



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

**Report 2009**

March 2010

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## 1 Research projects

The following research projects were coordinated by members of the Center in 2009:

### **Nonperturbative String Theory and Black Holes at LHC**

(Funding approved in 2009, started 2/2/2010)

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

*Reference:* CERN/FP/109344/2009

*Principal investigator:* Ricardo Schiappa

*Number of participants:* 9

This project is divided into two tasks, respectively addressing nonperturbative partition functions and quantization, and black holes and string theory.

### **Symplectic and Related Geometries**

(Funding approved in 2009, starts 1/2/2010)

*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.

### **Algebraic Geometry**

(Funding approved in 2009, started 25/1/2010)

*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.

## **New Geometry and Topology**

(Funding approved in 2009, starts 1/1/2010)

*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.

## **Symplectic Geometry and Generalizations**

(Started 1/7/2008, duration 24 months)

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

*Reference:* 4.1.3/CAPES/CPLP

*Principal investigator:* Rui Loja Fernandes

*Number of participants:* 4

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

## **Topological Aspects of Symplectic Geometry and Its Generalizations**

(Started 1/7/2008, duration 24 months)

*Funding agency:* Fundação para a Ciência e a Tecnologia/GRICES e Spanish National Research Council (CSIC)

*Reference:* 14/CSIC/08 2008/2009

*Principal investigator:* Rui Loja Fernandes

*Number of participants:* 4

Cooperation project involving researchers from CAMGSD and from CSIC-Madrid in the area of symplectic geometry and topology and their generalizations.

## **Quantum Topology**

(Concluded 31/12/2009)

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

*Reference:* PPCDT/MAT/60352/2004

*Principal investigator:* Roger Picken

*Number of participants:* 9

This project focuses on problems in low-dimensional topology and higher-order geometry, concerning knots, knotted surfaces, Khovanov homology and gerbes.

## **Low Dimension and Infinite Dimension Discrete Dynamical Systems**

(Concluded November 2009)

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

*Reference:* PPCDT/MAT/60380/2004

*Principal investigator:* Pedro Martins Rodrigues

*Number of participants:* 10

This project addressed the area of discrete dynamical systems and its interaction with other areas of mathematics, such as combinatorics, algebra and number theory. In particular it focused on applications of symbolic dynamics to PDEs with nonlinear boundary conditions, invariants such as zeta functions, Bowen–Franks groups, conductance, etc., as well as the study of algebraic and arithmetic dynamical systems.

## **Moduli spaces and string theory**

(Concluded 30/04/2009)

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

*Reference:* PPCDT/MAT/58549/2004

*Principal investigator:* João Pimentel Nunes

*Number of participants:* 6

Research project on the geometry of moduli spaces, string theory and related subjects.

## **Groupoids and Quantaes in Geometry and Analysis**

(Concluded 28/02/2009)

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

*Reference:* PPCDT/MAT/55958/2004

*Principal investigator:* Pedro Resende

*Number of participants:* 5

Starting from the notion of topological groupoid, and in particular that of Lie groupoid, this project addresses four topics: quantale theory, noncommutative geometry, classifying spaces and noncommutative index theory.

## **Symplectic and Related Geometries and Topology**

(Concluded 31/1/2009)

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

*Reference:* PPCDT/MAT/57888/2004

*Principal investigator:* Rui Loja Fernandes

*Number of participants:* 7

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

## **2 Visitors**

The following researchers visited the Center in 2009:

C. Abad, ETH, Zürich, 16.04.09.

M. Abbott, Brown Univ., USA, 23.09–8.10.09.

R. Andrade, MIT, USA, 17.12.09.

I. Aniceto, Brown Univ., USA, 04.06.09.

P. Aschieri, Univ. degli studi del Piemonte Orientale “Amedeo Avogadro”, Alessandria, Italy, 11–13.05.09.

M. Audin, IRMA, Strasbourg, 15–24.01.09.

A. Baraviera, Univ. Federal do Rio Grande do Sul, Brasil, 10.02.09.

M. Barja, Univ. Polytechnica da Catalunha, Spain, 03–07.12.09.

K. Behrend, Univ. of British Columbia, Canada, 27.06–05.07.09.

G. Borot, CEA-Saclay, France, 02–07.11.09.  
U. Bruzzo, SISSA, Trieste, Italy, 20–23.12.09.  
F. Bozorgnia, Royal Institute of Technology, KTH, Sweden, 07–16.02.09.  
G. Brown, Univ. Kent, UK, 2–4.05.09.  
H. Bursztyn, IMPA, Brazil, 07.07.09.  
P. Cartier, IHES, Paris, France, 3–13.06.09.  
H. Cayuela, ICREA - Pompeu Fabra Univ., Spain, 06–20.07.09.  
L. Cornalba, INFN Milan, Italy, 25.06–01.07.09.  
F. Correia, Univ. Porto, Portugal, 06.04.09.  
E. D’Aniello, Seconda Univ. degli Studi di Napoli, Italy, 20.04–11.05.09.  
L. DeMarco, Univ. Illinois, Chicago, USA, 08.09.09.  
O. Dias, Univ. Cambridge, Cambridge, UK, 18.05.09.  
A. Döring, Imperial College, UK, 16–22.02.09.  
F. Dehon, Univ. de Nice, France, 23.02–03.03.09.  
M. Efendiev, Munich Technical Institute, Germany, 22–29.11.09.  
S. Elaydi, Trinity Univ., USA, 28.6–09.07.09.  
R. El-Harti, Univ. Hassan I, Morocco, 24.05–6.06.09.  
B. Eynard, CEA-Saclay, France, 08–18.11.09.  
C. Faber, KTH, Sweden, 19–23.12.09.  
F. Ferrari, Univ. Libre de Bruxelles, Belgium, 28.06–02.07.09.  
B. Fiedler, Freie Univ. Berlin, Germany, 5–09.09.09.  
O. García-Prada, CSIC, Madrid, Spain, 6–9.10.09.  
R. Gopakumar, HCRI Allahabad, India, 28.06–02.07.09.  
C. Grossi, Max Planck Institute for Mathematics, Bonn, Germany, 13–  
22.07.09.  
M. Gross, Univ. California at San Diego, USA, 12–19.07.09.  
M. Hamilton, Tokyo Univ., Japan, 5–10.07.09.  
T. Harmark, Niels Bohr Institute, Copenhagen, Denmark, 28.06–02.07.09.  
B. Hu, Univ. Maryland, USA, 17–20.06.09.  
M. Hamilton, Tokyo Univ., Japan, 06.07.09.  
S. Iqbal, Univ. Warwick (PhD student), UK, 28.04–11 05.09.  
C. Imbimbo, Univ. Genoa, Italy, 27.11–11.12.09.  
H. Irie, National Taiwan Univ., Taiwan, 11–20.11.09.

B. Jurco, Max Planck Institute for Mathematics, Bonn, Germany, 6–11.12.09.  
J. Kollár, Princeton Univ., USA, 1–25.7.09.  
W. Kirwin, Max Planck Institute for Mathematics, Leipzig, Germany, 5–09.10.09.  
A. Klemm, Univ. Bonn, Germany, 1–04.11.09.  
Z. Kocan, Silesian Univ. in Opava, Czech Republic, 14–18.06.09.  
V. Kurkova, Silesian Univ. in Opava, Czech Republic, 14–18.06.09.  
L. Kauffman, Univ. Illinois, Chicago, USA, 27.06–05.07.09.  
H. Johansson, KTH, Stockholm, Sweden 15–21.03.09.  
F. Lalonde, Univ. Montreal, Canada, 2–14.07.09.  
S. Lawton, Univ. Maryland, USA, 9–24.01.09.  
M. Lemos, Univ. Estadual de Campinas, Brazil, 31.05–14.06.09.  
P. Lima-Filho, Texas A&M Univ., USA, 23.08–3.10.09.  
M. Logares, Univ. Porto, Portugal, 1–03.03.09.  
D. Lombardo, CABA, Buenos Aires, Argentina, 23.11–07.12.09.  
A. Lopes, Univ. Federal Rio Grande do Sul, Brazil, 29.12.08–19.01.09.  
T. Ludsteck, Univ. Stuttgart, Germany, 5–13.04.09.  
L. Macarini, Univ. Federal Rio de Janeiro, Brazil, 03–31.5.09.  
A. Marian, Univ. Illinois, Chicago, USA, 11–19.7.09.  
M. Mariño, Univ. Geneva, Switzerland, 28.06–02.07.09.  
D. Martelli, Swansea Univ., UK, 28.06–03.07.09.  
M. Mars, Univ. de Salamanca, Spain, 16–10.06.09.  
S. Minwalla, Tata Institute of Fundamental Research, Mumbai, India, 27.06–02.07.09.  
T. Mohaupt, Univ. Liverpool, UK, 24.06–2.07.09.  
M. Morini, SISSA, Italy, 22–30.06.09.  
M. Mozo, Univ. Salamanca, Spain, 22–24.11.09.  
S. Murthy, Laboratoire de Physique Théorique et Hautes Énergies, Paris, 5–14.06.09.  
J. Nelsoni, Univ. Torino, Italy, 22–30.06.09.  
B. Noohi, King’s College, UK, 28.06–05.07.09.  
N. Orantin, CERN, Switzerland, 12–24.10.09.  
A. Palmigiano, Univ. Amsterdam, Holland, 8.5–8.6.09.  
R. Pandharipande, Princeton Univ., USA, 13–18.7.09.



