. A new approach to the numerical solution of forward-backward equations. *Frontiers of Mathematics in China* 4(1):155-168, 2009. forward-backward equations. *Frontiers of Mathematics in China* 4(1):155-168, 2009.

## 7 Research Lectures

During 2008, CEMAT members gave the scientific talks listed below as: invited lectures at scientific events, external seminars, and communications at conferences/workshops with no associated publication.

### 7.1 Invited Lectures

- A. Moura, *Modelação e Simulação do Sistema Cardiovascular*. Jornadas de Outono de MAEG, December 3, 2008, ISEG, TU Lisbon, Portugal, .
- E. J. Sellountos, *Meshless LBIE - RBF velocity - vorticity formulation for 2D fluid flow*. ICCES Special Symposium on Meshless and other Novel Computational Methods. October 13-17, 2008, Suzhu, China. (Invited Speaker)
- A.L. Silvestre, *On the detection of an immersed rigid body by boundary measurements*. IV International Conference on Mathematical Fluid Mechanics and Applications, September 26 - 28, 2008, Évora, Portugal. (Invited Speaker)
- G. Boente, A.M. Pires, and I. M. Rodrigues, *Detecting influential observation in principal components and common principal components*. International Conference on Robust Statistics (ICORS 2008), September 8-12, 2008, Antalya, Turkey.
- R. Caldeira, E.A. Luís, D. Boutov, A. Santos, J.H. Videman, A. Chelius, and P. Sangrá, *Madeira Island case studies*. International Workshop on Geophysical Fluid Dynamics: Island wake studies, July 21-31, 2008, Funchal, Madeira, Portugal.
- E.A. Luís, *Equations, approximations and methods in Geophysical Fluid Dynamics*. International Workshop on Geophysical Fluid Dynamics: Island wake studies, July 21-31, 2008, Funchal, Madeira, Portugal.
- J.H. Videman, *Instabilities in Geophysical Flows: Barotropic/Baroclinic, Temporal/Spatial*. International Workshop on Geophysical Fluid Dynamics: Island Wake Studies, July 21-31, 2008, Funchal, Madeira, Portugal.
- A. Moura, *Geometrical multiscale modelling of the integrated cardiovascular system*. First Workshop IST / UT Austin in Computational Engineering: Fluid Dynamics, July 10-11, 2008, Lisbon, Portugal. (Invited Speaker)
- C. J. S. Alves, *RBF as MFS Approximations in Higher Dimension*. WCCM'08: Mynisymposium on Meshfree and Generalized/Extended Finite Element Methods, June 30 - July 4, 2008, Venice, Italy.
- A. Moura, *Coupling different models for the integrated cardiovascular system*. IV International Conference on Mathematical Fluid Mechanics and Applications, June 26-28, 2008, Évora, Portugal. (Invited Speaker)
- J.H. Videman, *Streamline Diffusion Methods for Shallow-Water Equations*. International Conference on Mathematical Fluid Mechanics and Applications, June 26-28, 2008, Évora, Portugal.

- N. Antunes, G. Jacinto, and A. Pacheco, *Distribuições dos tempos de duração dos caminhos em redes de telecomunicações móveis ad hoc*. (Distribution of persistence times of paths in mobile ad-hoc networks.) ENSPM08: National Meeting of the Portuguese Mathematical Society 2008, June 25-28, 2008, Coimbra, Portugal.
- A.L. Silvestre, *On the Navier-Stokes equations around a rotating obstacle. Vorticity, Rotation and Symmetry - Stabilizing and Destabilizing Fluid Motion*, CIRM (Luminy, Marselha), May 19 - 23, 2008.
- C. J. S. Alves, *On the detection of an immersed rigid body by boundary measurements*. International Conference on Inverse Scattering Problems. Sestri Levante. May 8-10, 2008 (Invited Speaker).

## 7.2 Communications at conferences/workshops

- E. Fernandes, A. Pacheco, and C. Penha-Gonçalves, *Mapeamento por intervalo composto e a distribuição normal-assimétrica*. (QTL compound interval mapping and the skew-normal distribution.) EQS2008: VI Conferência de Estatística e Qualidade na Saúde, November 20-21, 2008, Escola Superior de Tecnologia da Saúde de Lisboa, Lisboa, Portugal.
- P.M. Lima, *Asymptotic and numerical analysis of a singular boundary value problem for a quasi-linear ordinary differential equation*, International Conference on Modeling of Nonlinear Processes and Systems, October 14-18, 2008, Moscow, Russia.
- R. Caldeira, E.A. Luís, A. Santos, and J.H. Videman, *Madeira Island case studies*. 2008 ROMS/TOMS European Workshop, October 6-8, 2008, Grenoble, France.
- E. Almaraz-Luengo and A. Pacheco, *Ordenação estocástica de tempos de ruína em processos de risco em ambiente semi-markoviano* (Stochastic ordering of ruin times in semi-Markov modulated ruin processes.) XVI Annual Meeting of the Portuguese Statistical Society, October 1-4, 2008, Vila Real, Portugal.
- J. A. Branco, *Ordem e ordenação em análise multivariada*. XVI Annual Meeting of the Portuguese Statistical Society, October 1-4, 2008, Vila Real, Portugal.
- E. Fernandes, A. Pacheco, and C. Penha-Gonçalves, *Mapeamento por intervalo composto e a distribuição normal-assimétrica*. (QTL compound interval mapping and the skew-normal distribution.) XVI Annual Meeting of the Portuguese Statistical Society, October 1-4, 2008, Vila Real, Portugal.
- F. Ferreira, A. Pacheco, and H. Ribeiro, *Análise de sistemas oscilantes  $M^X/G/1/n$* . (Analysis of oscillating  $M^X/G/1/n$  systems.) XVI Annual Meeting of the Portuguese Statistical Society, October 1-4, 2008, Vila Real, Portugal.
- L. Gonçalves, M.R. Oliveira, A.M. Pires, and C. Pascoal, *Proporções versus dimensão da amostra: Um problema simples ou complicado?* (Proportion versus sample size: A simple or complex problem?) XVI Annual Meeting of the Portuguese Statistical Society, October 1-4, 2008, Vila Real, Portugal.
- M.S. Miranda, A. Rocha, and J. A. Branco, *Estimativas robustas para modelos de equações simultâneas*. XVI Annual Meeting of the Portuguese Statistical Society, October 1-4, 2008, Vila Real, Portugal.
- M.R. Neto and J.A. Branco, *Profundidades de Portugal no contexto Europeu*. XVI Annual Meeting of the Portuguese Statistical Society, October 1-4, 2008, Vila Real, Portugal.
- A. Pacheco and H. Ribeiro, *Perdas de clientes num período de ocupação contínua em sistemas oscilantes  $M/G/1/n$* . (Customer losses in busy periods of oscillating  $M/G/1/n$  systems.) XVI Annual Meeting of the Portuguese Statistical Society, October 1-4, 2008, Vila Real, Portugal.

- C. Pascoal, M.R. Oliveira, A. Pacheco, R. Valadas, and P. Salvador, *Estudo de associações entre características de fluxo de tráfego da Internet*. (Study of association between characteristics of Internet traffic flows.) XVI Annual Meeting of the Portuguese Statistical Society, October 1-4, 2008, Vila Real, Portugal.
- H. Pereira, C. Amado, and A. Pires, *Robust methods for nonlinear regression*. XVI Annual Meeting of the Portuguese Statistical Society, October 1-4, 2008, Vila Real, Portugal.
- S.F. Pinto and C. Amado, *Robust bootstrap for multivariate linear regression*. XVI Annual Meeting of the Portuguese Statistical Society, October 1-4, 2008, Vila Real, Portugal.
- A.M. Pires and J.A. Branco, *Componentes principais robustas: uma apreciação crítica*. XVI Annual Meeting of the Portuguese Statistical Society, October 1-4, 2008, Vila Real, Portugal.
- D. Pontes, J. Branco, and C. Amado, *ANOVA: robust or not robust, that is the question!* XVI Annual Meeting of the Portuguese Statistical Society, October 1-4, 2008, Vila Real, Portugal.
- E.A. Luís, R. Caldeira, A. Santos, and J.H. Videman, *Numerical modelling of island wake phenomena using ROMS*. Workshop on Climate Modelling, FC-University of Lisbon, September 24, 2008, Lisboa, Portugal.
- V. Pipiras, *Adaptive wavelet decompositions of stationary (Gaussian) processes*. 2008 NBER-NSF Time Series Conference, September 12-13, 2008, Aarhus, Denmark. (Poster Communication).
- P. Antunes and S. S. Valtchev, *A meshfree numerical method for acoustic wave propagation problems in planar domains with corners and cracks*. IWANASP 2008: Third International Workshop on Analysis and Numerical Approximation of Singular Problems, September 10-12, 2008, Ericeira, Portugal.
- A. Moura, *The coupling of multiscale models in hemodynamics and hemorheology*. IWANASP 2008: Third International Workshop on Analysis and Numerical Approximation of Singular Problems, September 10-12, 2008, Ericeira, Portugal.
- M. Rebelo, *Analytical and numerical results for weakly singular Volterra integral equations*. IWANASP 2008: Third International Workshop on Analysis and Numerical Approximation of Singular Problems, September 10-12, 2008, Ericeira, Portugal.
- M.F. Teodoro, *Analysis and numerical approximation of forward-backward differential equations*. IWANASP 2008: Third International Workshop on Analysis and Numerical Approximation of Singular Problems, September 10-12, 2008, Ericeira, Portugal.
- C. Santos Pereira and A. Pires, *Robustness of AIC based criterion for selecting the number of clusters*. COMPSTAT 2008 - International Conference on Computational Statistics, August 24-29, 2008, Porto, Portugal.
- C. Amado, A.M. Pires, R. Oliveira, and I. Rodrigues, *Multiple tests for robust regression in microarray data*. 29th Annual Conference of the International Society for Clinical Biostatistics, August 17-21, 2008, Copenhagen, Denmark.
- L. Gonçalves, C. Pascoal, A. M. Pires, and M. R. Oliveira, *Sample size for estimating a binomial proportion: comparison of different methods*. 29th Annual Conference of the International Society for Clinical Biostatistics, August 17-21, 2008, Copenhagen, Denmark.
- M.R. Oliveira and L. Gonçalves, *Confidence Intervals for Sensitivity and Specificity using a Latent Class Model*. 29th Annual Conference of the International Society for Clinical Biostatistics, August 17-21, 2008, Copenhagen, Denmark.
- A.M. Pires and V.M. Lourenço, *Statistical methods in association studies*. International Workshop Population, Quantitative and Comparative Genomics of Adaptation in Forest Trees, August 3-5, 2008, Centro di Ecologia Alpina, Monte Bondone, Trento, Italy.

