

**Short
Report on the Scientific Activities
of the
Centro di Ricerca Matematica Ennio De Giorgi
Matematica nelle Scienze Naturali e Sociali
for the years
2002-2004**

The De Giorgi Research Center was founded at the end of 2001 as a center of the Scuola Normale Superiore with the contribution of the three university institutions of Pisa: the University, the Scuola di Studi Superiori Sant'Anna and the Scuola Normale Superiore.

Presently it is ruled by: a Director, a Scientific Committee, a Council:

- The Director is Mariano Giaquinta (Scuola Normale Superiore).
- The Scientific Committee is composed by: Jean Pierre Bourguignon IHES, Bures-sur-Yvette), Luis Caffarelli (University of Texas, Austin), Stefan Hildebrandt (University of Bonn), Alan Kirman (Groupement de Recherche en Economie Quantitative, Marseille), Richard Schoen (Stanford University), Jean-Christophe Yoccoz (Collège de France, Paris).
- The Council is composed by: Giovanni Dosi as representative of the Scuola Sant'Anna, Franco Flandoli and Margherita Galbiati as representatives of the University of Pisa, Mariano Giaquinta and Giuseppe Tomassini as representatives of the Scuola Normale Superiore.

The center is part of ERCOM (European Research Centres on Mathematics), a Committee consisting of Scientific Directors of European Research Centres in the Mathematical Sciences.

According to the foundational agreement the center aims at:

- gathering Italian and foreign - both junior and senior - researchers with the idea of fostering collaboration and exchange of ideas,
- organizing research periods of several months focusing on areas of particular relevance, including pure mathematics, but also applications in the natural and social sciences (e.g. physics, biology, finance and economics),
- promoting the formation of collaborative research nuclei from among those present, to advance particular areas of mathematics, its application to the natural and social sciences, and its application to problems in the industrial and technological arena,
- establishing in Pisa an even more attractive intellectual environment for mathematicians and scientists.

The center is located in Collegio Puteano, opposite of Palazzo della Carovana. The guests of the Center have at their disposal 11 offices and 2 conference rooms.

The Center has hosted about

- 138 visitors in 2002
- 285 visitors in 2003
- 424 visitors in 2004.

In 2003 the Center started a program of distinguished senior visitors. Starting from September 2004 three junior researchers have been appointed to spend one, and possibly two, research years at the Center.

The Center organizes:

- intensive research periods
- workshops

- a series of public lectures
- a senior visiting program
- a junior visiting program

Intensive Research Periods 2002

Research Trimester on Dynamical Systems

February 04, 2002 – April 26, 2002

Scientific Committee: Stefano Marmi (Scuola Normale Superiore, Pisa), John Mather (Princeton University), John Milnor (SUNY), Jacob Palis (IMPA), Jean-Christophe Yoccoz (Collège de France)

Financial Markets

April 29, 2002 – July 12, 2002

Scientific Committee: William Brock (University of Wisconsin, Madison), Darrel Duffie (Stanford University), Paul Embrechts (ETH, Zurich), Doyne Farmer (Santa Fè Institute), Hans Föllmer (Humboldt University, Berlin)

Intensive Research Periods 2003

Interacting Particles and Computational Biology

January 10, 2003 – March 10, 2003

Scientific Committee: Jean-Louis Deneubourg (University of Brussels), Yuri Manin (Max Planck Institut), Hans Meinhardt (Max Planck Institut), Philippe Mathieu (International Solvay Institutes, Brussels), Franco Flandoli (Università di Pisa)

Topics in Complex and Real Geometry

March 15, 2003 – May 15, 2003

Scientific Committee: Jean-Pierre Demailly (Université de Grenoble), János Kollár (Princeton University), Adam Parusinski (Université d'Angers), Alberto Tognoli (University of Trento), Giuseppe Tomassini (Scuola Normale Superiore, Pisa)

Probability and Statistical Mechanics in Information Science

June 03, 2003- July 20, 2003

Scientific Committee: Sanjoy K. Mitter (M.I.T.), Giorgio Parisi (Università di Roma “La Sapienza”), S. R. Srinivasa Varadhan (Courant Institute)