G. Pareschi, Univ. Roma II, Italy, 06–12.09.09.  
R. Pignatelli, Univ. Trento, Italy, 2.06.09.  
A. Pires, MIT, USA, 24.03.09.  
M. Popa, Univ. Chicago, USA, 4–15.09.09.  
F. Presas, ICMAT-CSIC, Spain, 01–05.12.09.  
F. Radulescu, Univ. Roma-Tor Vergata, Italy, 2–09.02.09.  
L. Rastelli, Stony Brook Univ., New York, USA, 27.06–02.07.09.  
D. Ravenel, Univ. Rochester, USA, 1–14.05.09.  
G. Reis, CMAP, Ecole Polytechnique, France, 16.10.09.  
I. Riera, Univ. Barcelona, Spain, 8.01.2009.  
M. Rojas, Texas A&M Univ., USA, 19–20.05.09.  
S. Sabatini, EPFL, USA, 04–08.11.09.  
D. Salamon, ETH Zürich, Switzerland, 27.6–04.7.09.  
J. Sardanyés, Complex Systems Lab, Univ. Pompeu Fabra, Barcelona, 27.01.09.  
L. Scardia, Univ. Bonn, Germany, 22–30.11.09.  
F. Schätz, Univ. Zürich, Switzerland, 03–06.05.09.  
S. Shatashvili, Trinity College, Dublin, Ireland, 18–20.10.09.  
V. Schomerus, DESY Hamburg, Germany, 28–30.06.09.  
A. Siconolfi, Univ. Roma, Italy, 14–20.06.09.  
L. Stefanini, Penn State Univ., USA, 13–18.07.09.  
H. Tehrani, Univ. Nevada, USA, 30.06–7.08.09.  
P. Tod, Univ. Oxford, UK, 02.04.09.  
G. Trentinaglia, Univ. Padova, Italy, 19–25.04.09.  
S. Tzen, Univ. Warwick (PhD student), UK, 2–9 05.09.  
E. Valdinoci, Univ. Texas, Austin, USA, 26.01–02.02.09.  
H. van Roessel, Univ. Alberta, Canada, 13–30.09.09 and 1–10.11.09.  
B. van Steirteghem, Medgar Evers College, CUNY, New York, USA, 11–15.04.09.  
F. Viviani, Univ. degli Studi Roma III, Italy, 12–18.07.09.  
A. Vladimirovsky, Cornell Univ., USA, 10.03.09.  
A. Weinstein, Univ. California, Berkeley, USA, 8–15.7.09.  
B. Wit, Univ. Utrecht, Holland, 24–28.05.09.  
C. Zhu, Univ. Göttingen, Germany, 10–16.05.09.

### 3 Seminars

**Analysis, Geometry, and Dynamical Systems Seminar.** This is the main seminar of the Center. It included the following talks in 2009:

- Messoud Efendiev (Tech. Univ. Munich), On a criteria for verifying mathematical models, 26/11/09.
- Lucia Scardia (Hausdorff Center for Mathematics, Bonn), Convergence of equilibria for thin elastic plates under physical growth conditions, 24/11/09.
- Henry van Roessel (Univ. Alberta, Edmonton), Some recent work on coagulation equations, 3/11/09.
- Gonçalo dos Reis (CMAP, Ecole Polytechnique), Quadratic growth BSDE and applications to pricing and hedging of derivatives based on non-tradable underlyings, 16/10/09.
- Hossein Tehrani (Univ. Nevada, Las Vegas), Fucik spectrum of wave operator and related jumping nonlinearity problems, 28/7/09.
- Josep Sardanyés (Univ. Pompeu Fabra, Barcelona), On the dynamics of RNA viruses through nonlinear differential equations, 7/7/09.
- Louis Kauffman (Univ. Illinois, Chicago), Virtual knot theory and oriented extensions of the Jones polynomial, 30/6/09.
- Saber Elaydi (Trinity Univ., Texas), Towards a theory of periodic difference equations and population biology, 30/6/09.
- Massimiliano Morini (SISSA, Italy), Equilibrium configurations of epitaxially strained elastic films: existence, regularity, and qualitative properties of solutions, 23/6/09.
- Zdenek Kocan and Veronika Kurkova (Silesian Univ., Opava), Entropy, horseshoes and homoclinic trajectories on trees, graphs and on dendrites, 16/6/09.
- Pierre Cartier (IHES), Arithmetics: motives, periods and motivic Galois group, 9/6/09.
- Pierre Cartier (IHES), Geometry: sheaves, topos and fields, 8/6/09.
- Pierre Cartier (IHES), Geometry: the notions of spectrum and scheme, 5/6/09.
- Emma D’Aniello (Seconda Univ. Studi di Napoli), Topological dynamical systems and odometers, 8/5/09.

- Alex Vladimirovsky (Cornell Univ.), Homogenization and multiobjective optimization — computational challenges, 10/3/09.
- Andreas Döring (Imperial College, London), A topos approach to quantum theory, 17/2/09.
- Alexandre Baraviera (Univ. Federal Rio Grande do Sul), Iterated function systems, classical and quantum, 10/2/09.
- Florin Radulescu (Univ. Roma-Tor Vergata), Type  $II_1$  Von Neumann representations for Hecke operators on Maass forms and inequalities for their eigenvalues, 3/2/09.
- Josep Sardanyés (Univ. Pompeu Fabra, Barcelona), Theoretical models of cooperation with ODEs: from prebiotic evolution to complex ecosystems, 27/1/09.
- Artur Lopes (Univ. Federal Rio Grande do Sul), Transport and the involution kernel in Ergodic Theory, 13/1/09.

**Algebra Seminar.** This included the following talks in 2009:

- Ricardo Andrade (MIT), Hochschild homology and geometry of manifolds, 17/12/09.
- Gustavo Granja (IST), Quaternionic algebra, 26/11/09.
- Stavros Papadakis (IST), Unprojection and Stanley–Reisner rings of Gorenstein simplicial complexes, 22/10/09.
- Paulo Lima-Filho (Texas A&M Univ.), Arithmetic toric varieties, 30/9/09.
- Behrang Noohi (Kings College, London), Group stacks in geometry, 1/7/09.
- Inês Henriques (Univ. Nebraska), Cohomology over short Gorenstein rings, 23/6/09.
- J. Maurice Rojas (Texas A&M Univ.), Number theory, randomization, and real topology computation, 20/5/09.
- Francois-Xavier Dehon (Univ. Nice), Maps from the classifying space of an elementary abelian group, cohomology theories and elementary abelian subgroups of compact Lie groups, 25/2/09.

**“Geometria em Lisboa” Seminar.** This included the following talks in 2009:

- Rosa Sena Dias (IST), Scalar flat Kähler metrics on non-compact toric surfaces, 10/12/09.
- Francisco Presas (CSIC, Madrid), Non-complete intersections, 3/12/09.
- João Pedro Boavida (IST), What is an Eisenstein series?, 24/11/09.
- Silvia Sabatini (EPFL, Lausanne), GKM spaces and GKM fiber bundles, 5/11/09.
- Carlos Florentino (IST), Topology and singularities of moduli spaces of free group representations, 27/10/09.
- Carlo Rossi (CAMGSD), Formality Theorems and Caldararu’s conjecture, 20/10/09.
- Vladimir Dragovic (GFMUL, Lisbon), Geometrization and generalization of the Kowalevski top, 13/10/09.
- William Kirwin (MPI, Leipzig), Adapted Complex Structures and the Geodesic Flow, 6/10/09.
- Filippo Viviani (Univ. degli Studi Roma Tre), Torelli theorem for stable curves, 15/9/09.
- Laura DeMarco (Univ. Illinois at Chicago), The dynamical shape of a complex polynomial, 8/9/09.
- Carlos Grossi (Max Planck Institute for Mathematics, Bonn), Complex hyperbolic disc bundles, 21/7/09.
- Henrique Bursztyn (IMPA), Morita equivalence and characteristic classes of star products, 7/7/09.
- Mark Hamilton (Tokyo Univ.), Toric degeneration and quantization of flag manifolds, 6/7/09.
- Victor Guillemin (MIT), An equivariant “heat-type” trace formula for orbifolds plus some applications to inverse spectral theory, 16/6/09.
- Roberto Pignatelli (Univ. Trento), Compact complex surfaces of genus 0, 2/6/09.
- Leonardo Macarini (Univ. Federal do Rio de Janeiro), Symplectic homology of Morse–Bott stable hypersurfaces, 21/5/09.

- Margherita Sandon (IST), Contact non-squeezing via generating functions, 19/5/09.
- Chenchang Zhu (Univ. Göttingen), Higher structures in geometry, 12/5/09.
- Florian Schaetz (Zürich), Chain-level structures for coisotropic submanifolds, 5/5/09.
- Giorgio Trentinaglia (Univ. Göttingen), On the role of effective representations of proper Lie groupoids, 21/4/09.
- Camilo Arias Abad (ETH, Zürich), Representations up to homotopy and cohomology of classifying spaces, 16/4/09.
- Bart Van Steirteghem (CUNY), Equivariant degenerations of spherical modules for groups of type A, 14/4/09.
- Thomas Ludsteck (Univ. Stuttgart),  
Homogeneous  $p$ -adic vector bundles on abelian varieties that are analytic tori, 7/4/09.
- Ana Rita Pires (MIT), Symplectic origami, 24/3/09.
- Stavros Papadakis (CAMGSD), Parallel unprojection of type Kustin–Miller, 17/3/09.
- Olivier Brahic (CAMGSD), Extensions of Lie brackets, 10/3/09.
- Marina Logares (Univ. Porto),  
Moduli of parabolic Higgs bundles and the Atiyah algebroid, 3/3/09.
- Rahul Pandharipande (Univ. Princeton), Algebraic cobordism, 10/2/09.
- Sérgio Mendes (ISCTE, Lisbon), Langlands functoriality and  $K$ -theory for  $GL(n)$ , 3/2/09.
- Michèle Audin (IRMA, Strasbourg), Lagrangian skeletons, 20/1/09.
- Sean Lawton (Univ. Maryland), The topology of the moduli of free group representations, 15/1/09.
- Ignasi Mundet i Riera (Univ. Barcelona), Jordan’s theorem for the diffeomorphism group of some manifolds, 8/1/09.
- Ana Margarida Melo (Univ. Coimbra), Compactified Picard stacks over the moduli space of curves with marked points, 6/1/09.

**Mathematical Physics Seminar.** This included the following talks in 2009:

- Paul Tod (Univ. Oxford), Mason's theorem on solutions of the Einstein field equations, 2/4/09.
- Andreas Döring (Imperial College, London), Quantum states as measures on the spectral presheaf, 18/2/09.

