



**TÉCNICO**  
LISBOA

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

# **Report 2012**

**March 2013**

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## 1 Research Projects and Special Grants

The following research projects were coordinated by members of the Center in 2012:

### **Algebraic Geometry in Portugal**

(Started 25/1/2010, duration 36 months)

*Funding agency:* Fundação para a Ciência e a Tecnologia

*Reference:* PTDC/MAT/099275/2008

*Principal investigator:* Margarida Mendes Lopes

*Number of participants:* 14

This project aims to promote the interaction between algebraic geometers in Portugal and is focused on problems linked to moduli spaces and classification of objects of algebraic geometry.

### **Applied Mathematics: from Dynamical Systems to Cryptography**

(Started September 1, 2009, duration 48 months)

*Funding agency:* Fundação para a Ciência e a Tecnologia & UT Austin

*Reference:* UTAustin/MAT/0057/2008

*Principal investigator:* Diogo Gomes

*Number of participants:* 28

In this project we bring together researchers from several areas in Applied Mathematics including Dynamical Systems, Financial Mathematics, Game Theory, Optimal Control, Viscosity Solutions, Number Theory, and Cryptography. In all these areas there are strong research groups both in Portuguese Universities as well as in the University of Texas at Austin. The UTAustin—Portugal initiative presents a unique opportunity to foster scientific interactions between groups in Portugal and UT Austin.

### **CMU — Portugal: ICTI Program in Applied Mathematics**

*Funding agency:* Fundação para a Ciência e a Tecnologia

*Director:* Diogo Gomes

The Center for Mathematical Analysis, Geometry, and Dynamical Systems is one of the participating research units in this cooperation program between portuguese institutions and the Carnegie Mellon University.  
<http://icti.math.cmu.edu/>

### **CoLab Program UT Austin — Portugal**

*Funding agency:* Fundação para a Ciência e a Tecnologia

*Director:* Diogo Gomes

The Center for Mathematical Analysis, Geometry, and Dynamical Systems is one of the participating research units in this cooperation program between portuguese institutions and the University of Texas at Austin.  
<http://math.utaustinportugal.org/>

### **Contact and symplectic topology**

(Started January 27, 2010, duration 60 months)

*Funding agency:* European Science Foundation (Research Networking Programme)

*Reference:* CAST

*Member of Steering Committee in Portugal:* Sílvia Anjos

*Other Members in the Steering Committee:* Frédéric Bourgeois – Programme Chair, Vincent Colin, Kai Cieliebak, András Stipsicz, Michael Entov, Paolo Lisca, Robert Vandervorst, Aleksy Tralle, Francisco Presas, Tobias Ekholm, Felix Schlenk, Ivan Smith

The goal of this network is to stimulate exchange between researchers from all branches of contact and symplectic topology, in order to create a comprehensive perspective on the field and make progress on some of the basic open questions. The European scale of the network reflects the global nature of these questions as well as the European strength in the subject. The planned activities include workshops, research collaborations, and the exchange of PhD students and postdocs.

The research themes of CAST include: Fukaya categories and mirror symmetry, Floer homology and Hamiltonian dynamics, Symplectic field theory, Contact Topology, Complex geometry and Stein manifolds, Topology of symplectic manifolds, Groups of symplectomorphisms and contactomorphisms.  
<http://cast.ulb.ac.be/>

## **Degenerate elliptic and parabolic equations and its applications to front propagation**

Started 10/8/2011, duration 36 months

*Funding agency:* Fundação para a Ciência e a Tecnologia

*Reference:* UTA\_CMU/MAT/0007/2009

*Principal investigator:* Diogo Gomes

*Number of participants:* 16

The main goals of the project are the study of pde's arising in front propagation, namely degenerate elliptic and parabolic equations, their application to concrete problems such as ocean fronts, and the development of numerical tools for the analysis of inverse problems in front propagation. We foresee that the developed techniques will be of interest for other problems also, such as mathematical finance, non-linear filtering, classical mechanics (Aubry-Mather theory and its extensions), mathematical biology, mean field games, homogenization and stochastic pde's.

## **Geometry of quantization**

(Started 1/1/2012, duration 36 months)

*Funding agency:* Fundação para a Ciência e a Tecnologia

*Reference:* PTDC/MAT/119689/2010

*Principal investigator:* José Mourão

*Number of participants:* 11

Study of the dependence of quantization on the choice of polarization, in the new formalism provided by the distributional approach to the prequantum bundle over families of complex structures. In this formalism, it is possible to include real and mixed nonnegative polarizations as points in the boundary of the space of complex structures.

## **Hamiltonian Actions and Integrability in Geometry and Topology**

(Started 03/2012, duration 36 months)

*Funding agency:* Fundação para a Ciência e a Tecnologia

*Reference:* PTDC/MAT/117762/2010

*Principal investigator:* Miguel Tribolet de Abreu

*Number of participants:* 17

Devoted to certain global aspects of symplectic, contact and Poisson geometries, where Hamiltonian actions and integrability questions are relevant. These aspects include: Kaehler metrics invariant under Hamiltonian group actions; topology of certain Hamiltonian diffeomorphism groups; non-commutative integrable systems; polygon spaces and moduli spaces of bordered Riemann surfaces; Lagrangian intersection problems; Hamiltonian diffeomorphism groups of Poisson manifolds; complex hypersurfaces.

### **Higgs bundles and character varieties**

(Started 3/2012, duration 36 months)

*Funding agency:* Fundação para a Ciência e a Tecnologia

*Reference:* PTDC/MAT/120411/2010

*Principal investigator:* Carlos Florentino

*Number of participants:* 6

This project deals with the geometry and topology of two classes of intimately related spaces: on one side, we have the moduli spaces of Higgs bundles or other holomorphic objects over a complex manifold, and on the other side we have character varieties, which are moduli spaces of representations of a finitely generated group into a Lie group.

In this project, we plan to address some of the facets of this profitable connection that are still undeveloped. Our approach will be a natural continuation of many important established results that were obtained in recent years by many mathematicians, including results from members of the project.

### **New Geometry and Topology**

(Started 1/1/2010, duration 36 months)

*Funding agency:* Fundação para a Ciência e a Tecnologia

*Reference:* PTDC/MAT/101503/2008

*Principal investigator:* Roger Picken

*Number of participants:* 11

This project addresses questions in new areas of geometry and topology, including Khovanov homology, the categorification of quantum groups, parallel transport for abelian and non-abelian gerbes, invariants of knots and knotted surfaces, and questions related to quantum gravity.

## **Non-linear degenerate elliptic equations and systems**

(Started 1/1/2011, duration 36 months)

*Funding agency:* Fundação para a Ciência e a Tecnologia

*Reference:* PTDC/MAT/114397/2009

*Principal investigator:* Diogo Gomes

*Number of participants:* 14

This project focus on equations and systems of non-linear possibly degenerate elliptic partial differential equations, as well as its applications to stochastic optimal control, mean field games and Aubry-Mather theory.

## **Nonperturbative quantum strings and black holes**

(Started 01/04/2011, duration 12 months)

*Funding agency:* Fundação para a Ciência e a Tecnologia

*Reference:* CERN/FP/116386/2010

*Principal investigator:* Ricardo Schiappa

*Number of participants:* 12

In many string theoretic backgrounds, instantons provide for the full nonperturbative information and thus open the door to the possibility of obtaining full nonperturbative solutions to string theory (including models which are not exactly solvable!). It is one of the goals of this project to develop resurgent instanton analysis within the string theoretic context. It is expected that these new tools will allow for an exploration of the space of solutions to string theory of far greater depth than perturbation theory alone. Of these myriad of solutions, a certain class is also of particular interest to us: blackfolds. These are objects which generalize the usual black holes, which can be thought of black objects with horizon topology more complex than simply spherical. It is another goal of this project to apply nonperturbative quantization techniques in order to study and understand these solutions.

## **Research Chair in String Theory**

(started 01/10/2009, duration 60 months)

*Funding agency:* Fundação para a Ciência e a Tecnologia and IST

*Researcher:* Gabriel Lopes Cardoso

Gabriel Lopes Cardoso holds the Invited Research Chair on Mathematical Physics & String Theory. The main research goals are in the area of String Theory, with very strong links to Mathematical Physics, Geometry and Topology. This is a most promising venue for future research, lying at the interface between Mathematics and Theoretical Physics, and with proven major contributions to both fields.

<http://www.fct.pt/apoios/outros/catedras/index.phtml.en>

### **Resurgent Analysis and Random Matrices at Finite $N$**

(started 01/12/2011, duration 3 months)

*Funding agency:* Swiss National Science Foundation - International Short Visit Fellowship.

*Researcher:* Ricardo Schiappa

### **Resurgent Analysis, Random Matrices and Gromov-Witten Invariants**

(started 01/04/2012, duration 3 months)

*Funding agency:* European Science Foundation - Exchange Visit Grant

*Researcher:* Ricardo Schiappa

Interactions of Low-Dimensional Topology and Geometry with Mathematical Physics.

### **Stability of nonautonomous dynamical systems**

(Started 03/2012, duration 36 months)

*Funding agency:* Fundação para a Ciência e a Tecnologia

*Reference:* PTDC/MAT/117106/2010

*Principal investigator:* Claudia Valls Anglés

*Number of participants:* 3

The main objective of the project is to pursue several directions of research in dynamical systems and differential equations, with emphasis on the study of stability of nonautonomous dynamics, particularly in the presence of nonuniform hyperbolicity, and on the qualitative study of polynomial vector fields and equations of mathematical physics, including their integrability.



## **Symplectic and Related Geometries**

(Started 1/2/2010, duration 36 months)

*Funding agency:* Fundação para a Ciência e a Tecnologia

*Reference:* PTDC/MAT/098936/2008

*Principal investigator:* Rui Loja Fernandes

*Number of participants:* 10

Research project in symplectic geometry and related subjects. It provides funding for post-doctoral grants and junior research grants.

## **Symplectic Topology and Poisson Geometry**

(Started 1/1/2011, duration 24 months)

*Funding agency:* Fundação para a Ciência e Tecnologia  
and Ministério da Educação do Brasil/CAPES

*Reference:* FCT/CAPES - 2011/2012 - 4.4.1.00

*Principal investigator:* Miguel Abreu

*Number of participants:* 8

Cooperation project involving researchers from CAMGSD, the Universidade Federal do Rio de Janeiro, and IMPA, in the area of symplectic topology and Poisson geometry.