- N. Diniz dos Santos, *Modeling and simulations of erosion and deposition in avalanches*. CEM-RACS'08, July 21 - August 29, Marseille, France.
- F. Critchley, A. Pires, and C. Amado, *Principal Axis Analysis - with HDLSS bonuses!* 32nd Annual Conference of the German Classification Society, July 16-18, 2008, Hamburg, Germany.
- E.A. Luís, R. Caldeira, A. Santos, and J.H. Videman, *Island wake dynamics: Madeira Archipelago case study*. Portugal-UT Austin Workshop on Computational Engineering: Fluid Dynamics, July 10-11, 2008, IST, Lisbon, Portugal.
- E.J. Sellountosa and A. Sequeira, *2D Boundary Elements (BEM) for Newtonian and non-Newtonian flows*. First Portugal-UT Austin Workshop on Computational Engineering: Fluid Dynamics, July 10-11, 2008, IST, Lisbon, Portugal. (Poster Communication).
- J.H. Videman, *Stabilization Methods for Shallow-Water Equations*. First Portugal-UT Austin Workshop on Computational Engineering: Fluid Dynamics, July 10-11, 2008, IST, Lisbon, Portugal.
- M. Rebelo, *Analytical and numerical investigation of a non-linear Abel type Volterra equation*. ICCAM 2008: 13th International Conference on Computational and Applied mathematics, July 7-11, 2008, Ghent University, Belgium.
- M.F. Teodoro, *Existence results and computational methods for mixed type functional differential equations*, ICCAM 2008: 13th International Conference on Computational and Applied mathematics, July 7-11, 2008, Ghent University, Belgium.
- F. Ferreira and A. Pacheco, *Sufficient conditions for the level crossing ordering of Whittle networks*. 2008 International Workshop on Applied Probability, July 7-10, 2008, Université de Technologie de Compiègne, France.
- A. Pacheco and H. Ribeiro, *Moments of the duration of busy periods in oscillating  $M^X/G/1/n$  systems*. 2008 International Workshop on Applied Probability, July 7-10, 2008, Université de Technologie de Compiègne, France.
- P. Antunes, *Métodos sem malha para problemas de valores próprios em EDP's*. ENSPM08: National Meeting of Portuguese Mathematical Society. Instituto Superior de Engenharia de Coimbra, Portugal, June 25-28, 2008.
- M.F. Teodoro, *Métodos Numéricos para equações diferenciais mistas*. ENSPM08: National Meeting of Portuguese Mathematical Society. Instituto Superior de Engenharia de Coimbra, Portugal, June 25-28, 2008.
- M. R. Oliveira, A. Pacheco, C. Pascoal, R. Valadas, and P. Salvador, *Robust estimation of parameters of a truncated bivariate normal distribution*. CFE'08: 1st Workshop of the ERCIM Working Group on Computing & Statistics and 2nd International Workshop on Computational and Financial Econometrics, June 19-21, 2008, Neuchâtel, Switzerland.
- P.M. Lima, *Analysis and numerical investigation of forward-backward equation*. 13th International Conference on Mathematical Modelling and Analysis, June 7-9, 2008, Tartu, Estonia.
- T. Diogo, *Numerical solution of a nonlinear singular Volterra equation using graded meshes*. MMA2008: 13th International Conference on Mathematical Modelling and Analysis, June 4-7, 2008, Tartu, Estonia.

## 8 Seminar Series

CEMAT organized during 2008 the seminar talks listed below.



### 8.1 CEMAT Open Seminar and Colloquium

- Rainer Kress, Gottingen University, Germany, *Electrostatic Imaging and Conformal Mapping*, 29/05/08.
- Denis Collange, Orange Labs, France, *Quality of Experience assessment for network monitoring*, 3/06/08.

### 8.2 Applied Mathematics and Numerical Analysis Seminar

- Evelina Shamarova, Group of Physical Mathematics, University of Lisbon, *Navier-Stokes equations and forward-backward SDEs on the group of diffeomorphisms of a torus*, 26/09/08
- Davide La Torre, University of Milan, Italy, *Iterated Function Systems, Multifunctions and Multi-measures: Inverse Problems and Applications*, 6/10/08.
- Sellountos J. Euripides, CEMAT/IST, *The Boundary Element method (BEM) and the meshless Local Boundary Integral Equation*, 8/10/08.
- Phan Thanh An, Institute of Mathematics, Vietnamese Academy of Science and Technology, *Some Applications of Optimal Control Problems in Computational Geometry*, 16/10/08.
- Jin Yun Yuan, Universidade Federal do Paraná, Brasil, *Some recent studies on Numerical Methods for Linear Systems*, 16/10/08.
- G. Yu. Kulikov, University of the Witwatersrand, Johannesburg, *Global Error Control in Consistent and Quasi-Consistent Numerical Schemes*, 20/10/08.
- João Soares, Dept. Mechanical Engineering, Texas A&M University, USA, *Constitutive Modeling of Biodegradable Polymers for Application in Endovascular Stents*, 29/10/08.
- Feliz Minhós, Departamento de Matemática, Universidade de Évora, Portugal, *Existence, location and multiplicity results for general beam equations*, 5/11/08.
- Patrick Penel, Dept. Mathématique and Labo SNC, Univerité du Sud, Toulon-Var, France, *Theory of Navier-Stokes equations: moving bodies at the presence of contacts and collisions*, 21/11/08.
- Nuno Diniz dos Santos, CEMAT-IST, *Numerical methods for fluid-structure interaction problems with valves*, 12/12/08.
- Paulo Vasconcelos, Faculdade de Economia, Universidade do Porto, *Computing eigenvalues of integral operators: a distributed memory computing approach*, 17/12/08.

### 8.3 Probability and Statistics Seminar

- Patrícia Gonçalves, Universidade do Minho, Portugal, *Partial Differential Equations and Stochastic Differential Equations Arising in Particle Systems*, 4/12/08.
- Antonio Gómez-Corral, Department of Statistics OR, Faculty of Mathematics, Complutense University of Madrid, Spain, *An Overview of Retrial Queues*, 4/12/08.
- Vladas Pipiras, CEMAT / IST and University of North Carolina, *Estimation of matrix rank: historical overview and more recent developments*, 7/11/08.
- Cláudia Nunes, CEMAT e Departamento de Matemática, Instituto Superior Técnico, *Análise Probabilística de Opções Reais*, 4/7/08.
- Carlos Daniel Paulino, Departamento de Matemática, Instituto Superior Técnico, *Análise bayesiana de privação das famílias portuguesas*, 20/6/08.

- Manuela Souto de Miranda, Departamento de Matemática, Universidade de Aveiro, *Erros nos regressores: realismo, desconforto e desafios*, 30/5/08.
- Isabel Rodrigues, CEMAT and Department of Mathematics, Instituto Superior Técnico, *Métodos robustos para regressão com erros autocorrelacionados*, 20/5/08.
- João Branco, CEMAT and Department of Mathematics, Instituto Superior Técnico, *Regressão Robusta*, 11/4/08.
- Luzia Gonçalves, CEAUL e Instituto de Higiene e Medicina Tropical - Universidade Nova de Lisboa, *A Bioestatística integrada numa perspectiva multidisciplinar*, 7/3/08.
- G. Boente, Universidad de Buenos Aires e CONICET Argentina, *Robust estimators in Generalized Partially Linear Models*, 22/2/08.
- Ana Pires, Departamento de Matemática e CEMAT, Instituto Superior Técnico, *Robust statistics: an overview*, 15/2/08.

## 9 Organization of scientific events

CEMAT members were involved in the organization of the following scientific events during 2008:

- FITraMEn 2008: International Workshop on Traffic Mangement and Traffic Engineering for the Future Internet, Porto, Portugal, December 11-12, 2008. (A. Pacheco: Member of the Technical Program Committee). url: <http://www.fitramen.eu>
- Lectures on Modelling Cancer Growth and Treatments, Estoril, Portugal, December 8-9, 2008. (A. Sequeira: Chairman; A. Gambaruto, J. Janela: Co-organizers).
- International Conference on Modeling of Nonlinear Processes and Systems, Moscow, Russia, October 14-18, 2008. (P. Lima: Member of the Scientific Committee).
- XVI Annual Meeting of the Portuguese Statistical Society, Vila Real, Portugal, October 1-4, 2008. (F. Ferreira: Member of the Organizing Committee; A. Pacheco: President of the Session 'Socio-Economic Applications'). url: <http://home.utad.pt/~spe2008/>
- IWANASP08: Third International Workshop on Approximation and Analysis of Singular Problems, Ericeira, Portugal, September 10-12, 2008. (Organizing Committee : T. Diogo, P. Lima, M. Rebelo, and F. Teodoro)
- ICORS2008: International Conference on Robust Statistics, Antalya, Turquia, September 8-12, 2008. (A.M. Pires: Member of the Scientific Committee)
- COMPSTAT 2008: International Conference on Computational Statistics, Porto, Portugal, August 24-29, 2008. (A.M. Pires: Member of the Organizing Committee) url: <http://www.fep.up.pt/compstat08/>
- First Workshop IST/UT Austin in Computational Engineering: Fluid Dynamics, Lisbon, Portugal, July 10-11, 2008. (A. Sequeira: Chairman; A. Gambaruto, J. Janela, and A. Moura: Co-organizers).
- ENSPM08: National Meeting of the Portuguese Mathematical Society, Coimbra, Portugal, June 25-28, 2008. (A. Pacheco: Organizer of the Thematic Session on Probability and Statistics). url: <http://www.isec.pt/enspm08/>
- 6th ICIPE : 6th International Conference on Inverse Problems in Engineering: Theory and Practice, Dourdan (Paris), France, June 15-19, 2008. (C. Alves: Member of the Scientific Committee).

