

SCIENTIFIC REPORT ON THE INTENSIVE RESEARCH TRIMESTER
"GEOMETRIC FLOWS AND GEOMETRIC OPERATORS"
PISA, SPRING 2009

MAURO CARFORA, ZINDINE DJADLI, ANDREA MALCHIODI, AND CARLO MANTEGAZZA

The trimester was hosted and organized by the Centro di Ricerca Matematica "Ennio De Giorgi" in Pisa, Scuola Normale Superiore, during May, June and July 2009, in collaboration with INdAM, GNFM, Institut Joseph Fourier, Grenoble (FR) and Project ANR "Flot et Operateurs Geometriques" ANR-07-BLAN-0251-01, SISSA – Trieste, FIRB Ideas "Analysis and Beyond".

Website: <http://cogmt.sns.it/GFO>

1. ACTIVITIES OF THE TRIMESTER

The trimester has been concentrated on two main topics, related to series of lectures at introductory level.

The first one is the study of geometrically invariant operators, possibly of higher order. In recent years, there has been an intensive study of the relations between this kind of operators (which satisfy some invariance property under conformal change of metric), their associated scalar invariants and the study of the related partial differential equations. In two dimensions for example, the integral of the Gauss curvature (whose transformation law under conformal changes of metrics is related to the Laplace operator) determines completely the topology of the surface. In four dimensions there are partial analogues, involving the Q -curvature and the Paneitz operator, but most results are limited to the case of manifolds with positive curvature: it would be interesting to relax these assumptions and consider more general situations.

Lectures related to this research direction were given by Matt Gursky, Jeff Viaclovsky and Andrea Malchiodi.

The second topic concerns geometric flows, in particular, higher order flows, "coupling" of flows and relations to theoretical physics.

Lei Ni presented recent progress in applying Ricci flow to the study of the structure of Riemannian and Kähler manifolds.

Mauro Carfora discussed some ideas in setting connections between geometric flows and theoretical physics, in particular with quantum field theories, string theory and renormalization group techniques.

A workshop putting together leading theoretical physicists and mathematicians was held in the second part of June.

In July we organized a workgroup on mean curvature flow with the goal of studying the whole "classical" line of analysis of the evolution till the first singular time (the works of

Ecker, Huisken, Hamilton, etc).

The recent results about Ricci flow gave a strong impulse to the field of evolution of geometric structures, but not so much is known at the moment about other “natural” flows which can be used analogously to find out canonical metrics or to investigate the geometry and topology of manifolds, in particular in higher dimensions.

One of the goal of the trimester was to try to generalize these techniques, considering other flows associated to geometric quantities like functionals of the curvatures, with special care for the ones which are conformally invariant.

This study leads to higher order flows and it was one of our motivations to put together people working on higher order differential operators and on geometric flows.

At the end of June there was the general conference of the trimester.

In parallel to the series of lectures, we organized daily seminars given by the guests at the Centro De Giorgi. Many people (in particular young students) were invited to give a talk on their research activities.

The total number of participants to the activities of the trimester was about 120 (106 formally registered), among them around 60 young students (47 were financially supported).

Abstract of all the talks and other extra information on the trimester can be found in the website of the center “Ennio De Giorgi” at <http://www.crm.sns.it>.

2. CALENDAR OF THE MAIN ACTIVITIES

<i>Week</i>	<i>Events</i>
May	
Monday 4 – Friday 8	Gursky Lectures I
Monday 11 – Friday 15	Gursky Lectures II
Monday 18 – Friday 22	Carfora Lectures I
Monday 25 – Friday 29	Carfora Lectures II
June	
Monday 1 – Friday 5	—
Monday 8 – Friday 12	Malchiodi/Viaclovsky Lectures
Monday 15 – Friday 19	Ni Lectures
Monday 22 – Friday 26	Workshop on GeoFlows in Math/Physics
Monday 29 – Friday 3	General Conference “GFO in Pisa”
July	
Monday 6 – Friday 10	WorkGroup on Mean Curvature Flow I
Monday 13 – Friday 17	WorkGroup on Mean Curvature Flow II
Monday 20 – Friday 24	—