Summer School in Harmonic Analysis

September 01, 2003- September 13, 2003

Scientific Committee: Aline Bonami (Université de Orléans), Marco M. Peloso (Politecnico di Torino), Fulvio Ricci (Scuola Normale Superiore, Pisa)

Intensive Research Period on Geometric Analysis

November 01, 2003- November 30, 2003

Scientific Committee: Giovanni Alberti (Università di Pisa), Mariano Giaquinta (Scuola Normale Superiore, Pisa), Carlo Mantegazza (Scuola Normale Superiore, Pisa)

Intensive Research Periods 2004

Phase Space Analysis of Partial Differential Equations

February 15, 2004 – May 15, 2004

Scientific Committee: Jean-Michel Bony (École Polytechnique, Paris), Ferruccio Colombini (Università di Pisa), Sergiu Klainerman (Princeton University), Nicolas Lerner (Université de Rennes 1), Francois Treves (Rutgers University)

Harmonic Analysis

April 12, 2004 – July 9, 2004

Scientific Committee; Aline Bonami (Université de Orléans, CNRS), Anthony Carbery (University of Edinburgh), Michael Christ (University of California), Carlos Kenig (University of Chicago), Fulvio Ricci (Scuola Normale Superiore), Elias M. Stein (Princeton University)

Differential Geometry and Topology

September 6, - November 12, 2004

Scientific Committee: Simon Donaldson (Imperial College, London), Paul Gauduchon (Ecole Polytechnique, Palaiseau), Claude LeBrun (SUNY, Stony Brook), Simon Salamon (Imperial College, London)

Intensive Research Periods 2005

Two Weeks on Global Analysis

February 14 – 26, 2005

Scientific Committee: Alberto Abbondandolo (Scuola Normale Superiore, Pisa), Pietro Majer (Università di Pisa)

Diophantine Geometry

April 1 – July 30, 2005

Scientific Committee: Yuri Bilu (Université Bordeaux I), Enrico Bombieri (Institute for Advanced Study, Princeton), David Masser (Universität Basel), Lucien Szpiro (Graduate Center-CUNY, New York), Umberto Zannier (Scuola Normale Superiore, Pisa)

The Scientific Revolutions of the XVI and XVII Century

September 1 - December 31, 2005

Scientific Committee: Michele Ciliberto (Scuola Normale Superiore, Pisa), Enrico Giusti (Università di Firenze), Eberard Knobloch (Technischen Universität Berlin), Massimo Mugnai (Scuola Normale Superiore, Pisa), Pier Daniele Napoletani (Università di Pisa), Patricia Radelet-de Grave (Université Catholique de Louvain)

Workshop 2003

Optimal Transport Theory and Applications

October 9 – 12, 2003

Organizing Committee: Luigi Ambrosio (Scuola Normale Superiore, Pisa), Giuseppe Buttazzo (Università di Pisa), Robert McCann (University of Toronto)

Two Days on “Kolmogorow Equations

October 17 – 18, 2003

Organizing Committee: Giuseppe Da Prato (Scuola Normale Superiore, Pisa)

Workshops 2004

Boundary Control and Optimisation

February 26-28, 2004

Organizing Committee: Giuseppe Da Prato (Scuola Normale Superiore, Pisa), Jean Paul Zolesio (Sophia Antipolis University)

Aspects of Combinatorial Topology Arrangements, Graphs and Stratifications

March 22 and 24, 2004

Organizing Committee: Mario Salvetti (Università di Pisa), Giovanni Gaiffi (Scuola Normale Superiore, Pisa)

Interface Evolutions and Applications

September 27-29, 2004

Organizing Committee: Giovanni Bellettini (Università di Roma "Tor Vergata"), Vicent Caselles (Universidad Pompeu Fabra, Barcelona), Matteo Novaga (Università di Pisa)

Calcolo delle Variazioni e Teoria Geometrica della Misura

Lizzanello (Lecce) September 30- October 2, 2004

Organizing Committee: Luigi Ambrosio (Scuola Normale Superiore, Pisa), M. Carriero (Università di Lecce), Mariano Giaquinta (Scuola Normale Superiore, Pisa), A. Leaci (Università di Lecce), D. Pallara (Università di Lecce), E. Pascali (Università di Lecce)