- MAM6: Sixth International Conference on Matrix Analytic Methods in Stochastic Models, Beijing, China, June 11-14, 2008. (A. Pacheco: Member of the Scientific Advisory Committee). url: <http://mam6.industrialengineering.dal.ca/>
- Trefftz'08 : 5th Workshop on Trefftz Methods, Leuven, Belgium, March 31 - April 2, 2008. (C. Alves: Member of the Scientific Committee).
- XV Classification and Data Analysis Journeys, JOCLAD 2008, Setúbal, Portugal, March 27-29, 2008. (A.M. Pires: Member of the Scientific Committee)
- International Conference on Mathematics and Continuum Mechanics, Porto, February 19-22, 2008. (J.H. Videman: Co-organizer).

## 10 Academic degrees awarded in 2008

The following four Ph.D.'s and eleven M.Sc.'s awarded in 2008 were defended or supervised by CEMAT members.

### 10.1 Doutoramentos/Ph.D.'s

- Pedro Antunes, *The Method of Fundamental Solutions Applied to Eigenproblems in Partial Differential Equations*, PhD Thesis, IST, TU Lisbon, 2008. Supervisor: C. Alves.
- João Janela, *Mathematical and Numerical Modelling in Hemodynamics and Hemorheology*, PhD Thesis, IST, TU Lisbon, 2008. Supervisor: A. Sequeira.
- M. Luísa Morgado, *Analysis and Numerical Approximation of Singular Boundary Value Problems*, PhD Thesis, Universidade de Trás-os-Montes e Alto Douro, 2008. Supervisor: P. Lima.
- Svilen Valtchev, *Numerical Analysis of Methods with Fundamental Solutions for Acoustic and Elastic Wave Propagation Problems*, PhD Thesis, IST, TU Lisbon, 2008. Supervisor: C. Alves.

### 10.2 Mestrados/M.S.c.'s

- Carla Miranda, *Regressão linear múltipla com erros ARMA* (Multiple Linear Regression with ARMA errors), MSc thesis, IST, TU Lisbon, Lisbon, 2008, Supervisor: A.M. Pires. In Portuguese.
- Maria Raquel Neto, *O Conceito de Profundidade em Estatística* (The concept of depth in statistics), MSc thesis, IST, TU Lisbon, Lisbon, 2008, Supervisor: J. Branco. In Portuguese.
- Sílvia Nobre, *First Passage Times in Ito Processes considering a Jump Scenario; Applications in Finance*, MSc thesis, IST, TU Lisbon, Lisbon, 2008. Supervisor: C. Nunes.
- Inês Oliveira, *Um Método de Soluções Fundamentais Aplicado ao Tratamento de Imagem* (A method of fundamental solutions applied to image processing), MSc thesis, IST, TU Lisbon, Lisbon, 2008. Supervisor: C. Alves. In Portuguese.
- Daniela Pamplona, *Gaussian Foveation*, MSc thesis, IST, TU Lisbon, 2008, Supervisors: A. Bernardino and C. Alves.
- Helena Pereira, *Métodos Robustos em Regressão Não-Linear* (Robust Methods for Nonlinear Regression), MSc thesis, IST, TU Lisbon, Lisbon, 2008. Supervisor: C. Amado. In Portuguese.

- Sofia Pinto, *Robust bootstrap for multivariate linear regression*, MSc thesis, IST, TU Lisbon, Lisbon, 2008, Supervisor: C. Amado. In Portuguese.
- Bartolomeu Rabaçal, *Análise Discriminante com Restrições na Estrutura de Covariâncias*, MSc thesis, IST, TU Lisbon, 2008, Supervisor: I. M. Rodrigues.
- Teresa Riso, *Regressão logística multinomial e ordinal* (Multinomial and ordinal logistic regression), MSc thesis, IST, TU Lisbon, Lisbon, 2008, Supervisor: A.M. Pires. In Portuguese.
- Angel Rodriguez-Rozas, *Developing High Efficient Algorithms in Parallel Scientific Computing*, MSc thesis. Interdisciplinary Master of Catalanian Polytechnical University (UPC)/University Rovira i Virgili (URV). Barcelona (Spain), 2008, Supervisor: J.A. Acebron. In Spanish.
- Teresa Sampaio, *Aplicação de Modelos Mistos em Ensaio Genéticos Florestais* (Application of Mixed Models to Forest Genetics Experiments), MSc thesis, Instituto Superior de Agronomia, TU Lisbon, Lisbon, 2008, Supervisor: Manuela Neves (ISA/TU Lisbon); Co-Supervisors: J. Costa e Silva (CEMAT) and M. Helena Almeida (ISA/TU Lisbon). In Portuguese.

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Department of Mathematics  
Instituto Superior Técnico  
Portugal

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## 1 Introduction

The Center for Functional Analysis and Applications-CEAF is aimed at developing research in the area of Functional Analysis keeping in view applications to other areas of Mathematics and also to Physics and Engineering.

The center was founded in 2006 by initiative of a group of researchers from the Instituto Superior Técnico and the University of Algarve who formerly had been members of the Center for Mathematics and Applications. The main reason behind the creation of the Center was to have clearly focused scientific objectives leading to higher visibility of our research in the area.

Presently, the center possesses twenty four doctorate members and the main research interests include topics such as

- Riemann-Hilbert Problems and Factorization,
- Operator Algebras and Index Theory,
- Toeplitz Operators and Corona Problems,
- Operator Methods in Boundary-Value Problems,
- Singular Integral Operators with Shifts,
- Harmonic Analysis and Operator Theory.

**The list of members of CEAF in 2008 is the following:**

**PhD** members:

Amarino Lebre  
Ana Isabel Conceição Guerra  
Ana Moura Santos  
António Ferreira dos Santos  
António Bravo  
Catarina Carvalho  
Cláudio Fernandes  
Frank-Olme Speck  
Helena Mascarenhas  
Juan Rodriguez  
Lina Oliveira  
Luís Pessoa  
Maria Amélia Bastos  
Maria Cristina Câmara  
Matthew Heath  
Natasha Samko  
Nuno Cirilo António  
Oleksiy Karlovich  
Paulo Lopes  
Pedro Simões dos Santos  
Rui Marreiros  
Sofia Naique  
Stefan Samko  
Viktor Kravchenko

**Post-graduate** students:

Cristina Diogo  
Humberto Gil Silva Rafeiro  
Rui Domingos Rosado dos Reis  
Rui Palma

## 2 Publications in 2008

### 2.1 Books

- M. A. Bastos, I. Gohberg, A.B. Lebre, F.-O. Speck, Operator Algebras, Operator Theory and Applications. Proceedings of an International Summer School and Workshop “WOAT 2006” held at Lisbon in September 2006, Operator Theory: Advances and Applications, Vol. 181. Birkhäuser, Basel 2008, xiv + 437 p.

### 2.2 Chapters/articles in books with international refereeing

- V. Kokilashvili, S. Samko, Weighted boundedness of the maximal, singular and potential operators in variable exponent spaces. Analytic Methods of Analysis and Differential Equations (Eds: A.A. Kilbas and S.V. Rogosin), Cambridge Scientific Publishers, Cambridge 2008, 139-164.

### 2.3 Articles in international journals

- A. Almeida, J. Hasanov, S. Samko, Maximal and potential operators in variable exponent Morrey spaces. Georgian Math. J. 25 (2008), 195-208.
- A. Almeida, H. Rafeiro, Inversion of the Bessel potential operator in weighted variable Lebesgue spaces. J. Math. Anal. Appl. 340 (2008), 1336-1346.
- M.A. Bastos, C.A. Fernandes, Yu. Karlovich,  $C^*$ -algebra of singular integral operators with shifts having the same nonempty set of fixed points. Compl. Anal. Oper. Theory 2 (2008), 241-272.
- M.A. Bastos, P.A. Lopes, A.M. Santos, The two straight line approach and periodic boundary-value problems. J. Math. Anal. Appl. 338 (2008), 330-349.
- M.C. Câmara, M.T. Malheiro, Meromorphic factorization revisited and application to some groups of matrix functions. Compl. Anal. Oper. Theory 2 (2008), 299-326.
- M.C. Câmara, A.F. dos Santos, Pedro F. dos Santos, Matrix Riemann-Hilbert problems and factorization on Riemann surfaces. J. Funct. Anal. 255 (2008), 228-254.
- M.C. Câmara, C. Diogo, Invertibility of Toeplitz operators and corona conditions in a strip. J. Math. Anal. Appl. 342 (2008), 1297-1317.
- R. Cardoso, S. Samko, Weighted generalized Holder spaces as well-posedness classes for Sonine integral equations. J. Integr. Equat. Appl. 20 (2008), 437-480.
- L. Castro, R. Duduchava, F.-O. Speck, Solvability of singular integro-differential equations with multiple complex shifts. Complex Analysis and Operator Theory (special issue devoted to the memory of Georgii Semenovich Litvinchuk. Eds.: D. Alpay, M. Shapiro and I. Spitkovsky) Compl. Anal. Oper. Theory 2 (2008), 327-343.
- L. Ephremidze, V. Kokilashvili, S. Samko, Fractional, maximal and singular operators in variable exponent Lorentz spaces. Fract. Calc. Appl. Anal. 11 (2008), 407-420.