3. SCIENTIFIC COMMITTEE

Luigi Ambrosio – SNS, Pisa

G rard Besson – Institut Joseph Fourier, Grenoble

Jean-Pierre Bourguignon – IHES, Bures-sur-Yvette

Sun-Yung Alice Chang – Princeton

Gerhard Huisken – Max-Planck-Institut f r Gravitationsphysik, Albert Einstein Institute, Golm

4. ORGANIZING COMMITTEE

Zindine Djadli – Institut Joseph Fourier, Grenoble

Carlo Mantegazza – SNS, Pisa

Andrea Malchiodi – SISSA, Trieste

Mauro Carfora – Dipartimento di Fisica Nucleare e Teorica, Universit  di Pavia

5. ABSTRACTS OF THE COURSES

Matt Gursky, University of Notre Dame – *Fully Nonlinear Equations in Conformal Geometry*

Our goal in this series of lectures is to provide a comprehensive introduction to the σ_k -Yamabe problem, and some aspects of the general theory and applications of fully nonlinear equations in conformal geometry.

Mauro Carfora, University of Pavia – *Ricci Flow in Theoretical and Mathematical Physics*

Ricci flow plays a natural role in many distinct physical theories. In this series of lectures we review a few case studies which characterize an important interaction between mathematics and physics. In particular, we shall discuss the relations between Ricci flow and non-linear sigma model theory, the applications of Ricci flow to general relativity, and finally some aspects of the role of Ricci flow in the theory of diffusion processes on Riemannian manifolds.

Andrea Malchiodi, SISSA, Trieste – *Functional Determinants and Conformal Geometry*

Conformal variations of renormalized determinants for covariant operators can be sometimes expressed by explicit formulas. It is natural then to find metrics which might extremize the determinants: for example in two dimensions this is a way to characterize constant curvature metrics. I will discuss the derivation of such formulas and some cases in which it is possible to find or characterize extremal metrics.

The course will consist of four lectures, during about one hour and a half each. The material covered in the lectures will be the following:

1. Review on the min-max formulas for eigenvalues of the Laplacian, Weyl's asymptotic formula, heat kernels and the Minakshisundaram-Pleijel expansions.
2. Functional determinant of the Laplacian, Ray-Singer-Polyakov formulas, characterization of extremal metrics by Osgood-Phillips-Sarnak, Onofri inequality.
3. Isospectral surfaces, higher order heat invariants and compactness results for isospectral metrics in high order norms.
4. Functional determinants in higher dimensions, compactness of isospectral metrics, determinants of conformally invariant operators, existence and uniqueness of extremal metrics.

The course will require some basic knowledge and familiarity with Riemannian geometry, Sobolev spaces and regularity theory for elliptic partial differential equations.

Jeff Viaclovsky, University of Wisconsin, Madison – *Geometry of Anti-Self-Dual Metrics*

I will begin with some basic notions in 4-dimensional Riemannian geometry in order to define the concept of half-conformally-flat metrics (which are also known as self-dual or anti-self dual metrics), and a generalization of these known as Bach-flat metrics. These equations are elliptic in a suitable gauge, and I will discuss a basic regularity theorem. I will also discuss volume growth and Cheeger-Gromov convergence of such metrics, and discuss some explicit examples.

Lei Ni, University of California, San Diego – *Geometric Applications of Ricci Flow*

Ricci flow has been proven powerful in study the topology and geometry of manifolds by the fundamental work of Hamilton and Perelman. We shall focus on some recent progresses in applying Ricci flow to study the structure of Riemannian and Kähler manifolds.

WorkGroup on Mean Curvature Flow

Our aim is to organize an introductory but quite complete course on the results and techniques in the “classical” approach to mean curvature flow of hypersurfaces (the works of Ecker, Huisken, Hamilton, etc).