## **Toeplitz Operators and Riemann-Hilbert problems: at the crossroad of operator theory and complex analysis**

(Started 1/2/2012, duration 36 months)

*Funding agency:* Fundação para a Ciência e a Tecnologia

*Reference:* PTDC/MAT/121837/2010

*Principal investigator:* Maria Cristina Câmara

*Number of participants:* 3

The central object of this project is the interplay between Toeplitz operators and Riemann-Hilbert problems. It aims to study various properties of Toeplitz operators and to develop new methods to solve Riemann-Hilbert problems that arise in many areas in mathematics, as well as in connection with a variety of problems in Physics and Engineering, showing that progress in one topic goes hand in hand with progress in the other.

## 2 Visitors

The following researchers visited the Center in 2012:

- Alejandro Uribe, University of Michigan, Jan 2-7.  
Rafael Souza, Universidade Federal do Rio Grande do Sul, Jan 2-25.  
Joana Mohr, Universidade Federal do Rio Grande do Sul, Jan 2-Feb 25.  
Brian Hall, University of Notre Dame, Jan 4-11.  
Nuno Freitas, Universitat de Barcelona, Jan 6.  
Olivier Guéant, Université Paris-Diderot, Jan 8-13.  
Wladimir Neves, Universidade Federal do Rio de Janeiro, Jan 14-19.  
Fabio Camilli, Università di Roma, Feb 6-11.  
Sheila Sandon, CNRS and Institute for Advanced Study, Feb 7.  
José Ferreira Alves, Universidade do Porto, Feb 15-17.  
Ciro Ciliberto, Università di Roma II, Feb 22-May 22 and Nov 19-30.  
Marco Morandotti, Carnegie Mellon University, Mar 3-11.  
Miguel Costa, Universidade do Porto, Mar 5.  
Éveline Legendre, Université Paul Sabatier, Toulouse, Mar 6.  
George Sell, University of Minnesota, Mar 9-20.  
Bernold Fiedler, Freie Universität Berlin, Mar 17-Apr 3.  
Jonathan Partington, University of Leeds, March 19-24 and July 10-14.  
Saber Elaydi, Trinity University, San Antonio, Mar 23-Apr 8.  
André Neves, Imperial College London, Apr 10-11.  
Serena Dipierro, SISSA, Trieste, Apr 13-17.  
Enrico Valdinoci, Università di Milano, Apr 13-17.  
Samuel Monnier, ENS Paris, Apr 14-18.  
Simone Marchesi, Universidad Complutense de Madrid, Apr 9-29.  
Yolanda Lozano, Universidad de Oviedo, Apr 20-25.  
Enrique Arrondo, Universidad Complutense de Madrid, Apr 24-28.  
João Penedones, Universidade do Porto, Apr 29-30.  
Nuno Romão, Max-Planck-Institut für Mathematik, Bonn, May 2-7.  
Ethan Cotterill, Universidade de Coimbra, May 10.  
Gaetan Borot, University of Geneva, May 13-18.  
Richard Wentworth, University of Maryland, May 7-June 2.

Joaquim Correia, Universidade de Évora, May 30.  
Pietro Grassi, Università di Piemonte Orientale, Alessandria, June 3-10.  
João Gomes, Universidade do Porto, June 10-12.  
Rita Pardini, Università di Pisa, June-23-July 3.  
Gian Pietro Pirola, Università di Pavia, Jun 24-Jul 2.  
Roberto Pignatelli, Università di Trento, June 28-July 1.  
Sean Lawton, University of Texas-Pan American, June 28-July 7.  
Raymond Chan, The Chinese University of Hong Kong, July 3.  
Marta Batoreo, University of California at Santa Cruz, July 4.  
Michal Wojtylak, Jagiellonian University, Poland, July 9-14.  
Isabelle Chalendar, Université de Lyon, July 10-13.  
Marek Ptak, University of Agriculture of Krakow, July 10-13.  
Gustavo Corach, University of Buenos Aires, July 10-14.  
Alexei Karlovich, Universidade Nova de Lisboa, July 10-14.  
Aristides Katavolos, University of Athens, July 10-14.  
Mostafa Mbekhta, Université de Lille 1, France, July 10-14.  
Vladimir Muller, Academy of Sciences of the Czech Republic, July 10-14.  
Antti Perälä, University of Helsinki, July 10-14.  
Sandra Pott, Lund University, July 10-14.  
Jaydeb Sarkar, Indian Statistical Institute of Bangalore, July 10-14.  
Elizabeth Strouse, Université Bordeaux 1, July 10-14.  
Franciszek Hugon Szafraniec, Jagiellonian University, Poland, July 10-14.  
Dan Timotin, Institute of Mathematics, Romanian Academy, July 10-14.  
Jani Virtanen, Bristol University, July 10-14.  
Janko Bracic, University of Ljubljana, July 10-14 and November 21-25.  
László Kérchy, University of Szeged, Hungary, July 10-15.  
Wojciech Mlocek, University of Agriculture of Krakow, July 10-15.  
Sergei Treil, Brown University, July 10-15.  
Chafiq Benhida, Université de Lille 1, July 10-18.  
Tibor Beke, University of Massachusetts, July 12.  
David Owen, Carnegie Mellon University, July 12-18.  
Léonard Monsaingeon, Institut de Mathématiques de Toulouse, July 16-20.  
Marco Robalo, Université Montpellier 2, July 17.

JongHae Keum, Korean Institute for Advanced Study, July 22-28.  
Yongnam Lee, Sogang University, South Korea, July 22-28.  
Bruno Oliveira, University of Miami and New York University, July 23 – 25.  
Allen Knutson, Cornell University, July 26.  
Sumio Yamada, Tohoku University, Japan, Sep 15-20.  
Nuno Freitas, Universitat de Barcelona, Sep 28.  
Juan Rodríguez, Universidade do Algarve, Oct 18-19.  
Erik Lindgren, Norges teknisk-naturvitenskapelige universitet, Oct 24.  
Antonio de Nicola, CMUC, Coimbra, Oct 30.  
Daniel Waldram, Imperial College London, Nov 11-12.  
Richard Gonzales, IHES, Nov 12-15.  
Enxin Wu, University of Western Ontario, Nov 4-24.  
Marco Morandotti, Carnegie Mellon University, Nov 17-24.  
Michael McQuillan, IHES, Nov 19-21.  
Volodymyr Mazorchuk, Uppsala universitet, Nov 21.  
Louis-Hadrien Robert, Institut Mathématique de Jussieu, Nov 21.  
Jeffrey Morton, Universität Hamburg, Nov 19-26.  
Louis H. Kauffman, University of Illinois at Chicago, Nov 25-Dec 1.  
Stephanie Somersille, University of Texas at Austin, Nov 28.  
Jai Grover, Universidade de Aveiro, Dec 3.  
Beatriz Graça, Universidad de Salamanca, Dec 6-10.  
Ugo Bruzzo, SISSA, Trieste, Dec 4-10.  
Pavel Putrov, Université de Genève, Dec 10.  
Yoshihiko Mitsumatsu, Chuo University, Tokyo, Dec 9-12.  
Rafael de la Llave, Georgia Institute of Technology, Dec 13-15.  
Nguyen Tien Zung, Institut de Mathématiques de Toulouse, Dec 14-18.  
Sheila Sandon, Université de Nantes and CRM Montreal, Dec 17-21.  
Sara Tavares, University of Nottingham, Dec 19.

### 3 Seminar Series & Working Seminars

#### 3.1 Algebra Seminar

This included the following talks in 2012:

- **Maria Vaz Pinto**, Instituto Superior Técnico. *The regularity and the vanishing ideal of parameterized codes associated to even cycles* (July 3).
- **Tibor Beke**, University of Massachusetts. *The sign pattern theorem and Brouwer's fixed point theorem* (July 12).
- **Marco Robalo**, Université Montpellier 2. *Noncommutative Motives: A universal characterization of the motivic stable homotopy theory of schemes*. (July 17).
- **Enxin Wu**, University of Western Ontario. *Doing differential geometry on the irrational torus, a rush introduction to diffeology*. (November 15).

all sessions of this seminar

#### 3.2 Analysis, Geometry, and Dynamical Systems Seminar

This is the main seminar of the Center. It included the following talks in 2012:

- **José Ferreira Alves**, Universidade do Porto. *Gibbs-Markov structures vs statistical properties in dynamical systems* (February 16).
- **George Sell**, University of Minnesota. *How to use numerical techniques to study the dynamics inside the attractor* (March 13).
- **Saber Elaydi**, Trinity University, San Antonio, USA. *Application of singularity theory in planar discrete dynamical systems and applications to competition models* (April 3).
- **Henrique Oliveira**, Instituto Superior Técnico. *New Results on the Collatz Problem* (April 24).
- **Roman Hric**, Matej Bel University, Slovakia. *Dense orbits of homeomorphisms, flows and their time maps* (July 10).
- **David Owen**, Carnegie Mellon University. *Multiscale Geometrical Changes in Continua: Structured Deformations and Some Questions in Analysis* (July 16).

- **Jinjun Li**, Instituto Superior Técnico. *Topological entropy of refined irregular sets* (November 27).
- **Rafael de la Llave**, Georgia Institute of Technology. *Manifolds on the verge of a regularity breakdown* (December 14).

all sessions of this seminar

### 3.3 Colloquium

This included the following talk in 2012:

- **Richard Wentworth**, University of Maryland. *Topology of representation varieties of surface groups* (May 31).

all Colloquim sessions

### 3.4 Geometria em Lisboa Seminar

This included the following talks in 2012:

- **Alejandro Uribe**, University of Michigan. *On Donaldson's complexification of the group of Hamiltonian automorphisms of a symplectic manifold* (January 3).
- **Brian Hall**, University of Notre Dame. *Complex structures and magnetic fields* (January 10).
- **Xavier Roulleau**, CAMGSD/IST. *Quotients of Fano surfaces* (January 17).
- **Matias del Hoyo**, CAMGSD/IST. *Vector bundles over Lie groupoids and algebroids* (January 31).
- **Sheila Sandon**, CNRS and Institute for Advanced Study. *On translated points of contactomorphisms* (February 7).
- **Éveline Legendre**, Université Paul Sabatier, Toulouse. *Commonness of Kähler-Einstein metrics in toric geometry* (March 6).
- **Ciro Ciliberto**, Università di Roma II. *Gonality of nodal curves on general K3 surfaces* (March 13).
- **André Neves**, Imperial College London. *Willmore conjecture and min-max methods* (April 11).
- **Simone Marchesi**, Universidad Complutense de Madrid. *Steiner and Schwarzenberger bundles on Grassmannians* (April 17).