- A.Yu. Karlovich, L. Maligranda, On the interpolation constant for subadditive operators in Orlicz spaces. Proceedings of the International Symposium on Banach and Function Spaces, Kyushu Institute of Technology, Kitakyushu, Japan, Sept. 14-17, 2006, Yokohama Publishers, Yokohama 2008, 85-101.
- V. Kokilashvili, V. Paataashvili, S. Samko, Riemann problem in the class of Cauchy-type integrals with density in  $L_p(\cdot)(G)$ . Doklady Mathematics 78 (2008), 510–513.
- V. Kokilashvili, N. Samko, S. Samko, The maximal operator in weighted variable spaces  $L_p(\cdot)$ . J. Function Spaces Appl. 5 (2007), 299-317. (appeared 2008)
- V. Kokilashvili, S. Samko, Boundedness of maximal operators and potential operators on Carleson curves in Lebesgue spaces with variable exponent. Acta Math. Sinica 24 (2008), 1775-1800.
- V. Kokilashvili, S. Samko, The maximal operator in weighted variable Lebesgue spaces on metric spaces. Georg. Math. J. 15 (2008), 683-712.
- V. Kokilashvili, S. Samko, Singular operators and Fourier multipliers in weighted Lebesgue spaces with variable exponents. Vestnik Saint-Petersburg University (in Russian) 2 (2008), 56-68. Engl. transl. in Vestnik St. Petersburg University. Mathematics 41 (2008), 134–144.
- V.G. Kravchenko, A.B. Lebre, J.S. Rodríguez, Matrix functions consimilar to the identity and singular integral operators. Complex Analysis and Operator Theory (special issue devoted to the memory of Georgii Semenovich Litvinchuk. Eds.: D. Alpay, M. Shapiro and I. Spitkovsky). Compl. Anal. Oper. Theory 2 (2008), 593-615.
- L. Oliveira, On range tripotents in  $JBW^*$ -triples, Archiv der Mathematik 91 (2008), 544-553.
- M. Pires, V. Kravchenko, On a "stability" in the linear complementarity problem. Linear Algebra Appl. 429 (2008), 1810-1822.
- V. Rabinovich, S. Samko, Boundedness and Fredholmness of pseudodifferential operators in variable exponent spaces. Integr. Equat. Oper. Theory 60 (2008), 507-537.
- H. Rafeiro, S. Samko, Approximative method for the inversion of the Riesz potential operator in variable exponent spaces. Fract. Calc. Appl. Anal. 11 (2008), 269-280.
- H. Rafeiro, S. Samko, Dominated Compactness Theorem in Banach Function Spaces and its Applications. Compl. Anal. Oper. Theory 2 (2008), 669-681.
- N. Samko, Parameter depending Bary-Steckin classes and local dimensions of measure metric spaces. Proc. A. Razmadze Math. Inst. 145 (2007, appeared in 2008), 122-129.
- N. Samko, Parameter depending Matuszewska-Orlicz type indices and their applications. American Institute of Physics (Selected papers from ICNAAM-2007 and ICCMSE-2007) 1046 (2008), 126-129.
- N. Samko, Fredholmness of singular integral equations in weighted Morrey spaces. Proc. A. Razmadze Math. Inst. 148 (2008), 51-68.
- F.-O. Speck, E.P. Stephan, Boundary value problems for the Helmholtz equation in an octant. Integr. Equ. Oper. Theory 62 (2008), 269-300.

## 2.4 Articles/communication in proceedings of conferences

- A.C. Conceição, V.G. Kravchenko, Factorization algorithm for some special matrix functions. Operator Algebras, Operator Theory and Applications. Proceedings of an International Summer School and Workshop "WOAT 2006" held at Lisbon in September 2006, Operator Theory: Advances and Applications, Vol. 181, Birkhäuser, Basel 2008, 173-185.

- A.Yu. Karlovich, Higher order asymptotic formulas for Toeplitz matrices with symbols in generalized Holder spaces. Operator Algebras, Operator Theory and Applications. Proceedings of an International Summer School and Workshop “WOAT 2006” held at Lisbon in September 2006, Operator Theory: Advances and Applications, Vol. 181, Birkhäuser, Basel 2008, 207-228.
- Yu.I. Karlovich, L.V. Pessoa, Poly-Bergman projections and orthogonal decompositions of  $L_2$ -spaces over bounded domains. Operator Algebras, Operator Theory and Applications. Proceedings of an International Summer School and Workshop “WOAT 2006” held at Lisbon in September 2006, Operator Theory: Advances and Applications, Vol. 181, Birkhäuser, Basel 2008, 263-282.
- V. Kokilashvili, S. Samko, Vekua’s generalized singular integral on Carleson curves in weighted variable Lebesgue spaces. Operator Algebras, Operator Theory and Applications. Proceedings of an International Summer School and Workshop “WOAT 2006” held at Lisbon in September 2006, Operator Theory: Advances and Applications, Vol. 181, Birkhäuser, Basel 2008, 283-294.
- H. Rafeiro, S. Samko, Characterization of the range of one-dimensional fractional integration in the space with variable exponent. Operator Algebras, Operator Theory and Applications. Proceedings of an International Summer School and Workshop “WOAT 2006” held at Lisbon in September 2006, Operator Theory: Advances and Applications, Vol. 181, Birkhäuser, Basel 2008, 393-416.
- N. Samko, B. Vakulov, On generalized spherical fractional integration operators in weighted generalized Holder spaces on the unit sphere. Operator Algebras, Operator Theory and Applications. Proceedings of an International Summer School and Workshop “WOAT 2006” held at Lisbon in September 2006, Operator Theory: Advances and Applications, Vol. 181, Birkhäuser, Basel 2008, 429-437.

### 3 Publications accepted in 2008

#### 3.1 Articles

- A. Almeida, S. Samko, Fractional and hypersingular operators in variable exponent spaces on metric measure spaces, *Mediterr. J. Math.* doi:10.1007/s00009-003-0000.
- A. Almeida, S. Samko, Embeddings of variable Hajlasz-Sobolev spaces into Holder spaces of variable order, *J. Math. Anal. Appl.*
- M.A. Bastos, C.A. Fernandes, Yu. Karlovich, A  $C^*$ -algebra of functional operators with shifts having a nonempty set of periodic points. *Further Progress in Analysis, Proceedings of the 6th International ISAAC Congress, World Scientific (Eds. H.G.W. Begehr et al.), 2009, 111-121.*
- M.C. Câmara, Yu.I. Karlovich, I.M. Spitkovsky, Almost periodic factorization of some triangular matrix functions. *Modern Analysis and Applications; The Mark Krein Centenary Conference, Operator Theory: Advances and Applications.*
- M. Hajiboyev, S. Samko, Weighted estimates of generalized potentials in variable exponent Lebesgue spaces on homogeneous spaces. To appear in *Operator Theory: Advances and Applications (Eds. R. Duduchava, I. Gohberg, S. Grudsky, V. Rabinovich), 2009.*
- M. Hajiboyev, S. Samko, Generalized potential on variable exponent spaces on metric measure spaces, *Math. Nachr.*
- V. Kokilashvili, S. Samko, Operators of harmonic analysis in weighted spaces with non-standard growth. *J. Math. Anal. Appl.* doi:10.1016/j.jmaa.2008.06.056.
- V.G. Kravchenko, A.B. Lebre, J.S. Rodríguez, Factorization of singular integral operators with a Carleman shift: the case of bounded measurable coefficients. *J. Anal. Math.*, 36 p.
- H. Rafeiro, S. Samko, Hardy type inequality in variable Lebesgue spaces. *Annales Academiae Scientiarum Fennicae* 34 (2009), 279-289.

- S. Rogosin, F.-O. Speck, On the analytical solution of the linear-fractional Riemann problem. *Math. Nachr.*, 17 p.
- N. Samko, Parameter depending almost monotonic functions and their applications to dimensions in metric measure spaces. *J. Function Spaces Appl.*
- N. Samko, Weighted Hardy and singular operators in Morrey spaces. *J. Math. Anal. Appl.* 350 (2009), 56–72.
- N. Samko, B. Vakulov, Spherical fractional integrals and hypersingular integrals of variable order in generalized Holder spaces with variable characteristic. *Math. Nachr.*
- P.A. Santos, Games - refining the model. *Actas da Conferência ZON/Digital Games 2008*, 6-7 Nov, Porto, Portugal, 97-104.

## 4 Research Lectures

- M. A. Bastos
  - A  $C^*$  algebra of operators with shifts having a nonempty set of periodic points. *IWOTA 2008*, College of William and Mary, USA, 22-26 July 2008.
- M. Cristina Câmara
  - Fredholm properties of Toeplitz operators and Riemann-Hilbert problems. *International Conference on Operator Algebras and Applications in Morocco*, Marrakech, Morocco, 14-18 April 2008.
  - Toeplitz operators, Riemann-Hilbert problems and factorization. *Seminario de espacios de funciones analíticas y teoría de operadores*, Sevilla, Spain, 17 Junho 2008.
  - Almost periodic factorization for a class of triangular matrix symbols. *SWOT 2008 - Small Workshop on Operator Theory*, Krakow, Poland, 28 June - 1 July 2008.
  - Matrix Wiener-Hopf factorization and Riemann-Hilbert problems in a Riemann surface. *IWOTA 2008 - International Workshop in Operator Theory and its Applications*, Williamsburg, Virginia, USA, 22-26 July 2008.
- C. Carvalho
  - Index theory for pseudodifferential operators on non-compact spaces, *Encontro Nacional da Sociedade Portuguesa de Matematica*, Coimbra, 25-28 June 2008.
- A. Conceição
  - Factorization Algorithm for some Classes of Hermitian Matrix Functions – *International Workshop on Operator Theory and Applications (IWOTA 2008)*, Williamsburg, July 22-25, 2008.
- C. Diogo
  - Generalized inverses for a class of Toplitz operators. *SWOT 2008 - Small Workshop on Operator Theory*, Krakow, Poland, 28 June - 1 July 2008.
  - Corona conditions in a strip and invertibility for a class of Toeplitz operators; *IWOTA 2008 - International Workshop in Operator Theory and its Applications*, Williamsburg, Virginia, USA, 22-26 July 2008