Possibly, we will try to cover in a self-contained way the analysis from the small time existence theorem to the asymptotic behavior at the first singular time.

A list of people collaborating to the workgroup will include Roberta Alessandrini, Charles Baker, Giovanni Bellettini, Giovanni Catino, Zindine Djadli, Carlo Mantegazza, Annibale Magni, Lorenzo Mazzieri, Reto Müller, Matteo Novaga.

6. WORKSHOPS

Geometric Flows in Mathematics and Theoretical Physics – 22/25 June 2009
In collaboration with GNFM

The workshop, organized under the scientific direction of Prof. Mauro Carfora (Dipartimento di Fisica Nucleare e Teorica, Università di Pavia) collected around 50 participants. The main goal was to concentrate on the recent interdisciplinary developments about geometric flows with an emphasis on the discussion of problems and new research directions coming from the mathematical and theoretical physics communities.

Ricci flow has been the starting point and the motivating example for important developments in geometric analysis, most spectacularly for Perelman's proof of Thurston's geometrization program for three-manifolds and of the famous Poincaré conjecture. The Ricci flow also appears naturally in Quantum Field Theory (QFT), as the weak coupling limit of the renormalization group analysis of nonlinear sigma models. The existence of a QFT avatar is by no means an exclusive of Ricci flow, but it is a property shared by the mean curvature flow, by the curve shortening flow, and many other (weakly) parabolic flows of geometrical nature. Such an observation suggested that methods of quantum field theory may have useful applications in geometric flow theory, and has been the motivating stimulus of a remarkable series of meetings among mathematicians and physicists working in geometric analysis and in quantum field theory. The first of such meetings was held at the Albert Einstein Institute in Potsdam in November 2006. That meeting was very successful and set an agenda that in a year span has already seen other two very stimulating workshops in Banff and Munich. Many ideas have been put forward during these meetings and it is becoming increasingly apparent that the interaction between mathematicians and physicists in this area is indeed very fruitful. This workshop is the fourth in this series. As in the previous meetings, the objective was to provide a fast and informal channel of communications between the two communities, suggesting new problems of common interest and possible strategies of solutions. The properties of geometric flows discussed in depth by the methods of geometric analysis may shed light on the nature of significant models of QFT, while the imagination of QFT, often transcending and transgressing formal boundaries, may suggest new powerful strategies in geometric flow theory.

Speakers

Maria Athanassenas
Monash University, School of Mathematical Sciences, Clayton Campus
Volume-constrained mean curvature flow

Giovanni Bellettini
Dipartimento di Matematica, Università di Roma "Tor Vergata"
Remarks on singular perturbations for hyperbolic mean curvature flow

Francesco Costantino
Université Louis Pasteur – Strasbourg I
On the volume conjecture and geometric structures on knot complements

Daniel Friedan
Rutgers University
Preliminary evidence for a stable 2-sphere in the Yang-Mills flow for $SU(3)$ gauge fields on \mathbb{S}^4

David Glickenstein
Department of Mathematics, University of Arizona, Tucson
Discrete conformal variations and discrete scalar curvatures

Robert Gulliver
University of Minnesota
Harmonic mean curvature flow in Riemannian manifolds

Jens Hoppe
KTH Stockholm and ETH Zürich
M-brane singularity formation

Annibale Magni
SISSA, Trieste
On Perelman's dilaton

Sylvain Maillot
Université Louis Pasteur and CNRS, Strasbourg
Ricci flow on open 3-manifolds

Marios Petropoulos
École Polytechnique, CPHT, Paris
Gravitational instantons and geometric flows

Marc Troyanov
École Polytechnique Federale de Lausanne
Surfaces with bounded integral curvature in the sense of Alexandrov

Suneeta Vardarajan
Department of Mathematical & Statistical Sciences, University of Alberta
Ricci flow in theoretical physics

Mu-Tao Wang
Department of Mathematics, Columbia University
Mean curvature flows of Lagrangian graphs and isotopy problems

Eric Woolgar
Department of Mathematics, University of Alberta
The Ricci flow of static metrics

For more information and abstracts of the seminars, see at <http://cvgmt.sns.it/MPRicci-Workshop>

General Conference “GFO in Pisa” – 29 June/3 July 2009

The workshop, which was meant to be the general conference about all the topics discussed in the trimester, collected around 60 participants.