**String Theory Seminar.** This included the following talks in 2009:

- Niclas Johansson (Univ. Uppsala), Recent Developments in Three-Dimensional Gravity, 16/03/09.
- *Video Talk:* Chris Beasley, Non-Abelian Localization for Chern-Simons Theory, 23/03/09.
- *Video Talk:* Rajesh Gopakumar, Strebel Differentials and String Theory, 30/03/09.
- Filipe Paccetti Correia (Univ. Porto), From Two-Dimensional Surfaces to  $AdS_5$  Supersymmetric Black Holes, 06/04/09.
- *Video Talk:* Albrecht Klemm, Quasi-modular forms and Gromov-Witten Theory, 13/04/09.
- *Video Talk:* Mina Aganagic, Topological Strings and (Almost) Modular Forms, 20/04/09.
- Gabriel Lopes Cardoso (IST), Black Hole Partition Functions and Duality, 27/04/09.
- *Video Talk:* Hiroshi Ooguri, Crystal Melting and Quantum Calabi-Yau, 04/05/09.
- Paolo Aschieri (Univ. degli studi del Piemonte Orientale), Abelian Gerbes, Nonabelian Gerbes, and Global Anomalies, 11/05/09.
- Oscar Dias (DAMTP, Cambridge), Black Holes as Lumps of Fluid, 18/05/09.
- Bernard de Wit (Univ. Utrecht), Near-Horizon Analysis of D=5 BPS Black Holes and Rings, 25/05/09.
- Inês Aniceto (Brown Univ.), The Spectrum of String Solitons: Giant Magnons in  $AdS_5 \times S^5$  and  $AdS_4 \times CP^3$ , 04/06/09.
- Sameer Murthy (LP THE, Paris) Exact Counting of Black Hole Microstates in String Theory, 08/06/09.

- B.- L. Hu (Univ. Maryland), Emergent/Quantum Gravity: Macroscopic and Microscopic Structures of Spacetime, 17/06/09.
- B. - L. Hu (Univ. Maryland), Nonlocality and Stochasticity in Quantum Mechanics, Statistical Mechanics and Quantum Gravity, 19/06/09.
- *Video Talk:* Niklas Beisert / Konstantin Zarembo, Strong/Weak Interpolation in the Spectrum of AdS/CFT / Worldsheet Scattering in Open String Field Theory, 06/07/09.
- Nicolas Orantin (CERN), Enumerative Geometry from Topological Recursion, 13/07/09.
- *Video Talk:* Roberto Emparan / Edward Witten, Phases of Higher Dimensional Black Holes / Three-Dimensional Gravity Revisted, 20/07/09.
- *Video Talk:* Zvi Bern / Barton Zwiebach, Evidence for Ultraviolet Finiteness of N=8 Supergravity / Analytic Progress in Open String Field Theory, 27/07/09.
- Michele Cirafici (CAMGSD), Instantons, Hypermultiplets and Calabi-Yau Compactifications, 21/09/09.
- Michael Abbott (Brown/TIFR), Giant Magnons for SYM and ABJM Theory, 28/09/09.
- *Video Talk:* Matthias Staudacher / Romuald Janik, Integrability of the AdS/CFT System / 4-Loop Perturbative Konishi from  $AdS_5 \times S^5$  12/10/09.
- Samson Shatashvili (Trinity College Dublin/CERN) SUSY Gauge Theories and Quantization of Integrable Systems, 19/10/09.
- *Video Talk:* Marcos Mariño / Nathan Berkovits, Remodeling the Topological String, Perturbatively and Nonperturbatively / Fermionic T-Duality, 26/10/09.
- Albrecht Klemm (Univ. Bonn), Matrix Models and Geometry (Thematic Period: Lecture 1), 02/11/09.
- *Video Talk:* Andrew Strominger / Ashoke Sen, Quantum Gravity in Three Dimensions / Extremal Black Holes and  $AdS_2 \times CFT_1$  Correspondence, 09/11/09.
- Bertrand Eynard (CEA Saclay), Matrix Models and Geometry (Thematic Period: Lecture 4), 16/11/09.
- Miguel Vazquez-Mozo (Univ. Salamanca), Gravitational Collapse, Criticality and Holography, 23/11/09.

- Diego Cirilo-Lombardo (JINR, Dubna), On the Non-Abelian and Supersymmetric Extensions of the Born-Infeld Action, 30/11/09.
- *Video Talk*: Freddy Cachazo / Simeon Hellerman, What is the Simplest Quantum Field Theory? / Cosmological Unification of String Theories, 07/12/09.
- *Video Talk*: Boris Pioline, BPS Black Holes and Topological Strings: A Review, 14/12/09.

**Topological Quantum Field Theory Club.** This included the following talks in 2009:

- Branislav Jurco (Max Planck Institute for Mathematics, Bonn), Introduction to nonabelian bundle 2-gerbes, 7/12/09.
- Camille Laurent (Univ. Coimbra), Introduction to abelian and non-abelian gerbes, 30/11/09.

**Working Seminar on Contact/Symplectic Topology/Geometry.** This included the following talks in 2009:

- David Martinez Torres (CAMGSD), Open book decompositions and applications to contact geometry, three sessions on 17/03/09, 24/03/09 and 31/03/09.
- Sheila Sandon (CAMGSD), Orderability of 1-jet bundles and the Low conjecture, 28/04/09.
- Pedro Frejlich (CAMGSD), Basic concepts and examples of generalized complex structures, two sessions on 12/05/09 and 19/05/09.
- Rui Loja Fernandes (IST), Deformations of generalized complex structures, 26/05/09.
- David Martinez Torres (CAMGSD), Surgery and generalized complex structures in dimension 4, two sessions on 02/06/09 and 16/06/09.
- Camille Laurent-Gengoux (CMUC), Introduction to holomorphic Poisson structures, 27/10/09.
- Rui Loja Fernandes (IST), What is a QRT Map?, 03/11/09.
- David Martinez Torres (CAMGSD), QRT maps on biquadratic surfaces, 10/11/09.
- David Martinez Torres (CAMGSD), The QRT surface, 24/11/09.
- Video of Cambridge talk by Duistermaat, QRT maps and elliptic surfaces, 03/12/09.



**Working Seminar on Algebraic Topology and Model Theory.** This included the following talks in 2009:

- Mário Edmundo (CMAF, Univ. Aberta), o-minimal singular homology, five sessions on 21/5/09, 28/5/09, 4/6/09, 18/6/09, and 10/12/09.
- Gustavo Granja (IST), o-minimal singular homology and algebraic singular homology, 17/12/09.

**Working Seminar on Groupoids and Noncommutative Geometry.** This included the following talks in 2009:

- Rachel Dawe Martins (CAMGSD), A categorification of noncommutative manifolds, 22/4/09.

**Working Seminar on Topos/Quantum Theory.** This included the following talks in 2009:

- João Pimentel Nunes (IST), 2D-triangulations and matrix models, 22/01/09.

**Working Seminar on Partial Differential Equations.** This included the following talks in 2009:

- José Matias (IST), On a dimension reduction result in the framework of structured deformations, 23/04/09.

**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.

## 4 Conferences and short courses

The following Conferences and Short Courses were organized or co-organized by members of the Center in 2009:

### **SPM/CIM Mathematical Meeting on Algebraic Geometry**

*Coimbra, March 7, 2009*

*Organizer:* Margarida Mendes Lopes.

*Speakers:*

- Oscar Felgueiras (Univ. Porto)
- André Gama (Univ. Trás-os Montes e Alto Douro)
- Carlos Rito (Univ. Trás-os Montes e Alto Douro)
- Helena Soares (ISCTE)

[http://www.cim.pt/?q=spm\\_cim\\_geometria\\_algebrica\\_2009](http://www.cim.pt/?q=spm_cim_geometria_algebrica_2009)

### **A solution to the Arf–Kervaire invariant Problem**

*IST, Portugal, May 5–7, 2009*

*Organizers:* Sharon Hollander, Gustavo Granja.

*Lecturer:* Douglas Ravenel (Univ. Rochester)

<http://www.math.ist.utl.pt/~ggranja/Stablehomotopy/>

### **Mira Fernandes and his age — An historical Conference in honour of Aureliano de Mira Fernandes (1884–1958)**

*IST, Portugal, June 17, 2009*

*Scientific Committee:* Orfeu Bertolami, João Caraça, Waldyr Oliva, Luis Saraiva

*Local Organizing Committee:* Pedro Girão, Pedro Gonçalves Henriques, João Teixeira Pinto

*Speakers:*

- Amaro Rica da Silva (Instituto Superior Técnico)
- Augusto dos Santos Fitas (Univ. Évora)
- Carlos Herdeiro (Univ. Porto)
- Cecília Costa (Univ. Trás-os-Montes e Alto Douro)
- Erhard Scholz (Univ. Wuppertal)
- José Sande Lemos (IST)
- Orfeu Bertolami (IST)
- Paulo Crawford (Univ. Lisboa)
- Rossana Tazzioli (Univ. Lille 1)

[http://www.math.ist.utl.pt/~jpinto/Mira\\_Fernandes/historical.phtml.en](http://www.math.ist.utl.pt/~jpinto/Mira_Fernandes/historical.phtml.en)

## **Mathematical Relativity in Lisbon, International Conference in Honour of Aureliano de Mira Fernandes**

*IST, Portugal, June 18–19, 2009*

*Scientific Committee:* Filipe Mena, José Mourão, José Natário, José Sande Lemos, Paul Tod

*Local Organizing Committee:* Jorge Silva, José Natário, Leonor Godinho, Pedro Girão

*Speakers:*

- Alan Rendall (Albert Einstein Institut, Potsdam)
- Carlos Herdeiro (Univ. Porto)
- Hans Ringström (KTH, Stockholm)
- José Sande Lemos (IST)
- José Senovilla (Univ. País Vasco, Bilbao)
- Marc Mars (Univ. Salamanca)
- Miguel Sanchez (Univ. Granada)
- Piotr Chrusciel (Univ. Oxford)
- Simone Calogero (Univ. Granada)

<http://www.math.ist.utl.pt/~jnatar/Mira/index.html>

## **The IST String Fest: Perspectives From A Younger Generation**

*IST, Portugal, June 29–July 1, 2009*

*Organizers:* Gabriel Lopes Cardoso, José Mourão, João Pimentel Nunes, Ricardo Schiappa.