- C. Fernandes
  - 22nd International Conference on Operator Theory, Timisoara, Romania, 3-8 July 2008.
- Alexei Karlovich
  - Asymptotics of Toeplitz determinants: some new results. II Iberian Mathematical Meeting at Badajoz, Spain, 3-5 October 2008.
- V. Kravchenko
  - Zakharov-Shabat system and hyperbolic pseudoanalytic function theory. International Conference of Numerical Analysis and Applied Mathematics, September 2008.
- P. Lopes
  - Invertibility for a class of convolution type operators and solutions for related corona problems with n-AP data. II Iberian Mathematical Meeting at Badajoz, Spain, 3-5 October 2008.
- M. T. Malheiro
  - Meromorphic factorization and the kernel of a Toeplitz operator; International Conference on Operator Algebras and Applications in Morocco, Marrakech, Morocco, 14-18 April 2008.
  - Meromorphic factorization and Toeplitz operators: some new relations. IWOTA 2008 - International Workshop in Operator Theory and its Applications, Williamsburg, Virginia, USA, 22-26 July 2008.
- R. Marreiros
  - An estimate for the number of solutions of an homogeneous generalized Riemann boundary value problem with shift. IWOTA 2008: International Workshop in Operator Theory and its Applications, College of William and Mary, Williamsburg, USA, 22-26 July 2008.
  - On an estimate for the dimension of the kernel of a singular integral operator with a non-Carleman shift. II Iberian Mathematical Meeting, University of Estremadura, Badajoz, Spain, 3-5 October 2008.
- H. Mascarenhas
  - Álgebras de sucessões de aproximação. Aplicações a operadores de convolução em cones. ENSPM 2008, Coimbra, 25-28 June 2008.
  - Spectral approximation and index for convolution type operators on cones. IWOTA 2008, College of William and Mary, Virginia, USA, 22-26 July 2008.
- A. Moura Santos
  - Skills, concepts and models in a Linear Algebra course. 15th ILAS Conference, Cancun, Mexico, 16-20 June 2008.
  - Fredholm theory for periodic diffraction boundary-value problems of first order. II Iberian Mathematical Meeting, Badajoz, Spain, 3-5 October 2008.
- L. Oliveira
  - Weak \*-closed Jordan ideals of nest algebras. International Conference on Operator Algebras and Applications, Marrakech, 14-18 April 2008.
  - Range tripotents and order in JBW\*-triples. Functional Analysis Seminar, Mathematical Institute, Oxford University, 14 October 2008.

- N. Samko
  - Weighted Estimates of Singular and Potential Operators in Morrey Spaces. Seminar on Operator Theory and Function Spaces, Federal Southern University, Russia, 4 December 2008.
  - Spherical fractional integrals and hypersingular integrals of variable order in generalized Hölder spaces with variable characteristic, Tbilisi, September 2008.
  - Weighted estimations of the Cauchy singular integral operator along curves in Morrey spaces; On a new definition of local upper and lower dimensions in metric measure spaces. Seminar of Dipartimento di Costruzioni e Metodi Matematici in Architettura of University “Federico II” of Naples, Italy, July 2008.
  - Weighted estimates of the Cauchy singular integral operator in Morrey spaces. International Conference on Analysis, PDEs and Applications, Rome, Italy, July 2008.
  - Singular integral equations in Morrey spaces. ICNPAA- 2008, International Conference on Mathematical Problems in Engineering and Aerospace Sciences, Genoa, Italy, June 2008.
  - Weighted Hardy and singular operators in Morrey spaces. XVth International Conference on Mathematics, Economics and Education and Vth International Symposium on Fourier Series and Applications, Novorossiisk, Russia, 27 May – 3 June 2008.
- S. Samko
  - Classical operators of harmonic analysis in Lorentz spaces with variable exponent, Universidade do Aveiro, 17 April 2008.
  - Weighted Estimations of Classical Operators of Harmonic Analysis in Variable Exponent Setting. XVI International Conference on Mathematics, Economics and Education and Vth Intern. Symposium on Fourier Series and Applications, Russia, Novorossiisk, Moryak, 27 May – 3 June 2008.
  - Variable Exponent Spaces: Boundedness of Maximal Singular and Potential Operators. Università degli Studi di Padova, Dipartimento de Matematica Pura e Applicata, 23 June 2008.
  - On an equivalent reformulation of the Possio integral equation as a problem of matrix factorization. 7th Intern. Conf. on Math. Probl. in Engineering, Aerospace and Sciences, University of Genoa, Italy, 25-27 June 2008.
  - Weighted Estimates of Classical Operators of Harmonic Analysis in Variable Exponent Spaces. International Conference on Analysis, PDEs and Applications (on the occasion of V. Mazya’s 70th birthday), University La Sapienza, Rome, 30 June – 3 July 2008.
  - Selected Topics of the Operator Theory in Variable Exponent Spaces. FSDONA Workshop, Helsinki (Finland), 22-24 August 2008.
  - Maximal and potential operators in variable exponent Morrey spaces. International Workshop on Variable Exponent Analysis and Related Topics, A. Razmadze Institute and Georgian Technical University, 2-5 September 2008.
  - On Variable Exponent Trends in Fractional Calculus. Fractional Flows Workshop, University of Warwick, Coventry, UK, 18-19 September 2008.
  - Weighted Estimations in Variable Exponent Analysis on Metric Measure Spaces. II Iberian Mathematical Meeting, Universidad de Extremadura, Badajoz, 3-5 October 2008.
- F.-O. Speck
  - Boundary value problems for the Helmholtz equation in an octant. Conference on Analysis, PDEs and Applications on the occasion of the 70th birthday of Vladimir Maz’ya, Rome, 30 June – 3 July, 2008.

- A direct approach to convolution type operators with symmetry. International Workshop on Operator Theory and Applications on the occasion of the 80th birthday of Israel Gohberg, Williamsburg, Virginia, USA (session on Factorization Problems, Wiener-Hopf and Fredholm operators), 22-26 July 2008.
- Operator factorization, matrix identities and normalization. II Iberian Mathematical Meeting, Badajoz, 3-5 October 2008.
- Inversos generalizados. Seminário de Matemática, Instituto Superior Técnico, UT Lisboa, 4 November 2008.

## 5 Seminar Series

### 5.1 Functional Analysis and Applications

- Alexei Karlovich (Universidade Nova de Lisboa and CEAF, IST, UT Lisboa), Connectedness of spectra of Toeplitz operators on Hardy spaces with Muckenhoupt weights over Carleson curves, 5/12/08.
- Luís Castro (Universidade de Aveiro, Portugal), Solvability of singular integro-differential equations with multiple complex shifts, 14/11/08.
- Ioannis Stratis (National and Kapodistrian University of Athens, Greece), Transmission and boundary value problems in the theory of elasticity of hemitropic materials, 14/11/08.
- Franciszek Szafraniec (Unwersytet Jagiellonski, Krakow, Poland), Unbounded subnormal operators: the highlights, 7/11/08.
- Catarina Carvalho (Instituto Superior Técnico, U.T. Lisboa), Topological index for pseudodifferential operators on  $\mathbb{R}^n$ , 31/10/08.
- Mihaly Bakonyi (Centro de Estruturas Lineares e Combinatorias, Universidade de Lisboa), Factorizations of operator-valued functions on ordered groups, 17/10/08.
- Alexei Karlovich (Universidade Nova de Lisboa), Maximal operators on variable Lebesgue spaces with weights related to oscillations of Carleson curves, 26/9/08.
- Ivan Todorov (Queen's University Belfast, United Kingdom), s-numbers of elementary operators, 19/9/08.
- Bernd Silbermann (Technische Universität Chemnitz, Germany), 100 years Galerkin's method, 19/9/08.
- Matthew Heath (Instituto Superior Técnico, U.T. Lisboa), Compact failure of multiplicativity for linear maps between Banach algebras, 11/7/08.
- Yuri I. Karlovich (Universidad Autónoma del Estado de Morelos, Mexico), Wiener-Hopf operators with symbols generated by semi-almost periodic and slowly oscillating matrix functions, 11/7/08.
- Lina Oliveira (Instituto Superior Técnico, U.T. Lisboa), Range tripotents and order, 20/6/08.
- Giorgi Bogveradze (Andrea Razmadze Mathematical Institute, Tbilisi, Georgia), Invertibility characterization of scalar Wiener-Hopf plus Hankel operators with essentially bounded Fourier symbols, 6/6/08.
- El Hassan Zerouali (Faculté des Sciences de Rabat, Maroc), Hypercyclic transform of operators, 30/5/08.
- Chafiq Benhida (Université de Lille 1, France), Multicontractions, Poisson kernel and characteristic function, 23/5/08.

- Marek Ptak (Agricultural University, Krakow, Poland), On the reflexivity, hyperreflexivity and transitivity of algebras and subspaces of operators, 16/5/08.
- David Kapanadze (Universidade de Aveiro), Exterior wedge diffraction problems with Dirichlet, Neumann and impedance boundary conditions, 9/5/08.
- Roland Duduchava (Andrea Razmadze Mathematical Institute and IB Euro-Caucasian University, Tbilisi, Georgia), Boundary value problems on hypersurfaces, 22/4/08.
- Stefan Samko (Universidade do Algarve, Faro), Generalized potential operators in variable exponent spaces, 18/4/08.
- Alexei Karlovich (Universidade Nova de Lisboa and CEAF, IST), Asymptotics of Toeplitz matrices with symbols in some generalized Krein algebras, 7/3/08.
- Cristina Câmara (Instituto Superior Técnico, UT Lisboa), The classes  $C(Q,R)$ , matrix factorization and Riemann-Hilbert problems in a Riemann surface, 8/2/08.
- Luís Pessoa (Instituto Superior Técnico, UT Lisboa), Sequences of analytical type spaces and related Calderon-Zygmund operators, 1/2/08.
- Ilya Spitkovsky (College of William and Mary, Williamsburg, Virginia, USA), Spectral dominance and commuting chains, 11/1/08.

## 6 Research projects

- Non-local Operator Algebras, Related Operator Corona Problems and Applications, FCT project PPCDT/MAT/59972/2004. Coordinator: M.A. Bastos (2005 – June 2009).
- Toeplitz Operators, Factorization and Corona Problems. FCT project PTDC/MAT/81385/2006. Coordinator: M.C. Câmara.
- Generalised Lie groupoids and Index Theory. Funded by FCT - Bilateral Cooperation with France. Chairman in France: B. Monthubert. Chairman of the project in Portugal: C. Carvalho (January 2007 - January 2009).
- Variable Exponent Analysis, INTAS (Brussels) project 06-1000017-8792. Coordinator: S. Samko (finished in December 2008).

## 7 Postdoctoral program

- A.P. Nolasco, Universidade de Aveiro, March 2007 – 2010, advisor: F.-O. Speck.
- M. Heath, 2008-2011, advisor: A.F. dos Santos.