Speakers

Roberta Alessandroni

Dipartimento di Matematica, Università di Roma

Convexity estimates for a nonhomogeneous mean curvature flow

Charles Baker

Mathematical Sciences Institute, Australian National University

Mean curvature flow of submanifolds of high codimension

Laurent Bessières

Institut Joseph Fourier, Grenoble

Ricci flow with surgery on open 3-manifolds with bounded geometry

G rard Besson

Institut Joseph Fourier, Grenoble

Constructing maps between manifolds and applications

Francesco Bonsante

Dipartimento di Matematica, Universit  di Pavia

Mean curvature flow in Anti de Sitter space

Esther Cabezas-Rivas

Mathematics Institute, University of Warwick

How to apply optimal transport to build up Ricci solitons (and beyond)

Giovanni Catino

SISSA, Trieste

A gluing construction for solutions to fully nonlinear equations in conformal geometry

Emmanuel Hebey

Universit  de Cergy-Pontoise, Paris

Einstein-scalar field Lichnerowicz equations on compact Riemannian manifolds

Tobias Lamm

Department of Mathematics, University of British Columbia

Geometric flows with rough initial data

Philippe LeFloch Universit  Pierre et Marie Curie & CNRS, Paris

Weakly regular Einstein spacetimes with Gowdy symmetry

Luca Martinazzi

ETH Zürich

An application of Q -curvature to an embedding of critical type

Lorenzo Mazziere

SISSA, Trieste

On the singular σ_k -Yamabe problem

Reto Müller

ETH Zürich

Ricci flow coupled with harmonic map heat flow

Matteo Novaga

Dipartimento di Matematica, Università di Padova

Curvature evolution of nonconvex lens-shaped domains

Melanie Rupflin

ETH Zürich

Uniqueness for the (poly-)harmonic map heat flow

Harish Seshadri

Department of Mathematics, Indian Institute of Science, Bangalore

Surfaces of bounded mean curvature in Riemannian manifolds

Weimin Sheng

Department of Mathematics, Zhejiang University

K -Yamabe problem and some related problems

Miles Simon

University of Freiburg

Ricci flow of non-collapsed 3-manifolds whose Ricci curvature is bounded from below

Carlo Sinestrari

Dipartimento di Matematica, Università di Roma "Tor Vergata"

Mean curvature flow with surgeries of two-convex hypersurfaces

Jeffrey Streets

Princeton University

A parabolic flow of Hermitian metrics

Michael Struwe

ETH Zürich

The heat flow with a critical exponential nonlinearity

Gabriella Tarantello

Dipartimento di Matematica, Università di Roma "Tor Vergata"

On a class of mean field equations and their applications

For more information and abstracts of the seminars, see at <http://cvgmt.sns.it/GFO-Conf>

7. FULL LIST OF PARTICIPANTS

Mohamed Abdelmalek, University Aboubaker Belkaid Tlemcen
05 July 2009 – 30 July 2009

Roberta Alessandroni, Dipartimento di Matematica, Università di Roma
03 May 2009 – 17 July 2009

Pablo Alvarez Caudevilla, Scuola Normale Superiore, Centro Ennio De Giorgi, Pisa
02 May 2009 – 30 July 2009

Luigi Ambrosio, Scuola Normale Superiore, Pisa
02 May 2009 – 30 July 2009

Gennaro Amendola, University of Salento
22 June 2009 – 25 June 2009

Maria Athanassenas, Monash University, School of Mathematical Sciences, Clayton Campus
21 June 2009 – 27 June 2009