*Plenary speakers:*

- Lorenzo Cornalba (INFN Milan)
- Frank Ferrari (ULB)
- Rajesh Gopakumar (HCRI Allahabad)
- Troels Harmark (NBI)
- Marcos Mariño (Univ. Geneva)
- Dario Martelli (Univ. Swansea)
- Shiraz Minwalla (TIFR)
- Leonardo Rastelli (ITF Stony Brook)
- Volker Schomerus (DESY Hamburg)

<http://www.math.ist.utl.pt/~strings/StringFest/>

## **X Lisbon Summer Lectures in Geometry**

*IST, Portugal, June 29 – July 03, 2009*

*Organizing committee:* Miguel Abreu, Sílvia Anjos, Gustavo Granja.

*Lecturers:*

- Kai Behrend (University of British Columbia)
- Dietmar Salamon (ETH Zürich)

<http://www.math.ist.utl.pt/~sanjos/SummerLectures/SummerLect09>

## **Post-doctoral Academy in Mathematics — Mathematics Colab UT-Austin/Portugal - ICTI Carnegie Mellon/Portugal**

*IST, Portugal, July 7–9, 2009*

*Organizer:* Diogo Gomes.

*Lecturers:*

- Luis Caffarelli (Univ. Texas at Austin)
- Panagiotis Souganidis (Univ. Texas at Austin)

<http://math.utaustinportugal.org/pdworkshop/>

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

*Oporto, Portugal, July 9–12, 2009*

*Advisory Committee:* Miguel Abreu, Miguel Costa, Rui Loja Fernandes, Carlos Herdeiro, Marco Mackaay, José Mourão, Roger Picken, João Nuno Tavares.

*Organizing Committee:* Iakovos Androulidakis, Inês Cruz, João Faria Martins, João Nuno Tavares, Marco Zambon.

*Main speakers:*

- Paul Biran (Tel-Aviv Univ., Israel)
- Henrique Bursztyn (IMPA, Brazil)
- Yael Karshon (Univ. Toronto, Canada)
- Alan Weinstein (Univ. California, Berkeley, USA)

<http://cmup.fc.up.pt/cmup/omgtp/2009>

## **Geometry Summer School**

*IST, Lisbon, July 13–17, 2009*

*Organizers:* Ana Cannas da Silva, Rui Loja Fernandes.

*Lecturers:*

- Miguel Abreu (IST)
- János Kollár (Princeton Univ.)
- Alina Marian (Univ. Illinois, Chicago)
- Rahul Pandharipande (Princeton Univ.)
- Alan Weinstein (Univ. California, Berkeley)

<http://www.math.ist.utl.pt/geometry09/>

## **IST courses on Algebraic Geometry IV**

*IST, Lisbon, September 7–10, 2009*

*Organizer:* Margarida Mendes Lopes.

*Lecturers:*

- Mihnea Popa (Univ. Illinois at Chicago)
- Giuseppe Pareschi (Univ. Roma II)

<http://www.math.ist.utl.pt/~mmlopes/CourseAGIV.html>

## **2nd IST/IME Meeting**

*IST, Lisbon, September 7–11, 2009*

*Scientific Committee:*

- Luís Barreira (IST)
- Alexandre N. de Carvalho (ICMC, USP)
- Paulo D. Cordaro (IME, USP)
- Edson de Faria (IME, USP)
- Rui Loja Fernandes (IST)
- Pablo Ferrari (IME, USP)
- Djairo G. de Figueiredo (IME, UNICAMP)
- Antônio Galves (IME, USP)
- Diogo Gomes (IST)

- Jack Hale (Georgia I. Tech.)
- Orlando Lopes (IME, USP)
- Waldyr M. Oliva (IST & IME, USP)
- Jacob Palis (IMPA)
- Antônio Luiz Pereira (IME, USP)
- Paolo Piccione (IME, USP)
- Clodoaldo G. Ragazzo (IME, USP)
- Carlos Rocha (IST)
- Jorge Sotomayor (IME, USP)
- Claudia Valls (IST)

<http://www.math.ist.utl.pt/~pgirao/istime/istime2.html>

## **XIV ICDEA 2009 - International Conference on Difference Equations and Applications**

*Estoril, Portugal, October 19–23, 2009*

*Organizers:* Henrique Oliveira - Co-Chair, José Manuel Ferreira - Co-Chair, Ricardo Coutinho, Sara Fernandes, Stefan Hilger, Rafael Luís, Carlos Rocha, Luís Silva, Andreas Suhrer.

*Plenary speakers:*

- Luís Barreira (IST)
- Tomasz Downarowicz (Wroclaw Univ. Technology)
- Saber Elaydi (Trinity Univ.)
- Bernold Fiedler (Freie Univ. Berlin)
- Sergiy Kolyada (Institute of Mathematics NAS of Ukraine)
- Gerry Ladas (Univ. Rhode Island)
- Michal Misiurewicz (Indiana Univ., Purdue Univ. Indianapolis)
- Sebastian Schreiber (Univ. California, Davis)
- Sebastian van Strien (Warwick Univ.)
- James Yorke (Univ. Maryland)

<http://isdeds.org/icdea2009/>

## CAMGSD Thematic Period: Matrix Models and Geometry

*IST, Portugal, Fall 2009*

*Organizers:* Gabriel Lopes Cardoso, Ricardo Schiappa, Marcel Vonk.

*Plenary speakers:*

- Gaetan Borot (CEA-Saclay)
- Michele Cirafici (CAMGSD)
- Bertrand Eynard (CEA-Saclay)
- Camillo Imbimbo (Univ. Genoa)
- Hirotaka Irie (NTU Taiwan)
- Albrecht Klemm (Univ. Bonn)
- Nicolas Orantin (CERN)
- Marcel Vonk (CAMGSD)

<http://www.math.ist.utl.pt/~strings/MMG/>

## 5 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, Oberwolfach Workshop on Toric Geometry, Mathematisches Forschungsinstitut Oberwolfach, Germany, January 4–10, 2009.
- Miguel Abreu, Toric Kähler-Sasaki geometry in action-angle coordinates, Workshop on Symplectic Topology, Contact Topology, and Interactions (III), Univ. Strasbourg, France, January 29–31, 2009.
- Miguel Abreu, Contact Homology of Toric Contact Manifolds, Workshop on Conservative Dynamics and Symplectic Geometry, IMPA, Rio de Janeiro, Brazil, August 3–7, 2009.
- Miguel Abreu, Toric Kähler-Sasaki Geometry (short course), XI International Conference on Geometry, Integrability and Quantization, Varna, Bulgaria, June 5–10, 2009, and Geometry Summer School, Lisbon, Portugal, July 13–17, 2009.
- Miguel Abreu, Contact Homology of Toric Contact Manifolds, Complex Geometry Seminar, Instituto de Ciencias Matemáticas CSIC-UAM-UC3M-UCM, Madrid, Spain, October 21, 2009.

- Margarida Baía, A relaxation result in the framework of structured deformations, SMAI 2009, Belambra Club, La Colle sur Loup, Alpes Maritimes, France, May 28, 2009.
- Thomas Baier, (Tropical) amoebas in moment polytopes, MIT Symplectic Geometry Seminar, MIT, USA, February 2009.
- Luís Barreira, Birkhoff's ergodic theorem and multifractal analysis, Univ. Autónoma de Madrid, Spain, February 5, 2009.
- Luís Barreira, Hyperbolicity and recurrence in dynamical systems, Univ. Complutense de Madrid, Spain, March 23, 2009.
- Luís Barreira, Stability theory and nonuniform hyperbolicity, 2nd Meeting IST-IME, Lisbon, September 7–11, 2009.
- Luís Barreira, Quantitative Poincaré recurrence, International Conference on Difference Equations and Applications, Estoril, October 19–23, 2009.
- Luís Barreira, Pointwise dimension on hyperbolic sets, Departament de Matemàtiques, Univ. Autònoma de Barcelona, Spain, November 23, 2009.
- Ana Cannas da Silva, Symplectic origami, Topology Seminar, Univ. California, Berkeley, February 18, 2009.
- Ana Cristina Casimiro, First variation formula for discrete variational problems in two independent variables, Variational integrators and vakonomic mechanics: an exploratory workshop, Real Academia de Ciencias and Consejo Superior de Investigaciones Científicas, Madrid, September 16–18, 2009.
- Ana Cristina Casimiro, Mumford's Stability on the Sato Grassmannian and the moduli of vector bundles, Seminário de Geometria e Topologia, Centro de Matemática da Univ. Porto, September 25, 2009.
- Jorge Drumond Silva, Kadomtsev–Petviashvili II equations, with generalized dispersion, on two and three dimensional cylinders, IMPA, Rio de Janeiro, Brasil, January 15, 2009.
- Jorge Drumond Silva, Kadomtsev–Petviashvili II equations, with generalized dispersion, on two and three dimensional cylinders, 2nd Meeting IST-IME, Lisbon, Portugal, September 7–11, 2009.
- Carlos Florentino, Representações de grupos livres em grupos de Lie reductivos, alguns aspectos geométricos e topológicos, Jornadas SPM / CIM / CMUTAD de Álgebra, Geometria e Aplicações, June 6, 2009.