## 8 Academic degrees awarded in 2008

### 8.1 Mestrados/M.A's/M.S.c.'s

- R. Palma, Produtos Cruzados  $C^*$ . Invertibilidade numa álgebra de Operadores Funcionais. Orientador: Maria Amélia Bastos, I.S.T.
- R.D. Rosado dos Reis, Análise espectral em classes de operadores funcionais com deslocamento. PhD thesis, Departamento de Matemática, IST, UT Lisboa 2008. Supervisor: M.A. Bastos; Co-supervisor : C. Fernandes.

## 9 Conferences

### 9.1 Conferences organized in 2008

- II Iberian Mathematical Meeting, Badajoz, Spain, 3-5 October 2008. Member of the Scientific Committee: M.A. Bastos.
- Encontro Nacional da Sociedade Portuguesa de Matemática, Coimbra, June 2008, Member of the Scientific Committee: M.A. Bastos.

### 9.2 Organization of conferences in 2009

- International Summer School on Operator Algebras and Applications, IST, UT Lisboa, 15-19 June 2009. Coordinator of the Organizing Committee: M.A. Bastos, co-organizers: C. Carvalho, C. Fernandes.
- Function spaces of differentiable functions. Session at the ISAAC Congress ISAAC 2009, to be held at London in July 2009. Organizer: S. Samko.



# SQIG - Research Report 2008

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# 1 Members

## 1.1 Full members

- ADÃO, Pedro (Assistant Professor, DEI - Tagus Park)
- CALEIRO, Carlos (Assistant Professor, SLC)
- CAMPAGNOLO, Manuel (Associate Professor, ISA)
- CEDERQUIST, Jan (Assistant Professor, DEI - Tagus Park)
- DIONÍSIO, F. Miguel (Assistant Professor, SLC)
- GOUVEIA, Paula (Assistant Professor, SLC)
- GRAÇA, Daniel (Assistant Professor, UALG)
- LOURENÇO, Carlos (Assistant Professor, FCUL)
- MATEUS, Paulo (Associate Professor with Habilitation, SLC)
- MATOS, Ana (Assistant Professor, DEI - Tagus Park)
- OMAR, Yasser (Assistant Professor, ISEG)
- RAMOS, Jaime (Assistant Professor, SLC)
- RASGA, João (Assistant Professor, SLC)
- RAVARA, António (Assistant Professor, SLC)
- SERNADAS, Amílcar (Full Professor, SLC)
- SERNADAS, Cristina (Full Professor, SLC)

## 1.2 Researchers

- BANA, Gergei (Research Fellow - Ciência 2007, IT)
- QIU, Daowen (Research Fellow - Ciência 2007, IT)

## 1.3 Post-Docs

- OJAKIAN, Kerry (Postdoc Fellow on a grant from FCT)
- PAUNKOVIC, Nikola (Postdoc Fellow on a grant from FCT)

## 1.4 PhD Students

- BALTAZAR, Pedro (on a scholarship from FCT)
- CAMACHO, Luís (Teaching Assistant, UMadeira)
- GAMBONI, Maxime (on a scholarship of the Space-Time-Types project until June 2008)
- MARCELINO, Sérgio (on a scholarship from FCT)
- ROGGIA, Karina (on a scholarship from FCT)

## 2 Publications

### 2.1 Books

- [1] W. A. Carnielli, M. E. Coniglio, D. Gabbay, P. Gouveia, and C. Sernadas. *Analysis and Synthesis of Logics - How To Cut And Paste Reasoning Systems*, volume 35 of *Applied Logic*. Springer, 2008.
- [2] A. Sernadas and C. Sernadas. *Foundations of Logic and Theory of Computation*. College Publications, London, 2008. ISBN 978-1-904987-88-8.

### 2.2 Journal papers

- [3] P. Baltazar. M-solid varieties of languages. *Acta Cybernetica*, 18(4):719–731, 2008.
- [4] P. Baltazar, R. Chadha, and P. Mateus. Quantum computation tree logic – model checking and complete calculus. *International Journal of Quantum Information*, 6(2):281–302, 2008.
- [5] J. Bouda, P. Mateus, N. Paunkovic, and J. Rasga. On the power of quantum tamper-proof hardware. *International Journal of Quantum Information*, 6(2):219–236, 2008.
- [6] M. L. Campagnolo and K. Ojakian. Characterizing computable analysis with differential equations. *Electronic Notes in Theoretical Computer Science*, 221:23–35, 2008. Presented at the Fifth International Conference on Computability and Complexity in Analysis (CCA 2008).
- [7] M. L. Campagnolo and K. Ojakian. The elementary computable functions over the real numbers: Applying two new techniques. *Archive for Mathematical Logic*, 46(7-8):593–627, 2008.

- [8] W. A. Carnielli, J. Rasga, and C. Sernadas. Preservation of interpolation features by fibring. *Journal of Logic and Computation*, 18(1):123–151, 2008.
- [9] P. Collins and D. S. Graça. Effective computability of solutions of ordinary differential equations — the thousand monkeys approach. *Electronic Notes in Theoretical Computer Science*, 221:103–114, 2008. Presented at the Fifth International Conference on Computability and Complexity in Analysis (CCA 2008).
- [10] L. Cruz-Filipe, J. Rasga, A. Sernadas, and C. Sernadas. A complete axiomatization of discrete-measure almost-everywhere quantification. *Journal of Logic and Computation*, 18(6):885–911, 2008.
- [11] L. Cruz-Filipe, A. Sernadas, and C. Sernadas. Heterogeneous fibring of deductive systems via abstract proof systems. *Logic Journal of the IGPL*, 16:121–153, 2008.
- [12] H. Xing F. Liu, D. Qiu and Z. Fan. Decentralized diagnosis of stochastic discrete event systems. *IEEE Transactions on Automatic Control*, 53(12):535–546, 2008.
- [13] D. S. Graça, J. Buescu, and M. L. Campagnolo. Boundedness of the domain of definition is undecidable for polynomial odes. *Electronic Notes in Theoretical Computer Science*, 202:49–57, 2008. Proceedings of the 4th International Conference of Computability and Complexity in Analysis (CCA 2007).
- [14] D. S. Graça, M. L. Campagnolo, and J. Buescu. Computability with polynomial differential equations. *Advances in Applied Mathematics*, 40(3):330–349, 2008.
- [15] L. Li and D. Qiu. Determining the equivalence for one-way quantum finite automata. *Theoretical Computer Science*, 403(10):42–51, 2008.
- [16] L. Li and D. Qiu. Local entanglement is not necessary for perfect discrimination between unitary operations acting on two qudits by local operations and classical communication. *Physical Review A*, 77(7):032337, 2008.
- [17] L. Li and D. Qiu. Optimal discrimination between quantum operations. *Journal of Physics A: Math. Theor.*, 41:335302, 2008.
- [18] F. Liu and D. Qiu. Safe diagnosability of stochastic discrete event systems. *IEEE Transactions on Automatic Control*, 53(6):1291–1296, 2008.
- [19] N. Paunkovic, P. D. Sacramento, P. Nogueira, V. R. Vieira, and V. K. Dugaev. Fidelity between partial states as signature of quantum phase transitions. *Physical Review A*, 77:052302, 2008. ArXiv 0708.3494 [quant-ph].
- [20] N. Paunkovic and V. R. Vieira. Macroscopic distinguishability between quantum states defining different phases of matter: Fidelity and the Uhlmann geometric phase. *Physical Review E*, 77:011129, 2008. ArXiv 0707.4667 [quant-ph].

- [21] D. Qiu. Minimum-error discrimination between mixed quantum states. *Physical Review A*, 77(12):012328, 2008.
- [22] D. Qiu. A sufficient and necessary condition for superdense coding of quantum states. *International Journal of Quantum Information*, 6(11):1115–1125, 2008.
- [23] D. Qiu and L. Li. An overview of quantum computation models: quantum automata. *Frontiers of Computer Science in China*, 2(14):193–207, 2008.
- [24] J. Wen and D. Qiu. Entanglement in adiabatic quantum searching algorithms. *International Journal of Quantum Information*, 6(13):997–1009, 2008.

## 2.3 Book chapters

- [25] O. Bournez and M. L. Campagnolo. A survey on continuous time computations. In S.B. Cooper, B. Löwe, and A. Sorbi, editors, *New Computational Paradigms: Changing Conceptions of What is Computable*, pages 383–423. Springer, 2008.
- [26] L. Cruz-Filipe, I. Lanese, F. Martins, A. Ravara, and V. Vasconcelos. Behavioural theory at work: program transformations in a service-centred calculus. In G. Barthe and F. de Boer, editors, *Proceedings of the 10th IFIP International Conference on Formal Methods for Open Object-based Distributed Systems (FMOODS'08)*, Lecture Notes in Computer Science, pages 59–77. Springer, 2008.
- [27] C. Lourenço. EEG switching: three views from dynamical systems. In V. Kurková, R. Neruda, and J. Koutník, editors, *Proceedings of the 18th International Conference in Artificial Neural Networks - ICANN 2008*, volume 5164 of *Lecture Notes in Computer Science*, pages 665–674. Springer, 2008.
- [28] D. Qiu. Some observations on two-way finite automata with quantum and classical states. In *ICIC2008*, volume 5266 of *Lecture Notes in Computer Science*, pages 1–8. Springer, 2008.

## 2.4 Conference papers

- [29] D. Basin, C. Caleiro, J. Ramos, and L. Viganò. Labeled tableaux for distributed temporal logic. In *Proceedings of the 15th Intl.Symp. on Temporal Representation and Reasoning (TIME 2008)*, pages 101–109. IEEE Computer Society Press, 2008.
- D. S. Graça. Computability and dynamical systems: A perspective. In *Proceedings of the 26th Weak Arithmetics Days*, pages 95–107. Universidad de Sevilla, 2008.

- [30] J. Martinho and A. Ravara. Encoding cryptographic primitives in a calculus with polyadic synchronization. In *Proceedings the 2008 International Conference on Theoretical and Mathematical Foundations of Computer Science (TMFCS-08)*, pages 102–109. ISRST, 2008.
- [31] D. Qiu. Simulations of quantum turing machines by quantum multi-counter machines. In *Computability in Europe (CIE2008)*, 2008.

## 2.5 PhD thesis

- [32] R. Gonçalves. *Behavioral algebraization of logics*. PhD thesis, IST, Universidade Técnica de Lisboa, 2008. Supervised by C. Caleiro.