Charles Baker, Mathematical Sciences Institute, Australian National University
02 May 2009 – 18 July 2009

Richard Bamler, Princeton University
07 June 2009 – 24 June 2009

Daniele Bartolucci, Dipartimento di Matematica, Università di Roma
01 July 2009 – 03 July 2009

Ubertino Battisti, Dipartimento di Matematica, Università di Torino
07 June 2009 – 12 June 2009

Giovanni Bellettini, Dipartimento di Matematica, Università di Roma "Tor Vergata"
22 June 2009 – 25 June 2009

Riccardo Benedetti, Università di Pisa
22 June 2009 – 03 July 2009

Laurent Bessières, Institut Joseph Fourier, Grenoble
29 June 2009 – 03 July 2009

Gérard Besson, Institut Joseph Fourier, Grenoble
29 June 2009 – 03 July 2009

Pawel Biernat, Jagiellonian University, Faculty of Physics
17 May 2009 – 30 May 2009

Francesco Bonsante, Dipartimento di Matematica, Università di Pavia
30 June 2009 – 03 July 2009

Vincent Bour, Institut Joseph Fourier, Grenoble
22 June 2009 – 03 July 2009

Theodora Bourni, Max Planck Institute for Gravitational Physics (Albert Einstein Institute)
04 July 2009 – 18 July 2009

Esther Cabezas–Rivas, Mathematics Institute, University of Warwick
16 May 2009 – 30 May 2009
20 June 2009 – 05 July 2009
12 July 2009 – 18 July 2009

Huai–Dong Cao, Department of Mathematics, Lehigh University
15 July 2009 – 22 July 2009

Mauro Carfora, Dipartimento di Fisica Nucleare e Teorica, Università di Pavia
18 May 2009 – 29 May 2009
15 June 2009 – 26 June 2009

Alessandro Carlotto, Scuola Normale Superiore, Pisa
04 May 2009 – 30 July 2009

Giovanni Catino, SISSA, Trieste
12 May 2009 – 19 May 2009
07 June 2009 – 17 July 2009

Zhengxiang Chen, University of Southern California, Los Angeles
03 July 2009 – 17 July 2009

Francesco Costantino, Université Louis Pasteur – Strasbourg I
21 June 2009 – 25 June 2009

Liana Rodica David, Institute of Mathematics of the Romanian Academy
08 June 2009 – 15 June 2009

Francesca De Marchis, SISSA, Trieste
03 May 2009 – 16 May 2009
28 June 2009 – 03 July 2009

Luca Fabrizio Di Cerbo, Department of Mathematics, SUNY at Stony Brook, NY
07 June 2009 – 30 June 2009

Zindine Djadli, Institut Joseph Fourier, Grenoble
01 May 2009 – 30 July 2009

Ahmad El Soufi, Université François Rabelais, Tours
29 June 2009 – 03 July 2009

Salah Eddine En Nadifi, Lab-HEP, MedV University, Rabat, Morocco
21 June 2009 – 26 June 2009

Francesco Fanelli, SISSA, Trieste
18 May 2009 – 29 May 2009
07 June 2009 – 19 June 2009

Ali Fardoun, Département de Mathématiques, Université de Brest
25 June 2009 – 03 July 2009

Daniel Friedan, Rutgers University
21 June 2009 – 25 June 2009

Roberto Frigerio, Dipartimento di Matematica, Università di Pisa
22 June 2009 – 03 July 2009

Óscar J. Garay, University of the Basque Country, Spain
21 June 2009 – 26 June 2009

Francesco Ghiraldin, Scuola Normale Superiore, Pisa
01 May 2009 – 31 July 2009

David Glickenstein, Department of Mathematics, University of Arizona, Tucson
22 June 2009 – 25 June 2009