- Carlos Florentino, Topology and singularities of moduli spaces of free group representations, Geometry and Topology Seminar, Univ. Porto, October 22, 2009.
- Pedro Girão, On the Fucik spectrum of the wave operator and an asymptotically linear problem, Seminário de Análise, Centro de Matemática e Aplicações, Faculdade de Ciências e Tecnologia, Univ. Nova de Lisboa, March 2009.
- Pedro Girão, On a diffusive logistic equation with harvesting, 2nd Meeting IST-IME, Lisbon, September 2009.
- Pedro Girão, On a diffusive logistic equation with harvesting, VIII Americas Conference on Differential Equations, Pan-American Advanced Studies Institute 2009, Veracruz, Mexico, October 2009.
- Leonor Godinho, Polygons and hyperpolygons: a journey into spaces of parabolic Higgs bundles, Colloquium Paulette Libermann - Héritage et descendance, Institut Henri Poincaré, Paris, December 7–12, 2009.
- Diogo Gomes, The Mather problem for stationary Lagrangians, Nice weak KAM methods in Nice, Nice, February 2–7, 2009.
- Diogo Gomes, Bernstein estimates for weakly coupled fully non-linear elliptic systems, PDE and Math Finance III, Stockholm, August 17–20, 2009.
- Diogo Gomes, Soluções de viscosidade de equações de Hamilton–Jacobi, Mini-course at the 27th Colóquio Brasileiro de Matemática, IMPA, Rio de Janeiro, July 27–31, 2009.
- Sharon Hollander, Geometric criteria for Landweber exactness, Workshop on Unstable Homotopy Theory, CUNY Graduate Center, New York, June 26–27, 2009.
- Rui Loja Fernandes, Picard groups of Poisson manifolds, Centre de Mathématiques Laurent Schwartz, École Polytechnique, Paris, December 2009.
- Rui Loja Fernandes, Stability of symplectic leaves, Conference Paulette Libermann, Héritage et Descendance, Institute Henri Poincaré, Paris, December 2009.
- Rui Loja Fernandes, A geometric approach to Conn’s linearization theorem, XVIII Oporto Meeting on Geometry, Topology and Physics, Porto, July 2009.
- Rui Loja Fernandes, The Symplectization Functor, IMPA, Rio de Janeiro, Brazil, January 2009.

- Pedro Lopes, Stability of hyperfinite knots, Quantum Gravity Seminar, School of Mathematical Sciences, University of Nottingham, Nottingham, UK, July 22, 2009.
- Gabriel Lopes Cardoso, Black Hole Partition Functions and Duality, Opening Conference of GGI Workshop New Perspectives in String Theory, Arcetri, April 6–8, 2009.
- Gabriel Lopes Cardoso, BPS Black Holes, the Hesse Potential and the Topological String, II Workshop on Black Holes, IST, Lisbon, December 21–22, 2009.
- David Martínez Torres, Poisson geometry in dimension 2 and symplectic geometry in dimension 4. CRCG Workshop - Higher Structures in Topology and Geometry II, Goettingen Univ., Germany, February 2009.
- David Martínez Torres, Contact geometry and contact isometric embeddings in standard contact spheres. Geometry seminar, Goettingen Univ., Germany, February 2009.
- David Martínez Torres, Introduction to symplectic geometry, XVIII Oporto Meeting in Geometry, Topology and Physics, Porto, Portugal, July 2009.
- David Martínez Torres, Contact geometry and contact isometric embeddings in standard contact spheres, Workshop on Conservative Dynamics and Symplectic Geometry, IMPA, Brazil, August 2009.
- José Matias, A Relaxation result in the framework of structured deformations, Seminário de Análise, Centro de Matemática e Aplicações, Faculdade de Ciências e Tecnologia, Univ. Nova de Lisboa, May 2009.
- José Matias, Sufficient conditions for existence of solutions of a lower dimensional variational problem, 2nd Meeting IST/IME, Lisbon, September 7–11, 2009.
- Margarida Mendes Lopes, Numerical inequalities for irregular surfaces, Workshop “Algebraic surfaces and related topics”, POSTECH, Pohang, South Korea, August 21, 2009.
- Margarida Mendes Lopes, The algebraic fundamental group of surfaces with small invariants, Korean Institute for Advanced Study (KIAS), Seoul, South Korea, August 27, 2009.
- Waldyr Oliva, Rolling ball problems, Univ. Aut. Barcelona, Spain, February 2009.

- Waldyr Oliva, Rolling ball problems and the geometry of constraints, Univ. Sevilla, Spain, April 2009.
- Waldyr Oliva, Reduced Volterra and Levin–Nohel equation, Univ. Compl. Madrid, April 2009.
- Waldyr Oliva, The rolling ball problem on the plane and on the sphere, Univ. Sevilla, September 2009.
- Stavros Papadakis, Unprojection and Stanley–Reisner rings associated to cyclic polytopes, Univ. Coimbra, September 16, 2009.
- Stavros Papadakis, Unprojection and stellar subdivisions of simplicial complexes, Univ. Porto, May 22, 2009.
- Stavros Papadakis, Parallel unprojection of type Kustin–Miller, Univ. Essen, Germany, January 22, 2009.
- Fernando Pestana da Costa, Um problema de bifurcações num dispositivo de cristais líquidos, Seminário Matemática na AbERTA, Univ. Aberta, Lisbon, Portugal, November 17, 2009.
- João Pimentel Nunes, Examples of degenerating Kähler polarizations in geometric quantization, MIT Symplectic Geometry Seminar, MIT, March 2009.
- João Pimentel Nunes, Theta functions in symplectic geometry, Mini-Workshop on Vector Bundles, Univ. Porto, February 2009.
- Paulo Pinto,  $C^*$ -algebras from dynamical systems I, Univ. Hassan I, Faculté des Sciences et Techniques de Settat, Morocco, March 12, 2009.
- Paulo Pinto,  $C^*$ -algebras from dynamical systems II, Univ. Mohamed V, Faculté des Sciences de Rabat, Morocco, March 13, 2009.
- Paulo Pinto,  $C^*$ -algebras from interval maps, Centro de Matemática e Aplicações (CMA), Faculdade de Ciências e Tecnologia, Univ. Nova de Lisboa, May 15, 2009.
- Paulo Pinto, Similarity problems in dynamical systems Instituto Universitário de Lisboa (ISCTE), December 15, 2009.
- Pedro Resende, Stably Gelfand quantales, VI Portuguese Category Seminar, Coimbra, July 23, 2009.
- Pedro Resende, Stably Gelfand quantales, groupoids and Cartan sub- $C^*$ -algebras, Fifth Workshop on Categories, Logic and Foundations of Physics (CLP), Imperial College, London, August 6, 2009.

- Carlos Rocha, Morse–Smale Attractors for Semilinear Parabolic Equations with Periodic Boundary Conditions, Laboratoire Jacques-Louis Lions, Univ. Pierre et Marie Curie, Paris VI, April 30, 2009.
- Carlos Rocha, Transversality in Semilinear Parabolic Equations under Periodic Boundary Conditions, Faculté des Sciences d’Orsay, Univ. Paris-Sud 11, May 19, 2009.
- Carlos Rocha, Semilinear Parabolic Equations on the Circle, International Conference on Non-autonomous and Stochastic Dynamical Systems, Univ. Sevilla, June 22–26, 2009.
- Carlo Rossi, Deformation quantization via generators and relations, Max Planck Institute for Mathematics, Bonn, November 2009.
- Carlo Rossi, A Formality Theorem in presence of 2-submanifolds, Max Planck Institute for Mathematics, “Oberseminar”, Bonn, November 2009.
- Carlo Rossi, Informal Mini-Course on Batalin–Vilkovisky quantization, Max Planck Institute for Mathematics, Bonn, December 2009.
- Carlo Rossi, Deformation quantization via generators and relations, Univ. Oporto, December 2009.
- Pedro M. Santos, Two-scale gradient Young measures, Seminario de Análise, Centro de Matemática e Aplicações, Faculdade de Ciências e Tecnologia, Universidade Nova de Lisboa, July 1, 2009.
- Rosa Sena-Dias, Can you hear the shape of a Delzant polytope?, MIT (Informal geometry seminar), May 11, 2009.
- Rosa Sena-Dias, Spectral measures on toric manifolds, AMS Sectional Meeting, Worcester, April 26, 2009.
- Joana Ventura, Reduced and tame fusion systems, Conference on Algebraic Topology, Group Theory and Representation theory, Isle of Skye, Scotland, June 9 – 15, 2009.

## 6 Postdoctoral program and research fellows

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, and, since 2007, research fellows on five year contracts funded by the CIÊNCIA program.

The following fellows have stayed in the Center during the whole or part of 2009:

- 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–Jun. 2009).
- Inês Aniceto, PhD in Physics, Brown Univ., USA, 2009. Research areas: string theory. Supported by CAMGSD (Sep. 1, 2009–Aug. 31, 2010).
- 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).
- 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–Aug. 31, 2010).
- 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).
- 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).
- 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).

- William Kirwin, PhD in mathematics, University of Colorado, Boulder, USA, 2004, Research areas: Symplectic geometry, Lie groups and algebras, quantization. Supported by CAMGSD (Dec. 15, 2009, Dec. 14, 2010).
- Sean Lawton, PhD in Mathematics, Univ. Maryland, USA, 2006. Research areas: algebraic geometry, invariant theory, moduli theory. Supported by an FCT postdoctoral grant (Jan. 2009–Mar. 2009).
- Michal Málek, PhD in Mathematics, Silesian Univ., Opava, Czech Republic, 2002. Research areas: discrete dynamical systems. Supported by CAMGSD (Sep. 1, 2008–Aug. 31, 2010).
- Alessia Mandini, PhD in Mathematics, Univ. Bologna, Italy, 2007. Research areas: symplectic geometry. Supported by the CAMGSD funding (Sep. 1, 2007–May 31, 2009), and by an FCT postdoctoral grant (Jun. 1, 2009–present).
- 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).
- 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).
- Ioannis Parissis, PhD in Mathematics, Univ. Crete, Greece, 2007. Research area: Harmonic Analysis. Supported by the CAMGSD funding (Nov. 1, 2009–Oct. 31, 2010).
- Paulo Pires Pacheco, PhD in Physics, Imperial College, London, UK, 2007. Research areas: string theory. Supported by an FCT postdoctoral grant (Oct. 2008–present).
- Carlo Antonio Rossi, Dr. Sc. Math. Universität Zürich, Switzerland, 2002. Research areas: deformation quantization and applications thereof. Supported by the CIÊNCIA 2008 Program (Sep. 1, 2009–Aug. 31, 2014).
- Florian Schätz, PhD in Mathematics, Univ. Zürich, Switzerland, 2009. Research areas: Poisson geometry, homological and homotopical algebra, supergeometry, deformation/moduli problems. Supported by the CAMGSD funding (Sep. 1, 2009–Dec. 31, 2010).