- **Enrique Arrondo**, Universidad Complutense de Madrid. *Subvarieties of small codimension* (April 26).
- **Nuno M Romão**, Max-Planck-Institut für Mathematik, Bonn. *Vortices and Jacobian varieties* (May 3).
- **Leonor Godinho**, Instituto Superior Técnico. *Polygons in Minkowski 3-space: A quest for a long-lost family* (May 8).
- **Ethan Cotterill**, Universidade de Coimbra. *Some Brill-Noether theory on curves and metric graphs* (May 10).
- **Richard Wentworth**, University of Maryland. *Gluing formulas for determinants of Dolbeault laplacians on Riemann surfaces* (May 29).
- **Sean Lawton**, University of Texas-Pan American. *Topology of Character Varieties of Abelian Groups* (July 4).
- **Marta Batoreo**, University of California at Santa Cruz. *On the Rigidity of the Maslov Index for Coisotropic Submanifolds* (July 4).
- **Stavros Papadakis**, CAMGSD/IST. *Equivariant degenerations of spherical modules* (July 17).
- **Allen Knutson**, Cornell University. *Poisson  $T$ -manifolds with finitely many  $T$ -leaves* (July 26).
- **Sumio Yamada**, Tohoku University, Japan. *Teichmüller space and convex geometry* (September 18).
- **Antonio de Nicola**, CMUC/Universidade de Coimbra. *Geometry and topology of 3-quasi-Sasakian manifolds* (October 30).
- **Richard Gonzales**, Institut des Hautes Études Scientifiques. *Equivariant cohomology of spherical varieties* (November 13).
- **Michael McQuillan**, Institut des Hautes Études Scientifiques. *Hyperbolicity of Algebraic Surfaces* (November 20).
- **Beatriz Graña**, Universidad de Salamanca. *Jordan-Hölder reductions for principal Higgs bundles on curves* (December 6).
- **Ugo Bruzzo**, SISSA, Trieste. *Noether-Lefschetz theory for hypersurfaces in toric 3-folds* (December 7).
- **Yoshihiko Mitsumatsu**, Chuo University, Tokyo. *Regular Poisson structures on  $S^5$  and Milnor's open book* (December 11).
- **Nguyen Tien Zung**, Institut de Mathématiques de Toulouse. *Torus actions in normalization problems of dynamical systems* (December 17).

- **Sheila Sandon**, Université de Nantes and CRM Montreal. *The discriminant metric on the contactomorphism group* (December 18).

all sessions of this seminar

### 3.5 LARSyS Lecture Series in Engineering and Mathematics

This included the following talks in 2012:

- **Olivier Guéant**, Université Paris-Diderot. *Games with infinitely many players: the mean field games approach* (January 11).
- **Bernold Fiedler**, Free University Berlin. *Determining nodes for regulatory networks* (March 27).
- **Jonathan R. Partington**, University of Leeds. *Delay systems* (July 11-13).

all sessions of this series

### 3.6 Operator Theory, Complex Analysis and Applications Seminar

This included the following talks in 2012:

- **Juan Rodríguez**, Universidade do Algarve. *Factorization of rational matrix functions and difference equations* (October 18).
- **Janko Bracic**, University of Ljubljana, Slovenia. *Numerical ranges and hyperreflexivity* (November 22).
- **Cristina Diogo**, ISCTE-IUL/CAMGSD. *Corona conditions and symbols with a gap around zero* (December 6).

all sessions of this seminar

### 3.7 Partial Differential Equations Seminar

This included the following talks in 2012:

- **Wladimir Neves**, Instituto de Matemática, Universidade Federal do Rio de Janeiro. *The multidimensional Muskat Problem* (January 18).
- **Rafael Rigão Souza**, Universidade Federal do Rio Grande do Sul. *Discrete state space mean field games* (January 25).
- **Joana Mohr**, Universidade Federal do Rio Grande do Sul, Brazil. *On the general one-dimensional XY Model: positive and zero temperature, selection and non-selection* (February 1).



- **Fabio Camilli**, Università di Roma, La Sapienza. *Hamilton-Jacobi equations on ramified spaces* (February 8).
- **Jorge Drumond Silva**, Instituto Superior Técnico. *Dispersive PDE techniques and local well-posedness results for generalized KP-II type equations on cylinders* (February 15).
- **Carlos Rocha**, Instituto Superior Técnico. *Connection Graphs for Sturm Attractors of  $S^1$ -equivariant Parabolic Equations* (February 29).
- **Marco Morandotti**, Carnegie Mellon University. *Self-propulsion in viscous fluids through shape deformation* (March 7).
- **Levon Nurbekian**, IST/University of Texas at Austin. *Lagrangian dynamics and a weak KAM theorem on the  $d$ -infinite dimensional torus* (March 14).
- **Vardan Voskanian**, Instituto Superior Técnico. *Extended mean field games - existence* (March 21).
- **Serena Dipierro**, SISSA, Trieste. *Concentration of solutions for a singularly perturbed elliptic PDE problem in non-smooth domains* (April 13).
- **Enrico Valdinoci**, Università di Milano. *Local and nonlocal phase transition interfaces* (April 16).
- **Radoslaw Czaja**, CAMGSD/IST. *Introduction to Pullback Attractors* (April 18).
- **Joaquim Correia**, CIMA/Universidade de Évora. *Zero limits for hyperbolic conservation laws* (May 30).
- **Léonard Monsaingeon**, Institut de Mathématiques de Toulouse. *Existence of travelling waves for a degenerate non-linear advection-diffusion equation* (July 18).
- **Erik Lindgren**, Norges teknisk-naturvitenskapelige universitet. *Fractional eigenvalues* (October 24).
- **Diego Marcon Farias**, IST/University of Texas at Austin. *Calculus of variations and Weak KAM theorem in optimal switching* (November 14).
- **Juha Videman**, Instituto Superior Técnico. *On John's problem on freely floating bodies* (November 21).
- **Marco Morandotti**, Carnegie Mellon University. *Renormalized Energy and Dynamics for a System of Screw Dislocations* (November 21).

- **Robert Simione**, IST/Carnegie Mellon University. *Full Linearized Stability of Steady-States in Nonlocal Aggregation* (November 28).
- **Stephanie Somersille**, University of Texas at Austin. *Variants of Tug-of-War Games and the Infinity Laplace Equation* (November 28).
- **Rita Gonçalves Ferreira**, CAMGSD/IST. *Multiscale Convergence and Reiterated Homogenization in BV* (December 4).
- **Pedro Girão**, Instituto Superior Técnico. *Bifurcation curves of a diffusive logistic equation with harvesting orthogonal to the first eigenfunction* (December 12).

all sessions of this seminar

### 3.8 String Theory Seminar

This included the following talks in 2012:

- **Miguel Costa**, Universidade do Porto. *Deeply Virtual Compton Scattering from Gauge/Gravity Duality* (March 5).
- **João Esteves**, CAMGSD/IST. *Geometric Quantization: a beginner's perspective* (March 12).
- **José Mourão**, Instituto Superior Técnico. *Geometric quantization and simple non-equivalent quantizations of the harmonic oscillator* (March 19).
- **Igor Klebanov**. *Testing the F-theorem – video talk by Igor Klebanov @ KITP 2012* (March 26).
- **Shing-Tung Yau**. *The Shape of Inner Space – video talk by Shing-Tung Yau @ PI 2011* (April 2).
- **Samuel Monnier**, ENS Paris. *Geometric quantization and the metric dependence of the self-dual field theory* (April 16).
- **Yolanda Lozano**, Universidad de Oviedo. *Non-singlet baryons in gauge / gravity duality* (April 23).
- **João Penedones**, Universidade do Porto. *Conformal Regge Theory* (April 30).
- **Luca Mazzucato**. *The Konishi multiplet at strong coupling – video talk by Luca Mazzucato @ PI 2011* (May 7).
- **Gaetan Borot**, University of Geneva. *Matrix models, non-perturbative topological recursion, and knot invariants* (May 14).

- **Tadashi Takayanagi**. *Holographic Entanglement Entropy and Its Applications – video talk by Tadashi Takayanagi @ PI 2011* (May 21).
- **Michele Cirafici**, CAMGSD/IST. *Line defects and framed BPS quivers* (May 28).
- **Pietro Grassi**, Università di Piemonte Orientale, Alessandria. *Fluid/Gravity Correspondence: Navier-Stokes Equations from Einstein Equations* (June 4).
- **João Gomes**, Universidade do Porto. *Recent developments in computing the quantum entropy function of supersymmetric black holes and exact holography* (June 11).
- **Nicolas Orantin**, CAMGSD/IST. *Generalized loop equations and their formal solution on deformed spectral curves* (September 24).
- **Luca Mazzucato**. *The Konishi multiplet at strong coupling – video talk of Mazzucato @ PI 2011* (May 7).
- **Vitor Cardoso**, CENTRA/IST. *Black hole bombs* (October 8).
- **Marko Stosic**, ISR/IST. *Knots and HOMFLY 1* (October 15).
- **Marko Stosic**, ISR/IST. *Knots and HOMFLY 2* (October 22).
- **Sebastian Guttenberg**, CAMGSD/IST. *The Quantum Siegel Algebra* (October 29).
- **Masahito Yamazaki**. *3 Manifolds and 3D Gauge Theories – video talk of Yamazaki @ PI 2011* (November 5).
- **Daniel Waldram**, Imperial College London. *Generalised geometry and supergravity* (November 12).
- **Jorge Rocha**, CENTRA/IST. *Inverse Scattering Construction of Black Objects 1* (November 19).
- **Jorge Rocha**, CENTRA/IST. *Inverse Scattering Construction of Black Objects 2* (November 26).
- **Jai Grover**, Universidade de Aveiro. *Enhanced AdS Horizons* (December 3).
- **Pavel Putrov**, University of Geneva. *ABJM Theory as a Fermi Gas* (December 10).
- **Nguyen Tien Zung**, Institut de Mathématiques de Toulouse. *Torus actions in normalization problems of dynamical systems* (December 17).

all sessions of this seminar

### 3.9 Topological Quantum Field Theory Club

This included the following talks in 2012:

- **Nuno Freitas**, Universitat de Barcelona. *From Fermat's Last Theorem to some generalized Fermat equations* (January 6).
- **Jeffrey C. Morton**, CAMGSD/IST. *Groupoidification and Khovanov's Categorification of the Heisenberg Algebra* (January 12).
- **Marco Mackaay**, Universidade do Algarve.  *$\mathfrak{sl}_3$  web algebras* (May 9).
- **Anne-Laure Thiel**, CAMGSD/IST. *Diagrammatic categorification of extended Hecke algebra and quantum Schur algebra of affine type A* (May 9).
- **Nuno Freitas**, Universitat de Barcelona. *Fermat-type equations of signature  $(13, 13, p)$  via Hilbert cuspforms* (September 28).
- **Volodymyr Mazorchuk**, University of Uppsala. *The endomorphism category of a cell 2-representation* (November 21).
- **Marco Mackaay**, Universidade do Algarve.  *$\mathfrak{sl}_3$  web algebras, cyclotomic KLR algebras and categorical quantum skew Howe duality* (November 21).
- **Louis-Hadrien Robert**, Institut Mathématique de Jussieu, Paris. *Indecomposable modules over a Kuperberg-Khovanov algebras* (November 21).
- **Jeffrey Morton**, Universität Hamburg. *Classifying Extended TQFT and the Cobordism Hypothesis* (November 23).
- **Louis H. Kauffman**, University of Illinois at Chicago. *Non-Commutative Worlds and Classical Constraints* (November 28).
- **Sara Tavares**, University of Nottingham. *Observables in 2D BF theory* (December 19).

all sessions of this seminar

### 3.10 Working Seminar on Contact/Symplectic Topology/Geometry

This included the following talks in 2012:

- **José Mourão**, Instituto Superior Técnico. *Hyperkähler manifolds - I* (February 7).

- **Rosa Sena Dias**, CAMGSD/IST.  
*Hyperkähler manifolds - II* (February 14).
- **Daniele Sepe**, CAMGSD/IST.
  - I - An introduction to Lagrangian fibrations* (February 28).
  - II - Topological and symplectic classification* (March 6).
  - III - (Integral) affine manifolds and Lagrangian fibrations I* (March 13).
  - IV - (Integral) affine manifolds and Lagrangian fibrations II* (March 20).
  - V - Non-degenerate singularities* (March 27).
  - VI - The Eliasson-Miranda-Zung linearisation theorem* (April 3).
  - VII - Lagrangian fibrations with elliptic singularities* (April 10).

all sessions of this seminar

## 4 Conferences and short courses

The following Conferences and Short Courses were organized or co-organized by members of the Center in 2012:

### **Workshop on Operator Theory, Complex Analysis, and Applications**

*Instituto Superior Técnico, Lisbon, Portugal, July 11–13, 2012*

*Organizing committee:* Cristina Câmara (CAMGSD/IST), Cristina Diogo (ISCTE-IUL/CAMGSD), Teresa Malheiro (Universidade do Minho, Braga).

<http://wotca.math.ist.utl.pt/topics>

### **XXth Oporto Meeting on Geometry, Topology and Physics**

*Universidade do Porto, Portugal, July 19 – 22, 2012*

*Organizing committee:* Carlos Herdeiro (Universidade de Aveiro), David Evans (Cardiff University, UK), João Nuno Tavares (Universidade do Porto), José Mourão (CAMGSD/IST), Marco Mackaay (CAMGSD/Universidade do Algarve), Miguel Costa (Universidade do Porto), Paulo Pinto (CAMGSD/IST), Roger Picken (CAMGSD/IST)

<http://cmup.fc.up.pt/cmup/omgtp/2012>

### **XIII Lisbon Summer Lectures in Geometry**

*Instituto Superior Técnico, Lisbon, Portugal, July 23 – 25, 2012*

*Organizing committee:* Margarida Mendes Lopes (CAMGSD/IST), José Mourão (CAMGSD/IST) e João Pimentel Nunes (CAMGSD/IST).

*Lectures:*

- **JongHae Keum**, Korean Institute for Advanced Study.  
*Fake projective planes.*
- **Yongnam Lee**, Sogang University, Seoul, South Korea.  
*Q-Gorenstein deformation theory and its applications.*
- **Bruno Oliveira**, University of Miami and New York University.  
*Symmetric differentials and fundamental group.*

## **Fourth IST-IME Meeting on Ordinary and Partial Differential Equations and Related Topics**

*Instituto Superior Técnico, Lisbon, Portugal, September 3–7, 2012*

*Organizing committee:* Waldyr Oliva (Chairman), Luís Barreira, Fernando Pestana da Costa, Pedro Girão, Pedro Gonçalves Henriques, José Matias, João Palhoto Matos, Henrique Oliveira, João Teixeira Pinto, Jorge Silva.

<http://istime.math.ist.utl.pt>

## **VIII Avogadro Meeting on Strings, Supergravity and Gauge Theories**

*Scuola Normale Superiore, Pisa, Italy, 19-21 December 2012*

*Organizing committee:* Dario Francia (Scuola Normale Superiore, Italy), Marco Caldarelli (Southampton University, UK), Michele Cirafici (CAMGSD/IST), Valentina Forini (Humboldt-Universität, Germany), Erik Tonni (SISSA, Italy) and Roberto Valandro (ICTP, Italy).

<http://webtheory.sns.it/avogadro/index.html>

## 5 Seminars and lectures by Center members

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

- Miguel Abreu, Lagrangian intersections in toric manifolds, Topics in Symplectic Geometry Seminar, LMU - München, Germany, January 17, 2012.
- Miguel Abreu, (Non-)Displaceable Lagrangian Toric Fibers, Workshop on Toric Geometry, Oberwolfach, Germany, April 15–21, 2012.
- Miguel Abreu, Displacing Lagrangian Toric Fibers by Extended Probes, Workshop on Interactions between Algebra and Dynamics in Symplectic Topology, Technion, Haifa, Israel, June 17–21, 2012.
- Miguel Abreu, Kaehler geometry of toric symplectic manifolds in action-angle coordinates, mini-course at the Summer School on Kaehler Geometry and Quantization, University of Cologne, Germany, July 16–20, 2012.
- Miguel Abreu, Displacing Lagrangian Toric Fibers by Extended Probes, Conference on Holomorphic Curves and Low Dimensional Topology, Stanford University, USA, August 6–11, 2012.
- Miguel Abreu, (Non-)Displaceable Lagrangian Toric Fibers, 4th IST-IME Meeting, honoring Luís Magalhães and Carlos Rocha, Lisbon, September 3–7, 2012.
- Inês Aniceto, The Resurgence of Instantons in String Theory, String Theory Seminar, CERN, Geneva, Switzerland, May 29, 2012.
- Inês Aniceto, Resurgent Analysis in Matrix Models, XXth International Conference on Integrable Systems and Quantum symmetries, Prague, Czech Republic, June 18–22, 2012.
- Inês Aniceto, Resurgent Analysis in Matrix Models, Mathematical Physics Seminar, University of Surrey, Surrey, England, September 14, 2012.
- João Baptista, Vortex moduli spaces and their natural metrics, International Conference on Complex Analytic Geometry, TIFR, Mumbai, India, March 16–30, 2012.
- João Baptista, Abelian vortices and maps to projective space, Encontro Nacional da SPM, Faro, Portugal, July 9–11, 2012.



- João Baptista, Abelian Vortices on Kahler Manifolds, Topological Solitons: A Conference to Celebrate the 60th birthday of Prof. N. Manton, University of Cambridge, UK, September 19–22, 2012.
- João Baptista, Abelian vortices on Kahler manifolds, Vortex Seminar, HIM, Bonn, Germany, October 23, 2012.
- João Baptista, Abelian vortices on Kahler manifolds, Geometry and Topology seminar, University of Bielefeld, Germany, October 24, 2012.
- João Baptista, Abelian vortices revisited, Workshop on Geometry of the Vortex Equations, HIM, Bonn, Germany, 27–30 November, 2012.
- Filippo Cagnetti, Some Results in Calculus of Variations: Fracture Evolution and Steiner Symmetrization, University of Sussex, Brighton, UK, December 3, 2012.
- Filippo Cagnetti, Some Results in Calculus of Variations: Fracture Evolution and Steiner Symmetrization, Technical University of Munich, Germany, November 7, 2012.
- Filippo Cagnetti, Some Results in Calculus of Variations: Fracture Evolution and Steiner Symmetrization, University of Liverpool, UK, June 29, 2012.
- Filippo Cagnetti, Stability of the Steiner Symmetrization of Convex Sets, UT Austin, USA, May 2, 2012.
- Filippo Cagnetti, Some Results in Calculus of Variations: Fracture Evolution and Steiner Symmetrization, Université Libre de Bruxelles, Belgium, April 12, 2012.
- Filippo Cagnetti, Some Results in Calculus of Variations: Fracture Evolution and Steiner Symmetrization, University of Warwick, Coventry, UK, March 8, 2012.
- M. C. Câmara, Kernels of asymmetric Toeplitz operators and finite interval convolution operators in  $L_2$ , 6th European Congress of Mathematics, Satellite Thematic Session on Special Classes of Hilbert Space Operators, Krakow, Poland, July 2–7, 2012.
- M. C. Câmara, One sided invertibility, corona problems and applications to Toeplitz operators, Conference on Operator Theory, Operator Algebras and Applications, Oujda, Morocco, December 14–19, 2012.
- Gabriel Lopes Cardoso, Nernst branes in gauged supergravity, INFN Seminar, Padova, Italy, January 25, 2012.