Robert Gulliver, University of Minnesota
21 June 2009 – 27 June 2009

Matthew Gursky, Notre Dame University
04 May 2009 – 15 May 2009

Hal Haggard, University of California, Berkeley
23 June 2009 – 25 June 2009

Matthias Hammerl, Institut für Mathematik, Universität Wien
07 June 2009 – 13 June 2009

Robert Haslhofer, ETH Zürich
07 June 2009 – 05 July 2009

Emmanuel Hebey, Université de Cergy-Pontoise, Paris
29 June 2009 – 02 July 2009

Jens Hoppe, KTH Stockholm and ETH Zürich
21 June 2009 – 26 June 2009

Djideme Franck Houenou, Abdus Salam ICTP, Trieste
06 June 2009 – 04 July 2009

Debora Impera, Dipartimento di Matematica, Università di Milano
07 June 2009 – 20 June 2009

Biswajit Karmakar, Harish Chandra Research Institute for Mathematics, Allahabad
08 June 2009 – 29 June 2009

Stephen Kleene, Department of Mathematics, Johns Hopkins University
09 June 2009 – 20 July 2009

Benjamin Lambert, Durham University
29 June 2009 – 17 July 2009

Tobias Lamm, Department of Mathematics, University of British Columbia
24 June 2009 – 04 July 2009

Paul Woon Yin Lee, Department of Mathematics, University of Toronto
03 May 2009 – 16 May 2009

Philippe LeFloch, Université Pierre et Marie Curie & CNRS, Paris
29 June 2009 – 03 July 2009

Svetlana Lukashovich, Theoretical Physics Department, Gomel State University
19 June 2009 – 26 July 2009

Marco Magliaro, Dipartimento di Matematica, Università di Milano
07 June 2009 – 20 June 2009

Annibale Magni, SISSA, Trieste
03 May 2009 – 29 May 2009
14 June 2009 – 04 July 2009

Sylvain Maillot, Université Louis Pasteur and CNRS, Strasbourg
21 June 2009 – 04 July 2009

Andrea Malchiodi, SISSA, Trieste
04 May 2009 – 15 May 2009
08 June 2009 – 12 June 2009
29 June 2009 – 03 July 2009

Youssef Maliki, Département de Mathématiques, Université de Tlemcen
04 June 2009 – 01 July 2009

Carlo Mantegazza, Scuola Normale Superiore, Pisa
04 May 2009 – 31 July 2009

Luciano Mari, Dipartimento di Matematica, Università di Milano
07 June 2009 – 20 June 2009

Bruno Martelli, Dipartimento di Matematica, Università di Pisa
02 May 2009 – 30 July 2009

Luca Martinazzi, ETH Zürich
08 June 2009 – 17 July 2009

Paolo Mastrolia, Dipartimento di Matematica, Università di Milano
07 June 2009 – 20 June 2009

Lorenzo Mazziere, SISSA, Trieste
03 May 2009 – 15 May 2009
14 June 2009 – 10 July 2009

Benoît Michel, Département de Mathématiques, Université de Montpellier II
08 June 2009 – 17 June 2009

Andrea Mondino, SISSA, Trieste
04 May 2009 – 17 May 2009
07 June 2009 – 18 July 2009

Reto Müller, ETH Zürich
02 May 2009 – 15 July 2009

Lei Ni, Department of Mathematics, University of California, San Diego
14 June 2009 – 21 June 2009

Georgiou Nikos, Institute of Technology, Tralee
02 May 2009 – 30 July 2009

Davi Nogueira, Department of Mathematics, University of Texas
05 July 2009 – 17 July 2009

Hamid Reza Noori, University of Heidelberg
15 June 2009 – 03 July 2009

Matteo Novaga, Dipartimento di Matematica, Università di Padova
01 May 2009 – 31 July 2009

Marios Petropoulos, École Polytechnique, CPHT, Paris
21 June 2009 – 27 June 2009

Adriano Pisante, Dipartimento di Matematica, Università di Roma "La Sapienza"
07 June 2009 – 12 June 2009