- Ricardo Schiappa, PhD in Physics, MIT, USA, 1999. Research areas: String theory and mathematical physics. Supported by the CIÊNCIA 2007 Program (Mar. 1, 2008–Feb. 28, 2013).
- 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 CIÊNCIA 2007 Program (Feb. 1, 2008–Jan. 31, 2013).
- Marcel Vonk, PhD in Physics, Univ. Amsterdam, The Netherlands, 2003. Research areas: string theory. Supported by CAMGSD (Sep. 1, 2008–Aug. 31, 2010).

## 7 Doctoral supervision

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

- Thomas G. Baier, Univ. Técnica de Lisboa, December 23, 2009. Thesis title: Geometric quantization and degenerations of complex structures for two families of compact manifolds. Supervised by João P. Nunes.
- Maria Martí Sanchez, Univ. Lisboa, December 4, 2009. Thesis title: Classes of algebraic surfaces with special features. Supervised by Margarida Mendes Lopes.
- Sheila Sandon, Univ. Técnica Lisboa, December 4, 2009. Thesis title: Contact Homology, Capacity and Non-Squeezing in  $R^{2n} \times S^1$  via Generating Functions. Supervised by Miguel Abreu.
- Ivan Struchiner, UNICAMP, Brazil, January 2009. Thesis Title: The Classifying Lie Algebroid of a Geometric Structure. Supervised by Rui Loja Fernandes.

## 8 Publications in 2009

### Publications which appeared in 2009

#### Books

L. Barreira, *Análise Complexa e Equações Diferenciais*, Coleção Ensino da Ciência e da Tecnologia, IST Press, 2009.

D. Gomes, *Viscosity solutions of Hamilton–Jacobi equations*, Publicações Matemáticas do IMPA, 27º Colóquio Brasileiro de Matemática. Instituto Nacional de Matemática Pura e Aplicada (IMPA) , 2009.

#### Proceedings

M. Abreu, F. Lalonde and L. Polterovich (editors), *New Perspectives and Challenges in Symplectic Field Theory*, CRM Proceedings and Lecture Notes, American Mathematical Society, 2009.

#### Articles in refereed international journals

M. Abbott, I. Aniceto, and O. Ohlsson Sax, Dyonian Giant Magnons in  $CP^3$ : Strings and Curves at Finite J, *Phys. Rev. D* (3) (2009).

M. Abbott and I. Aniceto, Giant Magnons in  $AdS_4 \times CP^3$ : Embeddings, Charges and a Hamiltonian, *J. High Energy Phys.* (2009) 0904:136.

M. Abreu, G. Granja, and N. Kitchloo, Compatible complex structures on symplectic rational ruled surfaces, *Duke Math. J.* (2009), no. 148, 539–600.

J. Agapito and L. Godinho, Intersection numbers of polygon spaces, *Trans. Amer. Math. Soc.* **361** (2009), 4969–4997.

J. Ferreira Alves, What we need to find out the periods of a periodic difference equation, *J. Difference Equ. Appl.* **15** (2009), no. 8–9, 833–847.

I. Aniceto, Matrix Reduction and the  $su(2|2)$  superalgebra in AdS/CFT, *Phys. Rev. D* (2009) 086014.

I. Aniceto, J. Avan, and A. Jevicki, Poisson Structures of Calogero-Moser and Ruijsenaars-Schneider Models, *J. Phys. A* (2009).

S. Anjos, F. Lalonde, and M. Pinsonnault, The homotopy type of the space of symplectic balls in rational ruled 4-manifolds, *Geom. Topol.* **13** (2009), 1177–1227.

L. Barreira and P. Doutor, Almost additive multifractal analysis, *J. Math. Pures Appl.* (9) **92** (2009), no. 1, 1–17.



- L. Barreira and P. Doutor, Dimension spectra of almost additive sequences, *Nonlinearity* **22** (2009).
- L. Barreira and G. Iommi, Frequency of digits in the Lüroth expansion, *J. Number Theory* **129** (2009), no. 6, 1479–1490.
- L. Barreira, C. Silva, and C. Valls, Nonuniform behavior and robustness, *J. Differential Equations* **246** (2009), no. 9, 3579–3608.
- L. Barreira and C. Valls, A Grobman–Hartman theorem for general nonuniform exponential dichotomies, *J. Funct. Anal.* **257** (2009), no. 6, 1976–1993.
- L. Barreira and C. Valls, Center manifolds for infinite delay, *J. Differential Equations* **247** (2009), no. 4, 1297–1310.
- L. Barreira and C. Valls, Lyapunov sequences for exponential dichotomies, *J. Differential Equations* **246** (2009), no. 1, 183–215.
- L. Barreira and C. Valls, Nonuniform exponential contractions and Lyapunov sequences, *J. Differential Equations* **246** (2009), no. 12, 4743–4771.
- L. Barreira and C. Valls, Parameter dependence of stable manifolds under nonuniform hyperbolicity, *J. Math. Anal. Appl.* **358** (2009), no. 2, 419–426.
- L. Barreira and C. Valls, Quadratic Lyapunov functions and nonuniform exponential dichotomies, *J. Differential Equations* **246** (2009), no. 3, 1235–1263.
- L. Barreira and C. Valls, Robustness of discrete dynamics via Lyapunov sequences, *Comm. Math. Phys.* **290** (2009), no. 1, 219–238.
- L. Barreira and C. Valls, Robustness of general dichotomies, *J. Funct. Anal.* **257** (2009), no. 2, 464–484.
- L. Barreira and C. Valls, Robustness of nonuniform exponential trichotomies in Banach spaces, *J. Math. Anal. Appl.* **351** (2009), no. 1, 373–381.
- L. Barreira and C. Valls, Robustness via Lyapunov functions, *J. Differential Equations* **246** (2009), no. 7, 2891–2907.
- L. Barreira and C. Valls, Stable invariant manifolds for parabolic dynamics, *J. Funct. Anal.* **257** (2009), no. 4, 1018–1029.
- P. Berthomé, D. Forge, R. Cordovil, V. Ventos, and T. Zaslavsky, An elementary chromatic reduction for gain graphs and special hyperplane arrangements, *Electron. J. Combin.* **16** (2009), no. 1.

- R. Cordovil and J.L. Ramirez Alfonsin, Combinatorial geometries and applications: oriented matroids and matroids, *European J. Combin.* **30** (2009), no. 8, 1725–1726.
- R. Cordovil, B. Maia Junior, and M. Lemos, The 3-connected binary matroids with circumference 6 or 7, *European J. Combin.* **30** (2009), no. 8, 1810–1824.
- R. Cordovil, B. Maia Júnior, and M. Lemos, Removing circuits in 3-connected binary matroids, *Discrete Math.* **309** (2009), 655–665.
- R. Cordovil, M. Lemos, and C. Linhares Sales, Dirac’s theorem on simplicial matroids, *Ann. Comb.* **13** (2009), 53–63.
- C. Correia Ramos, N. Martins, J. Sousa Ramos, and R. Severino, Discrete potential theory for iterated maps of the interval, *Adv. Stud. Pure Math.* **53** (2009).
- E. D’Aniello and H. Oliveira, Pitchfork bifurcation for non-autonomous interval maps, *J. Difference Equ. Appl.* **15** (2009), no. 3, 291–302.
- J. Duarte, C. Januário, and N. Martins, Reciprocal inhibitory coupling: measure and control of chaos on a biophysically motivated model of bursting, *Commun. Nonlinear Sci. Numer. Simul.* **14** (2009), 2734–2746.
- J. Duarte, C. Januário, and N. Martins, Topological entropy and the controlled effect of glucose in the electrical activity of pancreatic  $\beta$ -cells, *Phys. D* **238** (2009), 2129–2137.
- J. Duarte, C. Januário, N. Martins, and J. Sardanyés, Chaos and crises in a model for cooperative hunting: a symbolic dynamics approach, *Chaos* **19** (2009).
- J. Faria Martins, The fundamental crossed module of the complement of a knotted surface, *Trans. Amer. Math. Soc.* **361** (2009), 4593–4630.
- J. Faria Martins and A. Mikovic, Spin Foam Perturbation Theory for Three-Dimensional Quantum Gravity, *Comm. Math. Phys.* **288** (2009), no. 2, 745–772.
- J. Ferreira, S. Pinelas, and A. Ruffing, Non autonomous oscillators and coefficient evaluation for orthogonal function systems, *J. Difference Equ. Appl.* **15** (2009), 1117–1133.
- B. Fiedler and C. Rocha, Connectivity and design of planar global attractors of Sturm type. I: Bipolar orientations and Hamiltonian paths, *J. Reine Angew. Math.* **635** (2009), 71–96.