- Gabriel Lopes Cardoso, Nernst branes in gauged supergravity, Iberian Strings 2012, Bilbao, Spain, February 1, 2012.
- Gabriel Lopes Cardoso, Extremal black holes in string theory (review lecture), Spanish Relativity Meeting in Portugal ERE2012, Guimarães, Portugal, September 5, 2012.
- Michele Cirafici, Line defects and framed BPS quivers, String theory seminar, CAMGSD, IST, Lisbon, 28 May 2012.
- Michele Cirafici, BPS states, wall-crossing and quivers, Iberian Strings 2012, Bilbao, Spain, Jan 31–Feb 2, 2012.
- João L. Costa, The problem of a self-gravitating scalar field with positive cosmological constant, ESI Workshop: Dynamics of General Relativity, Erwin Schrödinger Institute for Mathematical Physics, Vienna, Austria, December 2012.
- João L. Costa, The problem of a self-gravitating scalar field with positive cosmological constant, Workshop on Numerical and Mathematical Relativity, Oppurg, Germany, October 2012.
- João L. Costa, The problem of a self-gravitating scalar field with positive cosmological constant, CENTRA Seminar, IST, September 2012.
- João L. Costa, The problem of a self-gravitating scalar field with positive cosmological constant, Spanish Relativity Meeting ERE 2012, Guimarães, Portugal, September 2012.
- Radoslaw Czaja, Introduction to pullback attractors, PDE Seminar, IST, April 18, 2012.
- Radoslaw Czaja, Bi-spaces pullback attractors for closed processes, 4th IST-IME Meeting, Lisbon, Portugal, September 3–7, 2012.
- Fernando Pestana da Costa, Self-similar behaviour in coagulation equations: some results and open problems, Dynamical Systems Seminar, Universidade do Porto, Portugal, October 19, 2012
- Fernando Pestana da Costa, On self-similarity in coagulation-annihilation systems, Minisymposium on Dynamics of Coagulation-Fragmentation Processes, SIAM Conference on Nonlinear Waves and Coherent Structures, Seattle WA, USA, June 14, 2012
- Fernando Pestana da Costa, A nonautonomous predator-prey system arising from coagulation theory: is it of any use in biomathematics?, Pacific Institute for the Mathematical Sciences–Applied Mathematics Institute Seminar, Department of Mathematical and Statistical Sciences, University of Alberta, Edmonton, Canada, June 5, 2012

- Cristina Diogo, Factorization, Riemann-Hilbert problems and the corona theorem, 14th Workshop on Applications and Generalizations of Complex Analysis, Aveiro, Portugal, March 23–24, 2012.
- Cristina Diogo, Almost periodic Riemann-Hilbert problems, Toeplitz operators and the table method, WOTCA 2012 - Workshop on Operator Theory, Complex Analysis and Applications, Lisbon, Portugal, July 11–13, 2012.
- Cristina Diogo, Solving Riemann-Hilbert problems with the table method, Toeplitz operators and the table method, Ciclo de Seminários em Geometria, Topologia e Física-Matemática, Universidade do Minho, Guimarães, Portugal, September 3, 2012.
- Cristina Diogo, Corona Conditions and symbols with a gap around zero, Seminar on Operator Theory, Complex Analysis and Applications, Lisbon, Portugal, December 6, 2012.
- Cristina Diogo, Corona Conditions and symbols with a gap around zero, Conference on Operator Theory, Operator Algebras and Applications, Oujda, Morocco, December 14–19, 2012.
- Rui L. Fernandes, Stability of leaves, Colloquia of the Department of Mathematics, University of Connecticut, Storrs, USA, February 2012.
- Rui L. Fernandes, Stability of leaves, Colloquia of the Department of Mathematics, Temple University, USA, February 2012.
- Rui L. Fernandes, Stability of leaves, Colloquia of the Department of Mathematics, University of Illinois at Urbana-Champaign, USA, February 2012.
- Rui L. Fernandes, Stability of leaves, Colloquia of the Department of Mathematics, University of Hawaii, USA, February 2012.
- Rui L. Fernandes, Poisson Geometry-Global Aspects, Short course given at the Summer School of the Conference Poisson 2012, University of Utrecht, The Netherlands, July 2012.
- Rui L. Fernandes, Lie Algebroids and Classification Problems in Geometry, Gone Fishing Meeting, UCLA, USA, September, 2012.
- Rui L. Fernandes, Introduction to Lie groupoids, Groupoids and Stacks Seminar, University of Illinois at Urbana-Champaign, USA, October 2012.
- Rui L. Fernandes, Noncommutative Integrable Systems, Joint Symplectic Seminar Penn-Cornell, Cornell University, Ithaca, October 2012.

- Pedro Girão, Bifurcation curves of a diffusive logistic equation with harvesting orthogonal to the first eigenfunction. PDE Seminar, Instituto Superior Técnico December 12, 2012.
- Diogo Gomes, Continuous time, finite state mean-field games, Math Department, Università di Padova, Italy, April 2012.
- Diogo Gomes, A-priori estimates for mean-field games, Math Department, Università di Padova, Italy, May 2012.
- Diogo Gomes, Continuous time, finite state mean-field games, 3-hour short course at the Mathematics Institute of the University of Warwick, UK, May 2012.
- Diogo Gomes, From weak KAM to mean-field games, 2-hour short course at the Chinese Academy of Sciences, Beijing, China, June 2012.
- Diogo Gomes, Variational and quasi-variational mean-field games, Workshop on Stochastic and PDE Methods in Financial Mathematics, Yerevan, Armenia, September 2012.
- Diogo Gomes, A priori estimates for mean-field games, IST-IME, IST, September 2012.
- Diogo Gomes, Variational mean-field games, IMA Meeting Special Short Course on Mean Field Games and Applications, University of Minnesota, USA, November 2012.
- Diogo Gomes, Variational mean-field games, Math Department, EPFL, Lausanne, Switzerland, November 2012.
- Diogo Gomes, A-priori estimates for mean-field games, Math Department, University of Chicago, USA, November 2012.
- Sebastian Guttenberg, The Quantum Siegel Algebra, XXth Oporto Meeting on Geometry, Topology and Physics, Portugal, July 19, 2012.
- Sebastian Guttenberg, The Quantum Siegel Algebra, Strings and fields seminar, Arnold Sommerfeld Center for Theoretical Physics, Ludwig Maximilians Universität, Munich, Germany, December 13, 2012.
- Sebastian Guttenberg, The Quantum Siegel Algebra, Institute for Theoretical Physics, Vienna University of Technology, Austria, December 14, 2012.
- Matias del Hoyo, Vector bundles over Lie groupoids and Lie algebroids, Geometry Seminar, CMUC, Coimbra, Portugal, November 21, 2012.

- Matias del Hoyo, Fibrados vectoriales sobre grupoides de Lie, Algebraic Geometry Seminar, DM-FCEN-UBA, Buenos Aires, Argentina, July 6, 2012.
- Matias del Hoyo, VB-groupoids, Poisson Geometry Seminar, University of Utrecht, The Netherlands, June 1, 2012.
- Matias del Hoyo, On the loop space of a 2-category, Homotopy Theory Seminar, Institut Jussieu, Paris, France, March 28, 2012.
- Margarida Mendes Lopes, The behaviour of curves on irregular surfaces, Workshop on Algebraic Surfaces, KIAS, Seoul, March 29, 2012.
- Margarida Mendes Lopes, Properties of divisors on irregular varieties, Seminari de Geometria Algebraica de Barcelona, Universitat de Barcelona, June 1, 2012.
- Rafael Luis, Local stability implies global stability in the Ricker competition model, 18th International Conference on Difference Equations and Applications - ICDEA2012, Barcelona, Spain, July 22-27, 2012.
- Rachel A.D. Martins, Some topics in Non-commutative geometry and Physics, Dipartimento di Scienze di Base e Applicate per l'Ingegneria, Sezione di Matematica, Sapienza Università di Roma, Italia, June, 2012.
- José Matias, Lower semicontinuity for signed functionals with linear growth in the context of A-quasiconvexity, FCTUNL. February 15, 2012.
- José Matias, Coupled second order singular perturbations for phase transitions, 4º IST/IME, September 2012.
- José Mourão, Hyperkahler manifolds - I, Working Seminar on Symplectic/Contact Geometry/Topology, IST, February 7, 2012.
- José Mourão, Complex time evolution in geometric quantization and Mackey-Stone-Von Neumann theorem, Lie Theory Seminar, University of Erlangen-Nürnberg, Germany, May 7, 2012.
- José Mourão, Geometric quantization and simple non-equivalent quantizations of the harmonic oscillator, String Theory Seminar, IST, May 19, 2012.
- José Natário, Optimal time travel in the Gödel universe, Spanish Relativity Meeting, Guimarães, Portugal, September 7, 2012.

- José Natário, A linguagem secreta do universo, as part of the conference cycle *Matemática, a Ciência da Natureza*, Calouste Gulbenkian Foundation, Lisbon, Portugal, October 24, 2012.
- João Pimentel Nunes, Quantization and tropical geometry for toric manifolds, Tropical Geometry in Europe Itenerant Seminar, MPI Bonn, Germany, July 2012.
- João Pimentel Nunes, Geometric quantization: some of the old and some of the new, Plenary Session, Vector Bundles on Algebraic Curves 2012, CRM, Barcelona, June 2012.
- Henrique Oliveira, New Results on the Collatz Conjecture, Third Palestinian Conference in modern trends in Mathematics and Physics, Hebron, Palestine, July 16–18, 2012.
- Henrique Oliveira, On the distribution of the last digits under the Syracuse iteration. 4th IST-IME Meeting, Lisbon, September 3–7, 2012.
- Lina Oliveira, Subspace lattices, Jordan ideals and Lie ideals, International Conference on Jordan Theory, Analysis and Related Topics 2012, The Chinese University of Hong Kong, April 30–May 4, 2012.
- Lina Oliveira, Jordan and Lie structures in operator algebras, Malaga Workshop on Lie and Jordan Structures 2012, University of Malaga, Spain, June 1–4, 2012.
- Lina Oliveira, Reflexive operator algebras and the Hahn–Banach theorem revisited, Workshop on Operator Theory, Complex Analysis and Applications – WOTCA 2012, IST, July 11–13, 2012.
- Lina Oliveira, Jordan and Lie ideals in operator algebras, Séminaire d’Analyse Fonctionnelle, Laboratoire de Mathématiques de Besançon, France, September 11, 2012.
- Carlos Rocha, Connection Graphs for Sturm Attractors of  $S^1$ -Equivariant Parabolic Equations, 9th AIMS Conference on Dynamical Systems, Differential Equations and Applications, Orlando, USA, July 2, 2012.
- Carlos Rocha, Global Attractors for Reaction-Diffusion Equations, Dynamical Systems Seminar, Centro de Matemática da Universidade do Porto, Porto, November 28, 2012.
- Carlos Rocha, Connection Graphs for Sturm Attractors of  $S^1$ -Equivariant Parabolic Equations, Dynamics of Patterns, Oberwolfach, Deutschland, December 20, 2012.