Joan Porti, Universitat Autònoma de Barcelona
13 July 2009 – 17 July 2009

Daniel Ramos-Guallar, Universidad de Zaragoza, Spain
04 July 2009 – 20 July 2009

Thomas Richard, Institut Joseph Fourier, Grenoble
22 June 2009 – 03 July 2009

Marco Rigoli, Dipartimento di Matematica, Università di Milano
08 June 2009 – 20 June 2009

Michele Rimoldi, Dipartimento di Matematica, Università di Milano
07 June 2009 – 20 June 2009

Melanie Rupflin, ETH Zürich
28 June 2009 – 04 July 2009

Zaynab Salloum, École Polytechnique Universitaire de Lille
21 June 2009 – 26 June 2009

Matteo Scienza, Dipartimento di Matematica, Università di Pisa
02 May 2009 – 30 July 2009

Antonio Segatti, Dipartimento di Matematica, Università di Pavia
02 May 2009 – 09 May 2009

Cosimo Senni, Dipartimento di Matematica, Università di Bologna
05 July 2009 – 17 July 2009

Harish Seshadri, Department of Mathematics, Indian Institute of Science, Bangalore
29 June 2009 – 03 July 2009

Leili Shahriyari, Department of Mathematics, Johns Hopkins University
03 May 2009 – 30 July 2009

Weimin Sheng, Department of Mathematics, Zhejiang University
28 June 2009 – 04 July 2009

Miles Simon, University of Freiburg
29 June 2009 – 03 July 2009

Carlo Sinestrari, Dipartimento di Matematica, Università di Roma "Tor Vergata"
29 June 2009 – 03 July 2009

Jeffrey Streets, Princeton University
29 June 2009 – 03 July 2009

Michael Struwe, ETH Zürich
29 June 2009 – 03 July 2009

Kamel Tahri, University Aboubaker Belkaid Tlemcen
05 July 2009 – 30 July 2009

Gabriella Tarantello, Dipartimento di Matematica, Università di Roma "Tor Vergata"
01 July 2009 – 03 July 2009

Stephen Taylor, Department of Mathematics, SUNY at Stony Brook, NY
01 May 2009 – 29 July 2009

Enzo Tortorelli, Dipartimento di Matematica, Università di Pisa
04 May 2009 – 31 July 2009

Marc Troyanov, École Polytechnique Federale de Lausanne
19 June 2009 – 26 June 2009

Efstratios Tsatis, Max Planck Institut für Gesellschaftsforschung
14 June 2009 – 19 June 2009

Suneeta Vardarajan, Department of Mathematical & Statistical Sciences, University of Alberta
21 June 2009 – 04 July 2009

Giona Veronelli, Dipartimento di Matematica, Università di Milano
07 June 2009 – 20 June 2009

Jeff Viaclovsky, University of Wisconsin, Madison
08 June 2009 – 12 June 2009

Mu-Tao Wang, Department of Mathematics, Columbia University
21 June 2009 – 26 June 2009

Eric Woolgar, Department of Mathematics, University of Alberta
14 June 2009 – 04 July 2009

Chao Wu, Department of Mathematics, Zhejiang University
01 May 2009 – 25 July 2009

Chao Xia, University of Magdeburg
03 July 2009 – 17 July 2009

MAURO CARFORA, DIPARTIMENTO DI FISICA NUCLEARE E TEORICA, UNIVERSITÀ DI PAVIA
E-mail address: Mauro.Carfora@pv.infn.it

ZINDINE DJADLI, INSTITUT FOURIER – GRENOBLE
E-mail address: Zindine.Djadli@ujf-grenoble.fr

ANDREA MALCHIODI, SISSA – TRIESTE
E-mail address: malchiodi@sissa.it

CARLO MANTEGAZZA, SNS – PISA
E-mail address: c.mantegazza@sns.it