- C. Florentino, Simultaneous similarity and triangularization of sets of 2 by 2 matrices, *Linear Algebra Appl.* **431** (2009), 1652–1674.
- C. Florentino and S. Lawton, The topology of moduli spaces of free group representations, *Math. Ann.* **345** (2009), no. 2, 453–489.
- P. Girão and J. Gomes, Multibump nodal solutions for an indefinite nonhomogeneous elliptic problem., *Proc. Roy. Soc. Edinburgh Sect. A* **139** (2009), 797–817.
- P. Girão and J. Gomes, Multibump nodal solutions for an indefinite super-linear elliptic problem, *J. Differential Equations* **247** (2009), 1001–1012.
- P. Girão and H. Tehrani, Positive solutions to logistic type equations with harvesting, *J. Differential Equations* **247** (2009), 574–595.
- D. Gomes, J. Mohr, and R. Souza, Discrete time, finite state space mean field games, *J. Math. Pures Appl. (9)* (2009).
- J. Gomes, An energy-decreasing rearrangement of level sets preserving the domain and volume constraints, *Adv. Math.* **222** (2009), 130–150.
- A. Grünrock, M. Panthee, and J. Drumond Silva, On KP-II type equations on cylinders, *Ann. Inst. H. Poincaré Anal. Non Linéaire* **26** (2009), 2335–2358.
- T. Harmark, J. Natário, and R. Schiappa, Greybody Factors for d-Dimensional Black Holes, *Adv. Theor. Math. Phys.* **13** (2009).
- S. Hollander, Geometric criteria for Landweber exactness, *Proc. London Math. Soc. (3)* **99** (2009), 697–724.
- L. Kauffman and P. Lopes, Determinants of rational knots, *Discrete Math. Theor. Comput. Sci.* **11** (2009), 111–122.
- Z. Kocan, V. Korneck-Kurkova, and M. Málek, Entropy, horseshoes and homoclinic trajectories on trees, graphs and dendrites, *Ergodic Theory Dynam. Systems* (2009), 1–11.
- J. Llibre and C. Valls, Analytic first integrals of the FitzHugh-Nagumo systems, *Z. Angew. Math. Phys.* **60** (2009), 237–245.
- J. Llibre and C. Valls, Centers for polynomial vector fields of arbitrary degree, *Comm. Pure Appl. Math.* **8** (2009), 725–742.

- J. Llibre and C. Valls, Classification of the centers, their cyclicity and isochronicity for a class of polynomial differential systems generalizing the linear systems with cubic homogeneous nonlinearities, *J. Differential Equations* **246** (2009), 2192–2204.
- J. Llibre and C. Valls, Classification of the centers, their cyclicity and isochronicity for the generalized quadratic polynomial differential systems, *J. Math. Anal. Appl.* **357** (2009), 427–437.
- R. Loja Fernandes, Juan-Pablo Ortega, and T.S. Ratiu, The momentum map in poisson geometry, *Amer. J. Math.* **131** (2009), 1261–1310.
- R. Loja Fernandes and D.I. Ponte, Integrability of Poisson-Lie group actions, *Lett. Math. Phys.* **90** (2009), 137–159.
- G. Lopes Cardoso, B. de Wit, and S. Mahapatra, Subleading and non-holomorphic corrections to  $N = 2$  BPS black hole entropy, *J. High Energy Phys.* **0902** (2009), 006.
- R. Luís, S. Elaydi and H. Oliveira, An economical model with Allee effect, *J. Difference Equ. Appl.* **15** (2009), no. 8–9, 877–894.
- M. Mendes Lopes, R. Pardini, and M. Reid, Campedelli surfaces with fundamental group of order 8, *Geom. Dedicata* **139** (2009), no. 1, 49–55.
- P. Lopes, Permutations which make transitive groups primitive, *Cent. Eur. J. Math.* **7** (2009), no. 4, 650–659.
- M. Mackaay, M. Stosic, and P. Vaz,  $S1(N)$  link homology using foams and the Kapustin-Li formula, *Geom. Topol.* **13** (2009), 1075–1128.
- M. Mariño and R. Schiappa, Multi-Instantons and Multi-Cuts, *J. Math. Phys.* **50** (2009) 052301.
- D. Martínez Torres, The geometry of 2-calibrated structures, *Port. Math. (N.S.)* **66**, (2009), no. 4, 427–512.
- F. Mena and J. Natário, Matching stationary spacetimes, *J. Geom. Phys.* **59** (2009), 448–458.
- E. Monteiro and P. Pinto, On Galois theory from surfaces, *Chaos Solitons Fractals* **42** (2009), 46–51.
- J. Natário, Painlevé–Gullstrand Coordinates for the Kerr Solution, *Gen. Relativity Gravitation* **41** (2009), 2579–2586.

- W. Oliva, Massas fluidas em rotação e os elipsóides de Riemann - uma abordagem informal, *Matemática Universitária* (2009), no. 43, 28–37.
- B. Oliver and J. Ventura, Saturated fusion systems over 2-groups, *Trans. Amer. Math. Soc.* **361** (2009), no. 12, 6661–6728.
- S. Papadakis and J. Neves, A construction of numerical Campedelli surfaces with torsion  $Z/6$ , *Trans. Amer. Math. Soc.* **361** (2009), 4999–5021.
- F. Pestana da Costa, E. Gartland, Jr., M. Grinfeld, J. Teixeira Pinto, Bifurcation analysis of the twist-Fréedericksz transition in a nematic liquid crystal cell with pre-twist boundary conditions, *Euro. J. Appl. Math.* **20** (2009), no. 3, 269–287.
- F. Pestana da Costa, M. Grinfeld, N. Mottram, J. Teixeira Pinto, Uniqueness in the Fréedericksz transition with weak anchoring, *J. Differential Equations* **246** (2009), 2590–2600.
- C. Rito, A note on Todorov surfaces, *Osaka J. Math.* **46** (2009), no. 3, 685–693.
- C. Rito, Involutions on surfaces with  $p_g = q = 1$ , *Collect. Math.* **61** (2009), no. 1, 81–106 .
- M. Rodríguez-Olmos and M. Sousa Dias, Nonlinear stability of Riemann ellipsoids with symmetric configurations, *J. Nonlinear Sci.* **19** (2009), no. 2, 179–219.
- C. Rossi, Holonomy and Parallel Transport in the Differential Geometry of Loop Spaces and Generalized Gauge Transformations, *J. Math. Phys.* **50** (2009), no. 5, 34pp.
- Pedro M. Santos, A relaxation result for micromagnetics in SBV, NoDEA Nonlinear Differential Equations Appl., **16** (2009), no. 3, 327–353.
- R. Saramago, Dieudonné Module Structures for Ungraded and Periodically Graded Hopf Rings, *Algebr. Represent. Theory* (2009).
- R. Saramago, Finite Dimensional Connected and Geometric-Like Hopf Algebras, *Far East J. Math. Sci. (FJMS)* **34** (2009), no. 2, 189–205.
- M. Stosic, Khovanov homology of torus links, *Topology Appl.* **156** (2009), 533–541.

### **Communications in refereed proceedings**

R. Luís, S. Elaydi and H. Oliveira, Survey: Towards a Theory of periodic difference equations and population biology, to appear in Proc. DYNA 2008, Dynamics and Applications, International Conference in honor of Maurício Peixoto and David Rand, Braga, M. Peixoto, A. Pinto and D. Rand (editors), *Springer*, 2009.

### **Mathematics popularization articles**

J. Natário, O que é a curvatura de uma superfície?, *Gazeta da Matemática* **159** (2009).

### **Accepted publications (submitted or accepted in 2009)**

#### **Articles in refereed international journals**

M. Abreu, Kähler–Sasaki geometry of toric symplectic cones in action-angle coordinates, *Port. Math. (N.S.)*, To appear.

T. Baier, J. Mourão, and J. Nunes, Quantization of Abelian varieties: distributional sections and the transition from Kähler to real polarizations, *J. Funct. Anal.*, To appear.

L. Barreira and P. Doutor, Dimension spectra of hyperbolic flows, *J. Statist. Phys.*, To appear.

L. Barreira and G. Iommi, Multifractal analysis and phase transitions for hyperbolic and parabolic horseshoes, *Israel J. Math.*, To appear.

L. Barreira and C. Valls, Center manifolds for nonuniform trichotomies and arbitrary growth rates, *Comm. Pure Appl. Anal.*, To appear.

L. Barreira and C. Valls, Lyapunov functions for trichotomies with growth rates, *J. Differential Equations*, To appear.

L. Barreira and C. Valls, Lyapunov sequences for exponential trichotomies, *Nonlinear Anal.*, To appear.

L. Barreira and C. Valls, Polynomial growth rates, *Nonlinear Anal.*, To appear.

L. Barreira and C. Valls, Quadratic Lyapunov sequences and arbitrary growth rates, *Discrete Contin. Dyn. Syst.*, To appear.

L. Barreira and C. Valls, Stability of dichotomies in difference equations with infinite delay, *Nonlinear Anal.*, To appear.

- A. Barroso and J. Matias, On an Ill Posed Problem in  $SBV_0^2(\Omega)$ , *J. Convex Anal.*, To appear.
- A. Cannas da Silva, Fold-forms for four-folds, *J. Sympl. Geom.*, To appear.
- M. Crainic and R. Loja Fernandes, Stability of symplectic leaves, *Invent. Math.* (2009), To appear.
- J. Faria Martins and R. Picken, On two-dimensional holonomy, *Trans. Amer. Math. Soc.*, To appear.
- J. Ferreira and S. Pinelas, Oscillatory Mixed Differential Systems, *Funkcial. Ekvac.*, To appear.
- B. Fiedler and C. Rocha, Connectivity and design of planar global attractors of Sturm type. III: Small and platonic examples, *J. Dynam. Differential Equations*, To appear.
- C. Florentino, Simultaneous similarity and triangularization of sets of 2 by 2 matrices, *Linear Algebra Appl.*, To appear.
- P. Freitas and J. Palhoto Matos, On the characterization of harmonic and subharmonic functions via mean-value properties, *Potential Anal.* 32 (2010), 189–200.
- D. Gomes and A. Byriuk, Aubry–Mather theory and PDEs, *São Paulo J. Math. Sci.*, To appear.
- D. Gomes, A. Lopes and J. Mohr, The Mather measure and large deviation principle for the entropy penalized method, *Commun. Contemp. Math.*, To appear.
- D. Gomes, A. Lopes, and N. Jung, Minimax Aubry–Mather measures, *Commun. Contemp. Math.*, To appear.
- J. Llibre and C. Valls, On the local analytic integrability at the singular point of a class of Lienard analytic differential systems, *Proc. Amer. Math. Soc.*, To appear.
- J. Llibre e C. Valls, Classification of the centers, of their cyclicity and isochronicity for two classes of generalized quintic polynomial differential systems, *NoDEA Nonlinear Differential Equations Appl.*, To appear.
- J. Llibre and C. Valls, Global analytic first integrals for the simplified multistrain/two-stream model for tuberculosis and dengue fever, *J. Non-linear Math. Phys.*, To appear.