- Ricardo Schiappa, Resurgent Analysis of Large N Matrix Models, Poster at Integrability in Gauge and String Theory 2012, ETH, Zurich, Switzerland, August 2012.
- Ricardo Schiappa, Resurgent Analysis of Random Matrices at Large N, String-Math 2012, University of Bonn, Germany, July 2012.
- Rosa Sena-Dias, Non-compact scalar-flat Kähler toric metrics and their energy, Gauge theory and topology Seminar, University of Harvard, Cambridge, USA, November 9, 2012.
- Rosa Sena-Dias, Toric spectral results, Sessão temática de Geometria e Topologia do encontro da SPM, Universidade do Algarve, July 9, 2012.
- Daniele Sepe, Lectures on Lagrangian fibrations (7 lectures), Working Seminar on Symplectic and Contact Geometry, IST, Lisbon, February 28 – April 10, 2012.
- Daniele Sepe, Integral affine geometry of non-commutative integrable systems, University of Coimbra Geometry Seminar, Coimbra, Portugal, May 15, 2012.
- Daniele Sepe, Integral affine geometry of non-commutative integrable systems, Contemporary Ways of Integrability, Lisbon, Portugal, May 16 – 19, 2012.
- Daniele Sepe, On complete isotropic realisations of Poisson manifolds, Poisson Geometry Seminar, University of Utrecht, Utrecht, The Netherlands, September 21, 2012.
- Daniele Sepe, Integral affine geometry of integrable Hamiltonian systems, Hamiltonian Dynamics Seminar, EPFL, Lausanne, Switzerland, October 8, 2012.
- Daniele Sepe, The global geometry of Lagrangian fibrations, Geometry Seminar, Central Michigan University, Mount Pleasant, USA, November 15, 2012.
- Jorge Drumond Silva, Dispersive PDE techniques and local well-posedness results for generalized KP-II type equations on cylinders, PDE Seminar, IST, February 15, 2012.
- Jorge Drumond Silva, Local and global well-posedness for a perturbation of the critical nonlinear Schrödinger Equation, Centro de Matemática, Universidade do Minho, Braga, April 12, 2012.

- Jorge Drumond Silva, Local well-posedness for generalized KP-II type equations on cylinders, Instituto de Matemática, Universidade Federal do Rio de Janeiro, Brasil, May 8, 2012.
- Gabriele Terrone, Mather theory for lower semicontinuous Lagrangians, Seminari di Equazioni Differenziali ed Applicazioni, University of Padova, Italy, July 2012.
- Gabriele Terrone, COLAB meeting - Student's days, Universidade do Porto, June 2012.
- Maria Vaz Pinto, The regularity and the vanishing ideal of parameterized codes associated to even cycles, Algebra Seminar, Instituto Superior Técnico, Lisbon, July 3, 2012.
- Juha Videman, On John's Problem on Freely Floating Bodies, Department of Mathematics and System Analysis, School of Science and Technology of the Aalto University, Espoo, Finland, April 23, 2012.
- Juha Videman, Stabilization Methods for Obstacle Problems, CIM/SPM Day on Differential Equations, Braga, September 14, 2012.
- Juha Videman, On John's problem on freely floating bodies, PDE Seminar, Instituto Superior Técnico, Lisbon, November 21, 2012.



## 6 Postdoctoral program and research fellows

The Center started a postdoctoral program in the academic year 1998/99 and has received, over the years, many postdocs from other programs. Positions are for one year, with the possibility for extension for another year upon mutual agreement. Applicants must have a PhD degree in mathematics, preferably earned within the two-year period immediately preceding 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 in different ways including the European Commission Euroaxess and the European Mathematical Society web sites, leading to about 200 applicants every year.

The list of all our postdoctoral fellows since 1998 is available at:  
<http://camgsd.ist.utl.pt/posdoc.php.en>

The following fellows stayed at the Center during the whole or part of 2012:

- Inês Aniceto, PhD in Physics, Brown Univ., USA, 2009. Research areas: string theory. Supported by CAMGSD (Sep. 1, 2009–Aug. 31, 2010) and by an FCT postdoctoral grant (Sep. 1, 2010–Aug. 31, 2013).
- João Oliveira Baptista, PhD in Mathematical Physics, University of Cambridge, UK, 2006. Research areas: complex geometry, moduli spaces of solitons, gauge theory, quantum field theory. Supported by an FCT postdoctoral grant (Mar. 2012–Nov. 2013).
- Farid Bozorgnia, PhD in Applied Mathematics, Royal Institute of Technology, Stockholm, Sweden, 2009. Research Areas: Partial Differential Equations (Numerical Analysis and Theory), Calculus of Variations, Spectral Theory. Supported by the UT Austin/Portugal Program (Aug. 2010–Nov. 2011, June 2012–Mar. 2014).
- 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–Jan. 2012).
- Filippo Cagnetti, PhD in Applied Mathematics, SISSA, Trieste, Italy, 2007. Research Areas: Calculus of variations and partial differential equations. Supported by the CMU/Portugal Program (Sep. 1, 2009–Feb. 28, 2011) and by the UT Austin/Portugal Program (Mar.1, 2011–Feb. 28, 2014).

- Michele Cirafici, PhD in Physics, SISSA Trieste, 2004. Research areas: string theory, quantum field theory, geometry. Supported by the CIÊNCIA 2008 Program (Sep. 1, 2009–Aug. 31, 2014).
- Radoslaw Czaja, PhD in Mathematics, Univ. Silesia, Katowice, Poland, 2004. Research areas: continuous dynamical systems, partial differential equations. Supported by the CIÊNCIA 2008 Program (Sep. 1, 2009–Aug. 31, 2014).
- Gonçalo Aprá Dias, PhD in Theoretical Physics, IST, 2008. Research areas: Fluid Mechanics, Water Waves, Analysis. Supported by an FCT postdoctoral grant (Oct. 2010–Sep. 2013).
- 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–Jul. 2014).
- João Esteves, PhD in Physics, IST, 2011. Research area: Symplectic geometry, geometric quantization and mathematical physics. Supported by a CAMGSD postdoctoral grant (Nov. 2011–Jan. 2012) and by an FCT postdoctoral grant (Feb. 2012–Jan. 2015).
- Rita Ferreira, PhD in Mathematics, Carnegie Mellon University and Universidade Nova de Lisboa, 2011. Research areas: calculus of variations, homogenization, continuum mechanics, partial differential equations. Supported by an FCT postdoctoral grant (Nov. 2012–Nov. 2015).
- Sebastian Guttenberg, PhD in Physics, Technical Univ. Vienna, Austria, 2007. Research areas: string theory. Supported by FCT postdoctoral grant (Sep. 1, 2010–Aug. 31, 2013).
- Sharon Hollander, PhD in Mathematics, MIT, 2001. Research areas: algebraic topology and algebraic geometry. Supported by CAMGSD (Nov. 2006–Dec. 31, 2008), and by the CIÊNCIA 2007 Program (Jan. 1, 2008–Dec. 31, 2012).
- Jinjun Li, PhD in Mathematics, South China University of Technology (Guangzhou), 2012. Research areas: fractal geometry and dynamical systems. Supported by an FCT postdoctoral grant (Nov. 2012–Abr. 2013).
- Matias del Hoyo, PhD in Mathematics, Universidad de Buenos Aires, 2009. Research areas: algebraic topology, category theory, poisson geometry. Supported by an FCT postdoctoral grant (Oct. 2011 – Sep. 2012)

- Alessia Mandini, PhD in Mathematics, Univ. Bologna, Italy, 2007. Research areas: symplectic geometry. Supported by CAMGSD funding (Sep. 1, 2007–May 31, 2009), and by an FCT postdoctoral grant (Jun. 1, 2009–May 31, 2015).
- David Martinez 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).
- Jeffrey Morton, PhD in Mathematics. University of California, Riverside, 2007. Research areas: mathematical physics, topology, category theory. Supported by CAMGSD postdoctoral grant (Oct. 2010–Sep. 2012).
- Levon Nurbekian, PhD in Mathematics, Instituto Superior Técnico, 2012. Research areas: calculus of variations, optimal control, infinite dimensional weak KAM theory, optimal transportation, gradient flows in metric spaces. Supported by CMU-Portugal program (Jun. 2012–Jun. 2015).
- Nicolas Orantin, PhD in Mathematical Physics, CEA-Saclay, France, 2007. Research areas: string theory. Supported by FCT postdoctoral grant (Sep. 1, 2010–Aug. 31, 2013).
- 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 (Jan. 2006–Sep. 2012).
- Stefania Patrizi, PhD in Mathematics, Sapienza Università di Roma, Italy, 2010. Research areas: analysis, differential equations, homogenization. Supported by the UT Austin/Portugal Program (Apr. 2010–Jan. 2013).
- Xavier Roulleau, PhD in Mathematics, Université d’Angers, 2007. Research areas: Algebraic geometry, surfaces of general type, cotangent sheaf, hyperbolicity, Shimura surfaces. Supported by an FCT postdoctoral grant (Oct. 1, 2011–Sep. 1, 2012).
- Daniele Sepe, PhD in Mathematics, University of Edinburgh, UK, 2011. Research areas: topology, symplectic and Poisson geometry of finite dimensional integrable systems. Affinely flat geometry. Supported by CAMGSD in 2011 and by an FCT postdoctoral grant (Jan. 2012–Jan. 2015).

- 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, 2014).
- Giorgio Trentinaglia, PhD in Mathematics, Utrecht University, 2008. Research areas: complex analytic geometry, Hodge theory, Mumford–Tate groups; Lie groups and groupoids, orbifolds, foliations, differentiable stacks; representation theory, Tannaka duality, categorical algebra. Supported by an FCT postdoctoral grant (Oct. 2012–Oct. 2015).
- Anne-Laure Thiel, PhD in Mathematics, Univ. Strasbourg, France, 2010. Research areas: Categorification, braids, knots. Supported by a postdoctoral grant of the FCT-funded research project: New Geometry and Topology PTDC/MAT/101503/2008 (Sep. 2010–Oct. 2012).
- Pedro Vaz, PhD in Mathematics, Universidade do Algarve, 2008. Research areas: Quantum topology, categorification. FCT postdoctoral grant (Sep. 2011–Sep. 2012).