## 3 Project coordination

- KLog: Kleistic Logic – FCT and EU FEDER PTDC/MAT/68723/2006
  - C. Caleiro
- QSec: Quantum Security – FCT and EU FEDER PTDC/EIA/67661/2006
  - P. Mateus
- QuantTel: Quantum Telecommunications – IT project
  - P. Mateus

## 4 Organization of events

- Days in Logic (DiL’08), IST, Lisboa, January 16-18, 2008.
  - J. Rasga: Organization chair.
  - C. Caleiro: Co-organizer.

## 5 Seminars and research lectures

- The 4th Franco-Japanese Computer Security Workshop, Tokyo, December 5-6, 2008.
  - G. Bana: Computational semantics and the first order logic approach of the protocol correctness proofs.
- 4th TheNIS Information Security Workshop, Universidade de Aveiro, Aveiro, Portugal, Novembro 28, 2008.

- P. Adão: High-level programming for e-cash.
- J. Cederquist: Fairness constraints for the Dolev-Yao attacker model.
- A. Matos: Flow-policy awareness for distributed mobile code.
- B. Montalto: Modelling an attacker with cryptanalytical capabilities.
- 15th International Conference on Logic for Programming, Artificial Intelligence and Reasoning, Doha, Qatar, November 23-27, 2008.
  - J. Ramos: Linear algebra techniques for deciding the correctness of probabilistic programs with bounded resources.
- SENSORIA Workshop on Calculi for Service Oriented Computing, Lucca, Italy, September 18, 2008.
  - A. Ravara: Session types as generic process types.
- Workshop on Physics and Computation, Vienna, Austria, August 25-29, 2008.
  - D. S. Graça: Computational bounds on polynomial differential equations.
- Fifth International Conference on Computability and Complexity in Analysis, Hagen, Germany, August 21-24, 2008.
  - K. Ojakian: Characterizing computable analysis with differential equations.
- The Fourth World Congress of Paraconsistency, Melbourne, Australia, July 13-18, 2008.
  - R. Gonçalves: Behavioral algebraization of the Cn systems of da Costa.
- 4th Workshop on Formal and Computational Cryptography (Affiliated Workshop of CSF 2008), Pittsburgh, PA, USA, June 26, 2008.
  - P. Adão: High-level programming for e-cash.
- Encontro Nacional SPM - Sessão de Lógica e Computação, ISEC, Coimbra, Portugal, June 26, 2008.
  - J. Rasga: Discrete measure almost-everywhere quantification.
- Programming Language Approaches to Concurrency (Workshop affiliated with the DisCoTec federated conferences), Oslo, Norway, June 7, 2008.
  - A. Ravara: Session types as generic process types.
- 30th Anniversary of the CLE, UNICAMP, the 15th Brazilian Logic Conference, and the 14th Latin-American Symposium on Mathematical Logic, Paraty, Brasil, May 11-17, 2008.

- R. Gonçalves: An algebraic perspective on valuation semantics.
- WS on Non-Classical Logics: from Foundations to Applications, Centro di Ricerca Matematica Ennio di Giorgi, Scuola Normale Superiore, Pisa, Italy, April 24-26, 2008.
  - C. Caleiro [invited talk]: A bird’s eye view on the joys and troubles of combined logics.
- Seminário de Lógica Matemática, IST/FCUL, Lisboa, Portugal, April 17, 2008.
  - K. Ojakian: Proving the Church-Turing thesis?
- Workshop on Fair Exchange Protocols for Electronic Commerce, Vrije Universiteit, Amsterdam, the Netherlands, February 27, 2008.
  - J. Cederquist: Verifying liveness in security protocols.
- Concurrency Seminar, Oxford University, UK, February 20, 2008.
  - P. Mateus: A quantum fair contract signing protocol.
- Foundations Seminar, Oxford University, UK, February 19, 2008.
  - P. Mateus: Specifying and verifying quantum and probabilistic systems with exogenous semantics.
- Formal Analysis, Theory and Algorithms Seminar, Department of Computing Science, University of Glasgow, UK, February 12, 2008.
  - A. Ravara: A service-centred calculus: examples, theory and applications.
- Seminário de Álgebra e Lógica, Centro de Matemática, U Minho, Braga, Portugal, January 28, 2008.
  - J. Rasga: Preservation of interpolation and generalized negative translations.
- Days in Logic 2008, IST, Lisboa, Portugal, January 16-18, 2008.
  - K. Ojakian: Computable analysis and analog computation.
  - J. Rasga: Generalized negative translations and interpolation.



## 6 Guest Program

- Shi-Jian Gu, Chinese University of Hong-Kong, HK, 1-8.11.08. Lecture: Fidelity susceptibility and quantum phase transitions, 7.11.08.
- Gustavo Petri, INRIA, Sophia-Antipolis, France, 24-29.10.08. Lecture: Relaxed memory models - an operational approach, 28.10.08.
- Tamara Rezk, INRIA, Sophia-Antipolis, France, 24-29.10.08. Lecture: A provably secure cryptographic compiler, 24.10.08.
- Christel Baier, TU Dresden, German, 8-11.10.08. Lecture: Probabilistic Buchi automata, 10.10.08.
- Wafik Lotfallah, German University in Cairo, Egypt, 27.9-4.10.08. Lecture: Almost everywhere quantifier elimination for fragments of logics with probability quantifiers: discovering the interplay between two probability notions, 3.10.08.
- Marcelo Coniglio, State University of Campinas, Brazil, 21-27.9.08. Lecture: Metafibering and reconstruction of logics from its fragments, 26.9.08.
- Jean-Yves Béziau, Swiss National Science Foundation, Switzerland, 8-13.9.08. Lecture: Universal logic - a new perspective for logical research, 12.9.08.
- Konrad Banaszek, U Nicolaus Copernicus, Torun, Poland, 26-30.7.08. Lecture: Quantum communication in the presence of noise - part 2, 28.7.08.
- Konrad Banaszek, U Nicolaus Copernicus, Torun, Poland, 26-30.7.08. Lecture: Quantum communication in the presence of noise - part 1, 28.7.08.
- Massimo Palma, U Palermo Italy, 22-27.7.08. Lecture: Entanglement and ergodicity in randomly colliding qubits, 25.7.08.
- David Basin, ETH, Switzerland, 18-22.7.08.
- Vladimír Busek, Slovak Academy of Sciences, Slovakia, 12-16.7.08. Lecture: Toward quantum-ensured privacy and voting, 15.7.08.
- Luca Viganò, U Verona, Italy, 11-25.7.08. Lecture: Formal analysis of a SAML web browser single sign-on protocol, 18.7.08.
- Alexandre P. Francisco, INESC-ID, IST - TU Lisbon, 27.6.08. Lecture: Identification of transcription factor binding sites in promoter regions by modularity analysis of the motif co-occurrence graph.
- Gergei Bana, Tulane University, USA, 15-30.6.08. Lecture: Computational soundness of formal indistinguishability and static equivalence, 27.6.08.

- Romeo de Coss, Unidad Mérida del Centro de Investigación y de Estudios Avanzados, Mexico, 15-29.6.08. Lecture: Graphene: the new frontier of the carbon based materials, 27.6.08.
- Matthias Baaz, Vienna University of Technology, Austria, 20-27.6.08. Lecture: Towards a proof theory of analogical reasoning, 24.6.08.
- Marcelo Coniglio, U Campinas, Brazil, 10-21.6.08. Lecture: Logics of deontic inconsistency, 20.6.08.
- Paolo Zanardi, U Southern California, USA, 18-23.6.08. Lecture: Critical fidelities: the (quantum) information geometrical approach to phase transitions, 19.6.08.
- Guillermo Cordourier, Unidad Mérida del Centro de Investigación y de Estudios Avanzados, Mexico, 15-29.6.08. Lecture: Entanglement of magnetic impurities via electron scattering, 18.6.08.
- Gérard Boudol, INRIA, Sophia-Antipolis Méditerranée, France, 27-31.5.08. Lecture: Secure information flow as a safety property, 30.5.08.
- Jean-Yves Béziau, Swiss National Science Foundation, Switzerland, 19-25.5.08. Lecture: The world of possible logics, 23.5.08.
- Geraldo A. Barbosa, Center for Photonic Communication and Computing, Northwestern University, USA, 30.4-10.5.08. Lecture: Platform for telecommunications secured by physical noise, 9.5.08.
- Aires Ferreira, U Porto, 8-30.4.08. Lecture: Towards optomechanical entanglement between a movable mirror and light, 24.4.08.
- Francisco Marcos de Assis, U Federal de Campina Grande, Brazil, 13-27.4.08. Lecture: Security analysis of a quantum-classical authentication protocol, 18.4.08.
- Ricardo Chaves, INESC-ID, 11.4.08. Lecture: Secure computing on reconfigurable systems.
- Gergei Bana, Tulane University, USA, 15-19.3.08. Lecture: Computational soundness of first-order-logic-based symbolic analysis of cryptographic protocols, 18.3.08.
- Wagner Sanz, UF Goiás, Brazil, 22.2.08. Lecture: Preserving falsity.
- Dick de Jongh, University of Amsterdam, Netherlands, 15.1-2.2.08.
- Rui Joaquim, ISEL, 11.1.08. Lecture: Electronic voting.

Other Research Units  
2008

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## 1 Publications in 2008

### 1.1 Books (authored or edited)

J. Félix Costa,

- Cristian S. Calude, Rudolf Freund, Marion Oswald, and Grzegorz Rozenberg editors of Lecture Notes in Computer Science, volume 5204, Unconventional Computation 7th International Conference, UC 2008, Vienna, Austria, August 25-28, 2008, Proceedings, Springer, 2008.

A. B. Cruzeiro

- Ben Arous, G., Le Jan, Y. and Zambrini, J.-C. (Editors) - Stochastic Analysis in Mathematical Physics (Proceedings of the conference held in Lisbon, 2006), World Scientific Publishing Co. Pte. Ltd., Hackensack, NJ, 2008.

