

Summary of 2008 Research Activities



Research Fellow Adrian Ioana

The activities of CMI researchers and research programs are sketched below. Researchers and programs are selected by the Scientific Advisory Board (see inside back cover).

Clay Research Fellows

Spyros Alexakis received his Ph.D. from Princeton University under the supervision of Charles Fefferman in 2005. He is currently on leave from his position as Assistant Professor at the University of Toronto. He began his two-year appointment in July 2009 while a visiting researcher at MIT.

Adrian Ioana, a native of Romania, received his B.S. from University of Bucharest and his Ph.D. in 2007 at UCLA under the direction of Professor Sorin Popa. He began his three-year appointment while a post-doc at Caltech.

Xinyi Yuan received his PhD in 2008 from Columbia University under the direction of Shou-Wu Zhang. His three-year appointment began at the Institute for Advanced Study where he is a visitor in the School of Mathematics.

Alexakis, Ioana, and Yuan joined CMI's current group of research fellows Mohammed Abouzaid (MIT), Artur Avila (IMPA Brazil), Maria Chudnovsky (Columbia University), Soren Galatius (Stanford University), Bo'az Klartag (Princeton University), Ciprian Manolescu (Columbia University), Davesh Maulik (Columbia University), Maryam Mirzakhani (Princeton University), Sophie Morel (Institute for Advanced Study), Samuel Payne (Stanford University), and David Speyer (MIT) and Teruyoshi Yoshida (Harvard University)

Research Scholars

Dipendra Prasad (TIFR, Mumai). September 24, 2007–June 13, 2008 at University of California, San Diego.

Senior Scholars

Senior Scholars John Lott and Gang Tian at Institut Henri Poincaré. May 1–June 30.

Senior Scholar Rob Lazarsfeld at PCMI/IAS. July 6–26.

Senior Scholar Henri Gillet at the Fields Institute Program on Arithmetic Geometry, Hyperbolic Geometry and Related Topics. September 1–November 30.

Senior Scholar Fedor Bogomolov at the Centro di Ricerca Matematica Program on Groups in Algebraic Geometry. September 1–November 30.

Senior Scholar Richard Schoen at the Mittag-Leffler Institute Program on Geometry, Analysis and General Relativity. September 1–December 15.

Senior Scholar Werner Mueller at the MSRI Program on Analysis of Singular Spaces. September 10–October 21.

Senior Scholar Gunther Uhlmann at the MSRI Program on Analysis of Singular Spaces. September 16–December 15.

Liftoff Fellows

CMI appointed twenty Liftoff Fellows for the summer of 2008. Clay Liftoff Fellows are recent Ph.D. recipients who receive one month of summer salary and travel funds before their first academic position. See www.claymath.org/liftoff

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| Mark Braverman | Irine Peng |
| Dawei Chen | Jonathan (Jay) Pottharst |
| Michael Eichmair | Yanir Rubinstein |
| Inessa Epstein | Travis Schedler |
| David Fithian | David Smyth |
| Qëndrim Gashi | Robert Waelder |
| Marketa Havlíčková | Micah Warren |
| Kai-Wen Lan | Chenyang Xu |
| Manish Patnaik | Karen Yeats |
| Ron Peled | David Zywinia |



Research Fellow Xinyi Yu

Research Programs organized and supported by CMI

January 3–12. Cycles, Motives, and Shimura Varieties at TIFR, Mumbai, India.

January 31–Feb 3. Shrinking Target Properties at Brandeis University.

March 8. Symposium for Undergraduates in the Mathematical Sciences at Brown University, Providence, Rhode Island.

March 16–19. Algebraic Statistics, Machine Learning, and Lattice Spin Models at Banbury Conference Center, Cold Spring Harbor Laboratory.

March 16–21. Recent Progress on the Moduli Space of Curves at Banff International Research Station, Canada.

March 20–23. CMI Workshop on K3s: Modular Forms, Moduli, and String Theory.

March 25–29. Conference on Algebraic Cycles II at Ohio State University, Columbus, Ohio.

March 28–30. CMI Workshop: Automorphic Forms in Moduli Problems of Schottky and Brill-Noether Type.

April 5–13. Additive Combinatorics, Number Theory, and Harmonic Analysis at the Fields Institute, Toronto, Canada.

May 8. “The Music of the Primes,” Clay Public Lecture by Marcus du Sautoy at MIT.

May 11–18. Workshop on Global Riemannian Geometry, National Autonomous University of Mexico, Cuernavaca (IMATE-UNAM Cuernavaca), Mexico.

May 12–13. Clay Research Conference at MIT.

May 18–23. HIRZ80 at Emmy Noether Research Institute for Mathematics at Bar Ilan University, Ramat Gan, Israel.