## 7 Doctoral supervision

The following doctoral degrees have been concluded in 2012 under supervision of members of the Center:

- Levon Nurbekyan, IST, April 2012  
Thesis title: Weak KAM Theory on the D-Infinite Dimensional Torus.  
Supervised by Diogo Gomes.
- Alexandra Nascimento Baptista, Universidade de Évora, May 2012  
Thesis title: Sistemas Dinâmicos Discretos em Álgebras.  
Co-supervised by Nuno Martins.
- Davor Dragicevic, IST, July 2012  
Thesis title: Stability of Nonuniformly Hyperbolic Dynamics and Lyapunov Functions.  
Supervised by Cláudia Valls
- Artur Alho, Universidade do Minho, December 2012  
Thesis title: On the Future Stability of Cosmological Solutions of the Einstein-Nonlinear Scalar Field System.  
Supervised by José Natário.
- Hassan Najafi Alishah, IST, December 2012  
Thesis title: KAM Theory, Presymplectic Dynamics and Lie Algebroids.  
Supervised by Rui Loja Fernandes.

- Maria João Costa de Almeida Pereira Braga, IST, December 2012  
Thesis title: Towards a Classification of  $T^2$ -Actions on Contact 5-Manifolds.  
Supervised by Miguel Abreu. Co-supervised by Leonor Godinho.

## 8 Publications in 2012

### 8.1 Publications which appeared in 2012

#### Books & Monographs

- [1] L. Barreira. *Análise Complexa e Equações Diferenciais: Teoria*. Livraria da Física, 2012.
- [2] L. Barreira. *Análisis Complejo y Ecuaciones Diferenciales*. Delta Publicaciones, 2012.
- [3] L. Barreira. *Ergodic Theory, Hyperbolic Dynamics and Dimension Theory*. Universitext. Springer, 2012.
- [4] L. Barreira and C. Valls *Álgebra Linear: Exercícios*. Livraria da Física, 2012.
- [5] L. Barreira and C. Valls *Análise Complexa e Equações Diferenciais: Exercícios*. Livraria da Física, 2012.
- [6] L. Barreira and C. Valls. *Complex Analysis and Differential Equations*. Undergraduate Mathematics Series. Springer, 2012.
- [7] L. Barreira and C. Valls *Ejercicios de Análisis Complejo y Ecuaciones Diferenciales*. Delta Publicaciones, 2012.
- [8] L. Barreira and C. Valls *Equações Diferenciais Ordinárias: Teoria Qualitativa*. Livraria da Física, 2012.
- [9] L. Barreira and C. Valls. *Ordinary Differential Equations: Qualitative Theory*, volume 137 of *Graduate Studies in Mathematics*. American Mathematical Society, 2012.
- [10] L. Barreira and C. Valls. *Sistemas Dinâmicos: Uma Introdução*. Coleção Ensino da Ciência e da Tecnologia 44, IST Press, 2012.
- [11] L. Barreira and C. Valls. *Teoria dos Sistemas Dinâmicos: Uma Introdução*. Livraria da Física, 2012.
- [12] J.P. Boavida, R.P.Carpentier, L. Cruz-Filipe, P.S. Gonçalves, D. Henriques and A.R. Pires (eds.) *Números, cirurgias e nós de gravata - 10 anos de seminário diagonal no IST*. IST Press, 2012.
- [13] G. E. Pires. *Cálculo Diferencial e Integral em  $\mathbb{R}^n$* . Coleção Ensino da Ciência e da Tecnologia 45, IST Press, 2012.

## Articles in refereed international journals

- [1] M. Abreu and L. Macarini. Contact homology of good toric contact manifolds. *Compos. Math.*, 148:304–334, 2012.
- [2] M. Abreu and R. Sena-Dias. Scalar flat Kahler metrics on non-compact symplectic toric 4-manifolds. *Ann. Global Anal. Geom.*, 41:209–239, 2012. arXiv:0910.5466.
- [3] H. N. Alishah and R. de la Llave. Tracing KAM tori in presymplectic dynamical systems. *J. Dyn. Differ. Equ.*, 24(4):685–711, 2012. arXiv:1203.0054.
- [4] J. Alves and L. Silva. Periodic paths on nonautonomous graphs. *Linear Algebra Appl.*, 437(3):1003–1015, 2012.
- [5] K. Andersen, B. Oliver, and J. Ventura. Reduced, tame and exotic fusion systems. *Proc. London Math. Soc. (3)*, 105(1):87–152, 2012. arXiv:1009.0622.
- [6] I. Aniceto, R. Schiappa, and M. Vonk. The resurgence of instantons in string theory. *Commun. Number Theory Phys.*, 6:158pp, 2012.
- [7] M. Baía, J. Matias, and P. M. Santos. A relaxation result in the framework of structured deformations in the BV setting. *Proc. Roy. Soc. Edinburgh Sect. A*, 142A:239–271, 2012.
- [8] L. Bakker and P. Martins Rodrigues. A profinite group invariant for hyperbolic toral automorphisms. *Discrete Contin. Dyn. Syst.*, 32(6):1965–1976, 2012. arXiv:1102.0839.
- [9] A. N. Baptista, C. Correia Ramos, and N. Martins. Iteration of quadratic maps on matrix algebras. *Int. J. Bifurcat. Chaos*, 22(6):1250150, 7pp, 2012.
- [10] L. Barreira, D. Dragicevic, and C. Valls. Lyapunov functions and cone families. *J. Stat. Phys.*, 148(1):137–163, 2012.
- [11] L. Barreira, M. Fan, C. Valls, and J. Zhang. Parameter dependence of stable manifolds for delay equations with polinomial dichotomies. *J. Dyn. Differ. Equ.*, 24:101–118, 2012.
- [12] L. Barreira, M. Fan, C. Valls, and J. Zhang. Stable manifolds for delay equations and parameter dependence. *Nonlinear Anal.*, 75(15):5824–5835, 2012.
- [13] L. Barreira, J. Llibre, and C. Valls. Bifurcation of limit cycles from a 4-dimensional center in  $\mathbb{R}^m$  in resonance  $1:N$ . *J. Math. Anal. Appl.*, 389(2):754–768, 2012.

- [14] L. Barreira, J. Llibre, and C. Valls. Periodic orbits near equilibria via averaging theory of second order. *Math. Model. Anal.*, 17(5):715–731, 2012.
- [15] L. Barreira, J. Llibre, and C. Valls. Limit cycles from a four-dimensional centre in  $R^m$  in resonance  $p : q$ . *Dyn. Syst.*, 27(4):459–474, 2012.
- [16] L. Barreira and C. Valls. Conjugacies between general contractions. *Linear Algebra Appl.*, 436(9):3087–3098, 2012.
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- [18] L. Barreira and C. Valls. Frequencies of digits under trigonometric perturbations. *Monatsh. Math.*, 167(3-4):357–374, 2012.
- [19] L. Barreira and C. Valls. Hausdorff dimension and nonlinear relations between frequencies of digits. *Open Syst. Inf. Dyn.*, 19:1250018, 22pp, 2012.
- [20] L. Barreira and C. Valls. Nonautonomous difference equations and a Perron-type theorem. *Bull. Sci. Math.*, 136(3):277–290, 2012.
- [21] L. Barreira and C. Valls. Nonautonomous equations with arbitrary growth rates: a Perron-type theorem. *Nonlinear Anal.*, 75(16):6203–6215, 2012.
- [22] L. Barreira and C. Valls. Noninvertible cocycles: robustness of exponential dichotomies. *Discrete Contin. Dyn. Syst.*, 32(12):4111–4131, 2012.
- [23] L. Barreira and C. Valls. Nonuniformly hyperbolic cocycles: admissibility and robustness. *Ann. Sc. Norm. Super. Pisa Cl. Sci. (5)*, 11(3):545–564, 2012.
- [24] L. Barreira and C. Valls. Stable manifolds with optimal regularity for difference equations. *Discrete Contin. Dyn. Syst.*, 32:1537–1555, 2012.
- [25] J. Boehm and S. Papadakis. Implementing the Kustin-Miller complex construction. *J. Software Algebra Geometry*, 4:6–11, 2012. arXiv:1103.2314.
- [26] J. Boehm and S. Papadakis. On the structure of Stanley-Reisner rings associated to cyclic polytopes. *Osaka J. Math.*, 49(1):81–100, 2012. arXiv:0912.2152.



- [27] G. Buss and R. Leclercq. Pseudo-distances on symplectomorphism groups and applications to flux theory. *Math. Z.*, 272:1001–1022, 2012. arXiv:1103.5144.
- [28] F. S. Cal, G. A. Dias, and J. H. Videman. Existence of trapped modes along periodic structures in a two-layer fluid. *Quart. J. Mech. Appl. Math.*, 65:273–292, 2012.
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- [30] M. C. Câmara and M.T. Malheiro. Factorization in a torus and Riemann-Hilbert problems. *J. Math. Anal. Appl.*, 386:343–363, 2012.
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- [32] A. Casimiro and C. Rodrigo. First variation formula and conservation laws in several independent discrete variables. *J. Geom. Phys.*, 62(1):61–86, 2012.
- [33] A. Casimiro and C. Rodrigo. First variation formula for discrete variational problems in two independent variables. *Rev. R. Acad. Cienc. Exactas Fis. Nat. (Esp.)*, 106(1):111–135, 2012.
- [34] P. Chruściel, J. L. Costa, and M. Heusler. Stationary black holes: Uniqueness and beyond. *Living Rev. Relativity*, 15(7), 2012. arXiv:1205.6112.
- [35] C. Correia Ramos, N. Martins, and P. Pinto. Orbit representations from linear mod 1 transformations. *SIGMA Symmetry Integrability Geom. Methods Appl.*, 8:029, 9pp, 2012. arXiv:1205.3553.
- [36] F. Costa, C. Herdeiro, J. Natário, and M. Zilhão. Mathisson’s helical motions for a spinning particle - are they unphysical? *Phys. Rev. D (3)*, 85(024001):11pp, 2012. arXiv:1109.1019.
- [37] J. L. Costa, A. Alho, and J. Natário. Spherical linear waves in de Sitter spacetime. *J. Math. Phys.*, 53(052501):9 pp, 2012. arXiv:1107.0802.
- [38] G. Costakis and I. Parissis. Szemerédi’s theorem, frequent hypercyclicity and multiple recurrence. *Math. Scand.*, 110(2):251–272, 2012. arXiv:1008.4017.
- [39] F. P. da Costa, M. Grinfeld, M. Langer, N. J. Mottram, and J. T. Pinto. Kickback in nematic liquid crystals. *Quart. Appl. Math.*, 70:99–110, 2012.