### 1.2 Chapters/articles in books with international refereeing

J. Félix Costa,

- Edwin Beggs and John Tucker, Unifying science through computation: Reflections on computability and physics, Essays in Honour of Otto Neurath, Olga Pombo, Shahid Rahman, John Symons, and Juan Manuel Torres (eds.), Book series: Logic, Epistemology, and the Unity of Science, Springer, in print.

### 1.3 Articles in international journals

J. Félix Costa,

- Edwin Beggs, Bruno Loff, and John Tucker, Computational complexity with experiments as oracles, Proceedings of the Royal Society, Series A (Mathematical, Physical and Engineering Sciences), 464(2098): 2777-2801, October 8, 2008.
- Jerzy Mycka and Francisco Coelho, The Euclid abstract machine, International Journal of Unconventional Computing, 4(3): 223-248, Special Issue Towards a Theory of Unconventional Computing, Old City Publishing, Inc., 2008.

R. Coutinho,

- B. Fernandez, P. Guiraud, Symbolic dynamics of two coupled Lorenz maps: from uncoupled regime to synchronisation, Physica D 237 (2008) 2444-2462.

A.B. Cruzeiro,

- and C.J.S. Alves, Monte-Carlo simulation of stochastic differential systems - a geometrical approach. Stoch. Processes Appl, 118 (2008), n<sup>o</sup> 3, 346-367.
- and P. Malliavin, Non-existence of infinitesimally invariant measures on loop groups. J. Funct. Anal. 254 (2008) n<sup>o</sup>7, 1974-1987.
- and P. Malliavin, Nonergodicity of Euler fluid dynamics on tori versus positivity of the Arnold-Ricci tensor. J. Funct. Anal. 254 (2008), n<sup>o</sup>7, 1903-1925.

M. I. Santos

- and P. M. Santos, Sequential Experimental Designs for Nonlinear Regression Simulation Metamodels. Simulation Modeling Practice and Theory, 16 (9), 1365-1378, 2008.

**1.3.1 Articles/communication in proceedings of international conferences**

J. Félix Costa,

- Edwin Beggs, Bruno Loff and John Tucker, Oracles and advice as measurements, Cristian S. Calude et al. (eds.), *Unconventional Computation 2008, UC '08*, Vienna, August 25-28, *Lecture Notes in Computer Science 5204*: 33-50, Springer, 2008.
- Bruno Loff and Jerzy Mycka, *Differential Equations, Infinite Limits and Real Recursive Functions*, Proceedings of the Applied Computing Conference, Istanbul, Turkey, May 27-30, 2008, Published by WSEAS Press (ISBN 978-960-6766-67-1, ISSN 1790-2769).
- Edwin Beggs, Bruno Loff, and John Tucker, On the complexity of measurement in classical physics, M. Agrawal, D. Du, Z. Duan, and A. Li (eds.), *Theory and Applications of Models of Computation, TAMC 2008*, Xi'an, China, April 25-29, 2008, *Lecture Notes in Computer Science 4978*: 20-30, Springer, 2008.
- Edwin Beggs and John Tucker, *Quanta in classical mechanics: uncertainty in space, time, energy (abstract)*, *Studia Logica International Conference on Logic and the Foundations of Physics: Space, Time and Quanta*, Trends in Logic VI, December 2008.

A.B. Cruzeiro,

- and P. Malliavin, *Stochastic parallel transport on the d-dimensional torus*. *Stochastic Analysis in Mathematical Physics*, 1-18, World Sci. Publ., Hackensack, NJ, 2008.

**2 Publications accepted or submitted in 2008**

J. Félix Costa,

- Edwin Beggs, Bruno Loff, and John Tucker, *Computational complexity with experiments as oracles. II. Upper bounds*, *Proceedings of the Royal Society, Series A (Mathematical, Physical and Engineering Sciences)*, 465(2105): 1453-1465, 2009.
- and Hélia Guerra, *Processes with local and global liveness requirements*, *The Journal of Logic and Algebraic Programming*, 78(3): 117-137, 2009.
- Bruno Loff and Jerzy Mycka, *A foundation for real recursive function theory*, *Annals of Pure and Applied Logic*, 2009, in print. doi:10.1016/j.apal.2009.01.013.
- and Bruno Loff, *Five views of hypercomputation*, *International Journal of Unconventional Computing*, 5(3-4): 193-207, Special Issue on Hypercomputation, Old City Publishing, Inc., 2009.
- Edwin Beggs, Bruno Loff, and John Tucker, *Computational complexity with experiments as oracles*, *Proceedings of the Royal Society, Series A (Mathematical, Physical and Engineering Sciences)*, 464(2098): 2777-2801, October 8, 2008.
- Jerzy Mycka and Francisco Coelho, *The Euclid abstract machine*, *International Journal of Unconventional Computing*, 4(3): 223-248, Special Issue Towards a Theory of Unconventional Computing, Old City Publishing, Inc., 2008.

A.B. Cruzeiro,

- *Hydrodynamics, probability and the geometry of the diffeomorphisms group*, accepted for publication in the Proceedings of the 6th Sem. Stoch. Anal., Random Fields and Appl.
- and P. Malliavin, *Renormalized stochastic calculus of variations for a renormalized infinite dimensional Brownian motion*, accepted for publication in *Stochastics*
- and E. Shamarova, *Navier-Stokes equations and forward-backward SDEs on the group of diffeomorphisms of a torus*, submitted.

### 3 Research lectures and Seminars

J. Félix Costa,

- Quanta in classical mechanics: uncertainty in space, time, energy, Studia Logica International Conference on Logic and the foundations of physics: space, time and quanta - TRENDS VI, Belgium, Brussels, 11-12 December 2008.
- The Misconception of Hyper-computation, Workshop Grand Challenges of Unconventional Computation, Academia Europaea, Informatics Section, University of Liverpool, the 17th of September 2008.
- Oracles and advices as measurements, Seventh International Conference on Unconventional Computation (UC'08), Vienna, Austria, 25 - 28 August 2008.
- Laplace's daemon revisited, International Colloquium on Causality, Meaningful Complexity and Knowledge Construction, University of Rome "Tor Vergata", Rome, June 5-7, 2008.
- Oracles and advices as measurements, Seminar at University of Leicester, May 23, 2008.
- A foundation of real recursive function theory, Seminar at Swansea University , May 8, 2008.
- The semantic collider: computing with a dynamic experiment, Seminar at University of Sheffield, May 22, 2008.
- Oracles and advices as measurements in Physics, Seminar at University of Leeds, May 21, 2008.
- A foundation of real recursive function theory, Seminars at the University of Bristol (UWE) and University of Leicester, March 20 and April 11, 2008.
- An essay on the unity of science through computability, Theoretical Computer Science BCTCS, April 7, 2008.

R. Coutinho,

- Simple difference equations models of genetic regulatory networks. In Progress on Difference Equations and Applications 2008, Laufen, Germany, March 15, 2008.

A.B. Cruzeiro,

- Hydrodynamics and the geometry of the diffeomorphisms group: some results, Symp. Stoch. Analysis., Bonn, April 08.
- Hydrodynamics, probability and the geometry of the diffeomorphisms group, 6th Sem. Stoch. Anal., Random Fields and Appl., Ascona, May 08.
- Probabilidades em Hidrodinâmica, ENSPM, Coimbra, June 08.
- Quelques questions sur l'ergodicité et la stabilité en hydrodynamique, Univ. Poitiers, July 08.
- Hydrodynamics, probability and the geometry of the diffeomorphisms group, 1st ICTI CMU-Portugal Workshop, Lisboa, Sept 08.

## 4 Participation in research projects

R. Coutinho,

- PTDC/MAT/69635/2006, "Mathematical Physics" (FCT) 2007-2010

A. B. Cruzeiro,

- PTDC/MAT/69635/2006, "Mathematical Physics" (FCT) 2007-2010

M.F. Ramalhoto,

- Founder member with Guedes Soares and Barradas of the research unit of Marine Technology and Engineering <http://www.mar.ist.utl.pt/uetn/> . (In 2008 it will become a Research Center, CENTEC).

## 5 Organizations of scientific events

### 5.1 Events which took place in 2008

J. Félix Costa,

- Organized with Cristian Calude the Workshop on PHYSICS AND COMPUTATION 2008, a satellite event of the 7th International Conference on Unconventional Computation, UC 2008, Vienna, August 2008.

### 5.2 Events taking place after 2008

A. B. Cruzeiro,

- Member of the Scientific Committee of the International Conference on Stochastic Analysis and Applications, Tunisia, October, 12 -17 2009.
- Member of the Scientific Committee of the SPA 2010 (34th Conf. on Stoch. Processes and their Applic.), Japan.

M. F. Ramalhoto,

- member of the international scientific committee of the Second International Symposium on Stochastic Models in Reliability, Safety, Security and Logistics, Sami Shamoon College of Engineering (formerly NACE), Beer Sheva, Israel, February 15-18, 2010.

## 6 Other information

### 6.1 Editorial boards

J. Félix Costa,

- Coleção Máquina do Mundo, Bizâncio.

A. B. Cruzeiro,

- Member of the Editorial Board of the EMS Newsletter (up to middle 2008).

M. F. Ramalhoto,

- Associate Editor of the international scientific journal Quality Technology and Quantitative Management (QTQM).
- Associate Editor of the European Journal of Engineering Education (EJEE).



## 6.2 Scientific management positions

A. B. Cruzeiro,

- Member of the Mathematical Physics Committee (C18) of the IUPAP (International Union of Pure and applied Physics)
- Member of the jury senior of the IUF (Institut Universitaire de France)
- Member of the ERC (European Research Council) evaluation panels
- Referee for the ESF
- Referee for the Research Council of Norway

M. F. Ramalhoto,

- Founder member and former Vice- President of the European Network for Business and Industrial Statistics (ENBIS), Sheffield, UK.
- Member of the International Advisory Board of Reliability Conferences of the ISI.

## 6.3 Personal notes

J. Félix Costa,

- Co-chair of the Program Committee of the 7th International Conference on Unconventional Computation, UC 2008, Vienna, August 2008.

A. B. Cruzeiro,

- Evelina Shamarova (Post-doctoral fellow).

M. F. Ramalhoto,

- SEFI (Société Européenne pour la Formation des Ingénieurs) Fellow.
- Expert-Evaluator for the Seventh Framework of the European Commission, Brussels, Belgium.