CLAY MATHEMATICS INSTITUTE

The Music of the Primes

$$\zeta(s) = \prod (1 - p^{-s})^{-1}$$

CLAY PUBLIC LECTURE by

Marcus du Sautoy

Thursday, May 8, 2008 at 6 pm

MIT, Compton Laboratories
Building 26, Room 100
Access via 60 Vassar Street
Cambridge, Massachusetts

Why did Beethoven choose the number 23 short? How is 17 the key to the evolutionary survival of a strange species of insects? Prime numbers are the atoms of arithmetic – the hydrogen and oxygen of the world of numbers. Despite their fundamental importance in mathematics, they represent one of the most tantalizing enigmas in the pursuit of human knowledge. In 1859, the German mathematician Bernhard Riemann put forward an idea – a hypothesis – that seemed to reveal a magical harmony at work in the numerical landscape. A million dollars have awaits the person who can unravel the mystery of the hidden music that might explain the cacophony of the primes.

Marcus du Sautoy is Professor of Mathematics at the University of Oxford and a Fellow of Wolfson College. He is author of numerous academic articles and books on mathematics. He has been a visiting Professor at the Ecole Normale Supérieure in Paris, the Max Planck Institute in Bonn, the Hebrew University in Jerusalem and the Australian National University in Canberra.

Marcus du Sautoy is author of the best-selling popular mathematics book *The Music of the Primes*, published by Fourth Estate in 2003 and translated into 20 languages. It has won two major prizes in Italy and Germany for the best popular science book of the year. His new book *Finding Morpheus: a mathematical journey through geometry* is also published by Fourth Estate and was released in March 2008.

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Marcus du Sautoy discussed the mystery of prime numbers, the history behind the Riemann hypothesis and the ongoing quest to solve it in his May 2008 Clay Public Lecture at MIT. A video recording of his talk may be viewed at www.claymath.org/public_lectures/dusautoy.php.

Summary of 2008 Research Activities

May 19–25. Lie Theory and Geometry: The Mathematical Legacy of Bertram Kostant at PIMS in Vancouver, BC.

June 2–13. Conference on Motives, Quantum Field Theory and Pseudodifferential Operators at Boston University.

June 9–13. A Celebration of Raoul Bott's Legacy in Mathematics at CRM, Montreal.

June 15–28. School and Workshop on Aspects of Moduli Theory at the De Giorgi Center, Scuola Normale Superior di Pisa.

June 16–20. Analysis and Topology in Interaction at the Il Pallazone in Cortona, Italy.

June 22–28. Symmetries in Mathematics and Physics at the Palazzone della Scuola Normale Superiore, Cortona, Italy.

June 23–July 18. CMI Summer School: Evolution Equations at the ETH, Eidgenossische Technische Hochschule, Swiss Federal Institute of Technology, Zurich, Switzerland.

June 28–July 2. Conference on Modular Forms and Arithmetic in honor of Ken Ribet's 60th birthday at MSRI, Berkeley, CA.

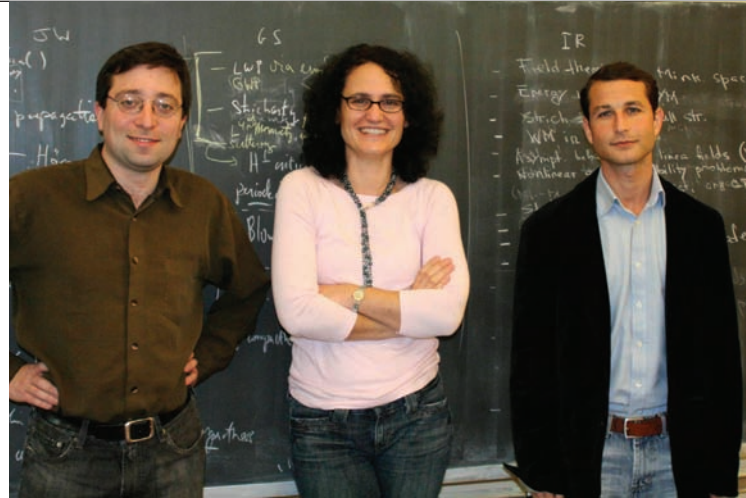
July 14–26. Algebraic Geometry, D-modules, Foliations and their Interactions, Buenos Aires, Argentina.

July 16–18. 60 Miles: A conference in Honor of Miles Reid's 60th Birthday, LMS, London.

August 4–15. CMI Workshop: The Foundations of Algebraic Geometry: Grothendieck's EGA Unbound.

October 13–16. CMI Workshop: Stringy Reflections on LHC.

October 14. "A Tribute to Euler," Clay Public Lecture by William Dunham at Harvard University.



CMI Summer School Scientific Committee members Jared Wunsch, Gigliola Staffilani and Igor Rodnianski, (and David Ellwood, not depicted).

Program Allocation

Estimated number of persons supported by CMI in selected scientific programs for calendar year 2008:

Research Fellows, Research Awardees, Senior Scholars, Research Scholars, Book Fellows, Liftoff Fellows	30
Summer School participants and faculty	134
PROMYS/Ross, participants and faculty	28
CMI Workshops	76
Participants attending Conferences and Joint Programs	> 1000

IRS Qualifying Charitable Expenses of CMI Since Inception



Total through September 30, 2008: Over \$32 million