Interactions and Markets

November 15-19, 2004

Organizing Committee: Giovanni Dosi (Scuola S. Anna, Pisa), Alan Kirman (Ecole des Hautes Etudes en Sciences Sociales Marseille), Marco Lippi (Università di Roma "La Sapienza")

Quantum Entanglement in Physical and Information Sciences

December 14-18, 2004

Organizing Committee: Arthur Ekert (University of Cambridge), Rosario Fazio (Scuola Normale Superiore, Pisa), Chiara Macchiavello (Università di Pavia), Massimo G. Palma (Università di Milano)

Workshops 2005

Evolution Equations for Deterministic and Stochastic Systems

May 23 – 26, 2005

Organizing Committee: Giuseppe Da Prato (Scuola Normale Superiore, Pisa), Alessandra Lunardi (Università di Parma), Mario Tessitore (Università di Parma)

Classical and Quantum Gravity in 3 dimensions

September 5-11, 2005

Organizing Committee: Riccardo Benedetti (Università di Pisa), Kirill Krasnov (Nottingham University), Joerg Teschner (Berlin University)

Hosted and/or partially supported events

HYTEC Opening Meeting, April 5 2003

Cantor e Dedekind: uno Straordinario Incontro di Idee, September 5 2003

Pisa week on Radiations from Cosmic and Astrophysical Sources, December 1 – 5 2003

Case Studies in Industrial Mathematics, December 19 – 20 2003

Lezioni Pubbliche 2003

Matematica, Cultura e Società

Lectures were presented by: Enrico Giusti (Università di Firenze) Leonardo Fibonacci e la rinascita della matematica in Occidente; Piero Villaggio (Università di Pisa) Matematica e Tecnologia: un connubio fecondo; Luciano Modica (Università di Pisa) Matematica e Gioco; Piergiorgio Odifreddi (Università di Torino) La Matematica è un umanesimo. Metodi matematici della letteratura; Lucio Russo (Università di Roma "Tor Vergata") Il ruolo della matematica nella formazione; Benedetto Scimemi (Università di Padova) Simmetrie musicali; Stefan Hildebrandt (Università di Bonn) Georg Joachim Rheticus e la rivoluzione scientifica del Rinascimento.

Lezioni Pubbliche 2004

Matematica, Cultura e Società

Luigi Pepe (Università di Ferrara) Curtatone e Montanara nella vita intellettuale dell'Italia unita; Vieri Benci (Università di Pisa) Come misurare l'infinitamente grande e l'infinitamente piccolo: idee vecchie e nuove; Giovanni Jona-Lasinio (Università di Roma) La matematica come linguaggio delle scienze della natura; Michele Emmer (Università di Roma) Matematica e cinema; Henri Berestycki (Centre d'Analyse et Mathématiques sociales) Rischi, società e probabilità; Sanjoy Mitter (Massachusetts Institute of Technology) La matematica della rivoluzione dell'informazione; Marco Forti (Università di Pisa) Principi di Leibniz ed estensioni di Hausdorff; Angelo Guerraggio (Università dell'Insubria e Università Bocconi) La matematica italiana durante il fascismo; Massimo Mugnai (Scuola Normale Superiore Pisa) Paradossi.

Lezioni Pubbliche 2005

Matematica, Cultura e Società

Jean Brette (Palais de la Découverte) Mathématiciens en herbe; Associazione Culturale Músamoi, Il Gallo al Guinzaglio. A cento anni dalla nascita. Renato Caccioppoli: non solo un matematico; Marco Abate (Università di Pisa) Matematica e Fumetti; Michele Emmer (Università di Roma 'La Sapienza') Video intervista a Ennio De Giorgi; Claude Viterbo (École Polytechnique) Esempi di rappresentazioni della matematica nella letteratura francese dell'Otto e Novecento; Piero D'Ancona (Università di Roma 'La Sapienza') La Matematica non è un'opinione!; Alessandra Carbone (Université Pierre et Marie Curie, Paris) Spazio dei genomi: geometria e significato biologico; Claudio Ambrosini (compositore) BIG BANG CIRCUS, Piccola Storia dell'Universo in musica; Angelo Guerraggio (Università dell'Insubria e Università Bocconi) La modernità di Vito Volterra; Elisabetta Cordero (Università degli studi di Milano Bicocca) Matematica e Meteorologia