- J. Llibre and C. Valls, On the limit cycles of polynomial differential systems with homogeneous nonlinearities of degree 3 via the averaging method, *Dynam. Contin. Discrete Impuls. Systems*, To appear.
- R. Luis, S. Elaydi, and H. Oliveira, Nonautonomous periodic systems with Allee effects, *J. Difference Equ. Appl.*, To appear.
- M. Mackaay, M. Stosic, and P. Vaz, The 1, 2-coloured HOMFLY-PT link homology, *Trans. Amer. Math. Soc.*, To appear.
- J. Matias, An ill posed problem in  $SBV_2_0(\Omega)$ , *J. Convex Anal.*, To appear.
- J. Matias, Sufficient conditions for existence of solutions of a lower dimensional variational problem, Proceedings of the 2nd IST/IME Meeting, *São Paulo J. Math. Sci.*, To appear.
- D. Matsnev and P. Resende, Étale groupoids as germ groupoids and their base extensions, *Proc. Edinburgh Math. Soc. (2)*, To appear.
- F. Mena, J. Natário, and Paul Tod, Formation of Higher-dimensional Topological Black Holes, *Ann. Henri Poincaré*, To appear.
- M. Mendes Lopes and R. Pardini, Severi type inequalities for irregular surfaces with ample canonical class, *Comm. Math. Helvetica*, To appear.
- J. Natário, An elementary derivation of the Montgomery phase formula for the Euler top, *J. Geom. Mech.*, To appear.
- W. Oliva, Birkhoffian systems in infinite dimensional manifolds, *J. Dynam. Differential Equations*, To appear.
- C. Rito, On equations of double planes with  $p_g = q = 1$ , *Math. Commun.*, To appear.
- S. Sandon, Contact homology, capacity and non-squeezing in  $R^{2n} \times S^1$  via generating functions, *Ann. Inst. Fourier (Grenoble)*, To appear.
- M. Stosic, On conjectures about positive braid knots and almost alternating torus knots, *J. Knot Theory Ramifications*, To appear.
- C. Valls, Center manifold variety for 8-parameter families of polynomial vector fields of arbitrary degree, *Proc. Edinburgh Math. Soc. (2)*, To appear.
- C. Valls, Stability of some solutions for elliptic equations on a cylindrical domain, *Proc. R. Soc. Lond. Ser. A*, To appear.
- C. Valls, Stability of some waves in the dissipative Boussinesq system, *Non-linear Anal.*, To appear.



### **Preprints submitted in 2009 (not yet accepted)**

M. Abreu, Toric Kähler metrics: cohomogeneity one examples of constant scalar curvature in action-angle coordinates, Preprint, 2009.

M. Abreu and R. Sena-Dias, Scalar-flat Kähler metrics on non-compact symplectic toric 4-manifolds, Preprint, 2009.

D. Calaque, G. Felder, A. Ferrario, and C. Rossi, Bimodules and branes in deformation quantization, Preprint, 2009.

D. Calaque, G. Felder, and C. Rossi, Deformation quantization with generators and relations, Preprint, 2009.

D. Calaque, C. Rossi, and M. Van den Bergh, Caldararu's conjecture and Tsygan's formality, Preprint, 2009.

D. Calaque, C. Rossi, and M. Van den Bergh, Hochschild (co)homology for Lie algebroids, Preprint, 2009.

A. Cannas da Silva, V. Guillemin and A. R. Pires, Symplectic origami, Preprint, 2009.

A. Casimiro and C. Rodrigo, Large first variation formula and conservation laws in several independent discrete variables, Preprint, 2009.

M. Cirafici, A. Kashani-Poor, and R. Szabo, Crystal melting on toric surfaces, Preprint, 2009.

M. Crainic and R. Loja Fernandes, A geometric approach to Conn's linearization theorem, Preprint, 2009.

S. Elaydi, R. Luis, and H. Oliveira, Towards a theory of periodic difference equations and its application to population dynamics, Preprint, 2009.

J. Faria Martins and A. Mikovic, Four-dimensional spin foam perturbation theory, Preprint, 2009.

J. Faria Martins and R. Picken, A cubical set approach to 2-bundles with connection and Wilson surfaces, Preprint, 2009.

J. Faria Martins and R. Picken, The fundamental Gray 3-groupoid of a smooth manifold and local 3-dimensional holonomy based on a 2-crossed module, Preprint, 2009.

B. Fiedler and C. Rocha, Global attractors of Sturm type, Preprint, 2009.

- A. Grünrock, M. Panthee, and J. Drumond Silva, On  $KP$ -II type equations on cylinders.
- S. Hollander, Adjoint pairs for quasi-coherent sheaves, change of rings, and algebraic chromatic convergence, Preprint, 2009.
- S. Hollander, Characterizing Artin stacks, Preprint, 2009.
- G. Lopes Cardoso, G. Dall’Agata, and V. Grass, On subextensive corrections to fluid dynamics from gravity, Preprint, 2009.
- M. Mackaay,  $sl(3)$ -Foams and the Khovanov–Lauda categorification of quantum  $sl(k)$ , Preprint, 2009.
- M. Martí Sanchez, Even sets of  $(-4)$ -curves on rational surfaces , Preprint, 2009.
- M. Martí Sanchez, Surfaces with  $K^2 = 2\mathcal{X} - 2$  and  $p_g \geq 5$  , Preprint, 2009.
- M. Mendes Lopes and R. Pardini, The geography of irregular surfaces, Preprint, 2009.
- W. Oliva and C. Rocha, Reducible Volterra and Levin–Nohel retarded equations with infinite delay, Preprint, 2009.
- W. Oliva and G. Terra, An inverse problem on vakonomic mechanics, Preprint, 2009.
- S. Papadakis and J. Boehm, On the structure of Stanley-Reisner rings associated to cyclic polytopes, Preprint, 2009.
- S. Papadakis and J. Boehm, Stellar subdivisions and Stanley-Reisner rings of Gorenstein complexes, Preprint, 2009.
- S. Pasquetti and R. Schiappa, Borel and stokes nonperturbative phenomena in topological string theory and  $c = 1$  matrix models, Preprint, 2009.
- M. Protin and P. Resende, Quantaes of open groupoids, Preprint, 2009.
- G. Rodrigues, Categorifying measure theory: a roadmap, Preprint, 2009.
- S. Sandon, An integer valued bi-invariant metric on the group of contactomorphisms of  $R^{2n} \times S^1$ , Preprint, 2009.
- R. Saramago, Induced Hopf coring structures, Preprint, 2009.
- R. Schiappa and N. Wyllard, An  $A_r$  Threesome: Matrix Models,  $2d$  CFTs and  $4d$   $N = 2$  Gauge Theories, Preprint, 2009.
- S. Papadakis and C. Liedtke, Birational modifications of surfaces via unprojections, Preprint, 2009.

## 9 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 Mathematics and Satellite Orbits.** “A Matemática e as órbitas dos Satélites - Estágio de iniciação científica para alunos do 11ºano”, July 20–24, 2009.

<http://www.math.ist.utl.pt/~schiappa/cv2009/>.

**Summer school for undergraduates.** “Escola Diagonal 2009”, Porto, September 7–11, 2009.

<http://www.fc.up.pt/pessoas/jfalves/ed2009/>.

**Mathematics conference for undergraduates.** “Encontro Nacional do Programa Gulbenkian Novos Talentos em Matemática”, Porto, September 11–12, 2009.

<http://www.math.ist.utl.pt/talentos/edicao9.html#encontro>.

**Science&Technology Week.** Participation in “Semana da Ciência e Tecnologia”, Portugal, November 21–27, 2009.

<http://www.cienciaviva.pt/semanact/edicao2009/>.

**Winter school for undergraduates.** “Escola de Inverno de Matemática (EIM09)”, IST, Lisbon, February 9–14, 2009.

<http://www.math.ist.utl.pt/~mbaia/EIM09>.

**Popular Science Blog.** Popularization articles about strings, knots, etc.  
[http://www.math.ist.utl.pt/~strings/generic\\_page.phtml?text=blog.txt](http://www.math.ist.utl.pt/~strings/generic_page.phtml?text=blog.txt).

## 10 Personal notes

- Carlos Florentino is a member of the Scientific Committee of the annual conference of the VBAC (Vector Bundles on Algebraic Curves) research group.
- Rui Loja Fernandes is chair of the Scientific Committee of the conference Poisson 2010 - Poisson geometry in Mathematics and Physics, IMPA, Rio de Janeiro, Brazil, July 20–30, 2010.
- Rui Loja Fernandes and Roger Picken are members of the Scientific Committee of the XVIII International Fall Workshop on Geometry and Physics, Benasque, Spain, September 6–11, 2009, and the XIX International Fall Workshop on Geometry and Physics, Oporto, Portugal, September 6–9, 2010.
- Pedro Lopes is a member of the Scientific Committee for the XVII Encontro Brasileiro de Topologia to be held at Pontifícia Universidade Católica, Rio de Janeiro, Brazil, August 2–6, 2010.
- Waldyr Oliva and Carlos Rocha are members of the Scientific Committee of the 2010 Chapter of the ICMC Meeting on Differential Equations, São Carlos, Brazil, February 8–10, 2010.
- Henrique Oliveira was editor of the special issue of the Journal of Difference Equations and Applications dedicated to the proceedings of DYNA 2008 in honor of Maurício Peixoto and David Rand, Braga, Portugal, 2009.
- Fernando Pestana da Costa has obtained the “Agregação” in Mathematics at Univ. Aberta, Lisboa, in December 2009.
- Ricardo Schiappa has obtained the “Agregação” in Mathematics at Univ. Técnica de Lisboa in December 2009.