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- [41] A. F. dos Santos and P. F. dos Santos. Lax equations, singularities and Riemann-Hilbert problems. *Math. Phys. Anal. Geom.*, 15(3):203–229, 2012. arXiv:1010.2933.
- [42] E. B. Dryden, V. Guillemin, and R. Sena-Dias. Equivariant inverse spectral theory and toric orbifolds. *Adv. Math.*, 231(3-4):1271–1290, 2012. arXiv:1107.0986.
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- [53] C. Florentino and S. Lawton. Singularities of free group character varieties. *Pacific J. Math.*, 260(1):149–179, 2012. arXiv:0907.4720.
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- [74] P. Lopes and J. Matias. Minimum number of Fox colors for small primes. *J. Knot Theory Ramifications*, 21(3):1–12, 2012.
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- [81] M. Mendes Lopes and R. Pardini. The geography of irregular surfaces, current developments in algebraic geometry. *Math. Sci. Res. Inst. Publ.*, 59:349–378, 2012.
- [82] R. Monneau and S. Patrizi. Derivation of Orowan’s law from the Peierls-Nabarro model. *Comm. Partial Differential Equations*, 37(10):1887–1911, 2012.
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- [86] N. Orantin and A. Veliz-Osorio. Non-homogenous disks in the chain of matrices. *J. High Energy Phys.*, (080):25pp, 2012. arXiv:1111.3777.
- [87] R. Pandharipande. Descendent bounds for effective divisors on the moduli space of curves. *J. Algebraic Geom.*, 21:299–303, 2012.
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- [93] A. Siconolfi and G. Terrone. A metric proof of the converse Lyapunov theorem for semicontinuous dynamics. *Discrete Contin. Dyn. Syst.*, 32(12):4409–4427, 2012.
- [94] A. Sorsimo, M. Juntunen, R. Stenberg, and J. Videman. Finite element analysis of the Reynolds lubrication equation with cavitation. *J. Struct. Mech.*, 45(4):188–200, 2012.
- [95] J. Teixeira and M. J. Borges. Existence of periodic solutions of ordinary differential equations. *J. Math. Anal. Appl.*, 385:414–422, 2012.
- [96] A.-L. Thiel. Virtual braid groups of type  $B$  and weak categorification. *J. Knot Theory Ramifications*, 21(1250020):21pp, 2012. arXiv:0912.3680.
- [97] C. Valls. Analytic integrability of a modified Michaelis-Menten equation. *J. Dynam. Control Systems*, 18(3):297–307, 2012.
- [98] C. Valls. Rational integrability of a nonlinear finance system. *Chaos Solitons Fractals*, 45(2):141–146, 2012.
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### Communications in refereed proceedings

- [1] A. Alho, J. L. Costa, and J. Natário. Towards the Einstein- $\Lambda$ -scalar field system in spherical symmetry. In *XX International Fall Workshop on Geometry and Physics*, volume 1460 of *AIP Conference Proceedings*, pages 149–153. 2012.
- [2] J. L. Costa, A. Alho, and J. Natário. Linear and non-linear waves in de Sitter spacetime. In *Spanish Relativity Meeting (ERE 2009)*, volume 1458 of *AIP - Conference Proceedings*, pages 451–454. 2012.
- [3] E. B. Dryden, V. Guillemin, and R. Sena-Dias. Equivariant inverse spectral problems. In *Spectral Geometry*, volume 84 of *Proc. Sympos. Pure Math.*, pages 155–166. AMS, 2012.
- [4] C. Gordon, W. Kirwin, D. Schueth, and D. Webb. Classical equivalence and quantum equivalence for magnetic fields on flat tori. In *Spectral Geometry*, volume 84 of *Proc. Sympos. Pure Math.*, pages 167–180. AMS, 2012. arXiv:1108.5113.
- [5] S. Guttenberg. A Projection to the Pure Spinor Space, In *Strings, Gauge Fields, and the Geometry Behind - The Legacy of Maximilian Kreuzer*, pages 305-314. World Scientific Publishing, 2012.

## 8.2 Accepted publications (submitted or accepted in 2012)

### Books

- [1] L. Barreira. *Dimension Theory of Hyperbolic Flows*. Springer Monographs in Mathematics, Springer. To appear.
- [2] L. Barreira and Ya. Pesin. *Introduction to Smooth Ergodic Theory*. Graduate Studies in Mathematics, AMS. To appear.
- [3] L. Barreira and C. Valls. *Dynamical Systems: An Introduction*. Universitext, Springer. To appear.
- [4] L. Barreira and C. Valls. *Théorie des Systèmes Dynamiques: Une Introduction*. Enseignement Sup - Mathématiques, EDP Sciences. To appear.
- [5] J.P. Santos, J. P. *Cálculo numa variável real*. IST Press. To appear.

### Articles in refereed international journals

- [1] M. Abreu and L. Macarini. Remarks on Lagrangian intersections in toric manifolds. *Trans. Amer. Math. Soc.* arXiv:1105.0640. To appear.
- [2] J. F. Alves and M. Málek. Zeta functions and topological entropy of periodic nonautonomous dynamical systems. *Discrete Contin. Dyn. Syst.* To appear.
- [3] K. Andersen, B. Oliver, and J. Ventura. Fusion systems and amalgams. *Math. Z.* To appear.
- [4] S. Anjos and M. Pinsonnault. The homotopy Lie algebra of symplectomorphism groups of 3-fold blow-ups of the projective plane. *Math. Z.* To appear.
- [5] A. Arakelyan and F. Bozorgnia. Numerical approximations for variational problem for the spatial segregation of reaction-diffusion systems. *Appl. Math. Comput.* arXiv:1206.1388. To appear.
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### 8.3 Preprints submitted in 2012 (not yet accepted)

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- [2] M. Baía, A. C. Barroso, M. Chermisi, and J. Matias. Coupled second order singular perturbations for phase transitions. Submitted.
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- [4] J.M. Baptista and I. Biswas. Abelian vortices with singularities. arXiv:1207.0863. Submitted.
- [5] M. Bazarganzadeh and F. Bozorgnia. Numerical approximation of multi phase quadrature domains. Submitted.
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- [7] J. Boehm and S. Papadakis. Bounds for the Betti numbers of successive stellar subdivisions of a simplex. arXiv:1212.4358. Submitted.
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- [9] F. Bozorgnia. Numerical simulations for spectral minimal partitions of Laplace operator. Submitted.
- [10] F. Cagnetti, D. Gomes, H. Mitake, and H. V. Tran. A new method for large time behavior of convex Hamilton–Jacobi equations I: degenerate equations and weakly coupled systems. arXiv:1212.4694. Submitted.
- [11] M. C. Câmara, L. Rodman, and I. M. Spitkovsky. One sided invertibility of matrices over commutative rings, corona problems, and Toeplitz operators with matrix symbols. Submitted.
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- [41] P. Vaz and E. Wagner. A remark on BMW algebra,  $q$ -Schur algebras and categorification. arXiv:1203.4628. Submitted.

## 9 Partnership and outreach

### Participation in the the Gulbenkian Foundation Programme Novos Talentos da Matemática

<http://www.math.ist.utl.pt/talentos/>

### Participation in Mathematical Routes of TU Lisbon:

February 29–March 8, 2012.

### Participation in the Winter School for Undergraduates:

*Escola de Inverno de Matemática (EIM12)*, IST, February 6–8, 2012.

<http://www.math.ist.utl.pt/EIM2012/EIM/>

### Outreach activities by individual members

- Miguel Abreu coordinated the SPM project *5 minutos de Matemática*, financed by Compete and Ciência Viva, which is behind the TV show *Isto é Matemática* that airs on SIC-Notícias.
- Miguel Abreu, Ensino da Matemática em Portugal (ensino básico), TEDxISTTagus, Oeiras, January 22, 2012.
- Miguel Abreu, Introdução às Geometrias Não-Euclidianas, Schola Europaea, Brussels, Belgium, February, 2012.
- Miguel Abreu, 22 Centuries Measuring Area, Schola Europaea, Brussels, Belgium, February, 2012.
- Miguel Abreu, Matemática e Realidade, Schola Europaea, Brussels, Belgium, February, 2012.
- Miguel Abreu, O papel fundamental da Matemática, Escola Secundária Henriques Nogueira, Torres Vedras, May 9, 2012.
- Miguel Abreu, Metas Curriculares em Portugal, Painel Plenário do ProfMat, Coimbra, October 5, 2012.
- Miguel Abreu, SPM e MPT-2013, Painel MPT-2013 do ProfMat, Coimbra, October 6, 2012.
- Miguel Abreu, SPM - o que faz?, Jornadas de MAEG, ISEG-UTL, December 5, 2012.

- João Boavida, Rui Carpentier and Pedro Gonçalves co-edited the book *Números, Cirurgias e Nós de Gravata - 10 anos de Seminário Diagonal no IST*, IST Press, 2012.
- Cristina Câmara, Caminhos da Ciência, Tecnologia e Sociedade - Caminho 7 (IST); Universidade Técnica de Lisboa, 15 de Março de 2012.
- Ricardo Schiappa was interviewed on July 7, 2012 in TVI24 about How to create a Higgs boson at home
- Ricardo Schiappa was interviewed on August 7, 2012 in TVI24 about The Importance of the Higgs boson

## 10 Personal notes

- Miguel Abreu is President of the Portuguese Mathematical Society (Sociedade Portuguesa de Matemática).
- Sílvia Anjos is the Treasurer of the Portuguese Mathematical Society (Sociedade Portuguesa de Matemática).
- Fernando Pestana da Costa is Vice-president of the Portuguese Mathematical Society (Sociedade Portuguesa de Matemática).
- Fernando Pestana da Costa is editor of the International Journal of Biomathematics and Biostatistics.
- Rui L. Fernandes was a member of the Executive Committee of the European Mathematical Society.
- Rui L. Fernandes and Roger Picken were members of the Scientific Committee of the XXI International Fall Workshop on Geometry and Physics, Burgos, Spain, August 30 - September 1, 2012.
- Diogo Gomes was a member of the Scientific Council for Exact Sciences and Engineering of the FCT.
- Gustavo Granja is a Member of the Scientific Committee of the Program Novos Talentos em Matemática.
- Pedro Lopes is Editor for Discrete Mathematics, Central European Journal of Mathematics.
- Paulo Pinto and Margarida Mendes Lopes received an honourable mention in the 2012 Santander/UTL prize in Mathematics.
- João Pimentel Nunes obtained the *Agregação* in Mathematics at the Universidade Técnica de Lisboa in January 2012.