Senior Visitors

- Neil Trudinger (Australian National University)
November 12 - 28, 2003 Pieri Visitor
- Frédéric Helein (Ecole Normale Supérieure de Cachan)
November 17 – 28, 2003 UMI lecturer
- Jean-Christophe Yoccoz (Collège de France))
January/ February- March 2004 Cattedra De Giorgi Venturi
- Nicolai V. Krylov (University of Minnesota)
May 15 - June 14, 2004 UMI lecturer
- Elias M. Stein (Princeton University)
May 15 - June 15, 2004 Pieri Visitor
- Claude Bardos (Université de Paris 7)
November 17-21, 2004
- Louis Nirenberg (Courant Institute, New York University)
January 22 – 29, 2005
- Ernst Kuwert (Universität Freiburg)
February 21 – March 19, 2005
- Reiner Schaetzle (Universität Tübingen))
February 21- March 19, 2005

Junior Visitors

- Alexander V. Kolesnikov (Moscow State University)
September 2, 2004 – August 30, 2005
- Didier Smets (Université Paris VI)
September 15, 2004 – August 30, 2005
- Gianluigi Del Magno (Centro De Giorgi)
October 4, 2004 – September 30, 2005
- Bruno Fabre (Paris VI)
October 8, 2004 – December 8, 2004
- Vincenzo Manco (Università di Lecce)
January 10- June 10, 2005
- Joao Lopes Dias (Universidade Tecnica de Lisboa)
February 1-28, 2005
- Sascha Weitkamp (Università di Trento)
February 5- March 5, 2005
- Gabriele La Nave (Lehigh University and Courant Institute)
May 15- July 15, 2005

Research groups

Four research groups operated within the Center:

- Evolution of Interfaces: Giovanni Bellettini (Università di Roma Tor Vergata), Vicent Caselles (University Pompeu-Fabra, Barcelona), Matteo Novaga (Università di Pisa);
- Holomorphic Dynamical Systems and Arithmetic: Marco Abate (Università di Pisa), Carlo Carminati (Università di Pisa), Stefano Marmi (Scuola Normale Superiore, Pisa);
- Measure theoretic aspects of partial differential equations: Giovanni Alberti (Università di Pisa), Luigi Ambrosio (Scuola Normale Superiore, Pisa), Giuseppe Buttazzo (Università di Pisa)

- Probability in Information Science: Fabio Fagnani (Politecnico di Torino), Franco Flandoli (Università di Pisa), Marco Isopi (Università di Bari e New York University)

Publicazioni

CRM Series, published by the Edizioni della Normale:

- Dynamical Systems
Part I: Hamiltonian Systems and Celestial Mechanics
217 pp., 2003
- Dynamical Systems
Part II: Topological, Geometrical and Ergodic Properties of Dynamics
237 pp., 2003
- Matematica, Cultura e Società 2003
61 pp., 2003
- Nicolai V. Krylov, Probabilistic Methods of Investigating Interior Smoothness of Harmonic Functions Associated with Degenerate Elliptic Operators
105 pp., 2004
- Ricordando Franco Conti,
354 pp., 2004
- Phase Space Analysis of Partial Differential Equations
2 voll., to appear
- Matematica, Cultura e Società 2004
to appear

Scientific papers

- S. Marmi, P. Moussa, J. C. Yoccoz The cohomological equation for Roth type interval exchange map
- D. Mucci Fractures and vector valued maps
- M. Giaquinta, D. Mucci Density results for the $W^{1/2}$ energy of maps into a manifold
- M. Giaquinta, D. Mucci On sequences of maps into a manifold with equibounded $W^{1/2}$ -energies
- G. Bellettini, V. Caselles, A. Chambolle, M. Novaga Crystalline mean curvature flow of convex sets
- G. Bellettini, G. Fusco The ϵ -limit and the related gradient flow for singular perturbation functionals of Perona-Malik type
- H. Koch, F. Ricci Spectral projections for the twisted Laplacian
- V. I. Bogachev, A. V. Kolesnikov On the Monge-Ampère equation in infinite dimensions