Dear Friends,

Greetings from MIT Mathematics!

Faculty recruiting was tremendous last year and brought us four fantastic new individuals: Professors Alice Guionnet (probability), Larry Guth (geometry and harmonic analysis), Bill Minicozzi (geometric analysis and PDEs), and Assistant Professor Aaron Naber (Ricci solitons, collapsing theory). Jörn Dunkel (physical applied mathematics) will join us next year as Assistant Professor.

We filled two key staff positions with outstanding people: Barbara Peskin joined the department in January as Academic Administrator, with primary responsibility for running MAS, the Mathematics Academic Services office. This office, and hence Barbara herself, is our nexus for all things educational. With the growth in the mathematics major, now at over 350 students the third largest at MIT, and assorted new technologies and other changes, we are most fortunate to have Barbara, one of our former PhDs, here with us. Barbara’s extensive mathematical experience as well as managerial experience from leadership positions at Dragon Systems and the International Computer Science Institute will serve us well. Cynthia Shen arrived two months ago as Administrative Officer. Cynthia runs Headquarters and is responsible for the oversight of all department finances and staff. She brings a great depth of knowledge from her prior MIT positions in finance at CSAIL and RLE.

Annual Retreat

The first Mathematics Department Retreat took place late September, organized by our graduate students. Over 160 department members, families, and guests traveled to Purity Springs Resort in the White Mountains in New Hampshire for a splendid weekend of hiking, canoeing, picking mushrooms, doing mathematics and relaxing. Late nights laughing around the bonfire and playing board games in the lodge made for a memorable time. We expect the Retreat to become an annual tradition.

Building 2 Renovation

Preparations for the Building 2 renovation gathered speed over the summer. We’ve worked closely with Ann Beha Architects and MIT planners to arrive at an exciting scheme that adds common spaces and offices, mezzanines and skylights, and takes good advantage of our outlooks over the Charles River. The schedule calls for construction to begin this summer. We’ll pack up our things and move to temporary quarters in Building E17/18, which is being refurbished too. Mathematics faculty and staff recently saw the E17/18 space during a lunch we served there. It met with general approval—proximity to the Kendall Square restaurants and the T station being seen as a plus, as noted by several people. We will be sharing E17/18 with Economics, whose regular building will be renovated at the same time. When we return to Building 2 after the work is done, Building E17/18 will serve as swing space for other departments as their turn comes for major renovation.

We are deeply grateful to Jim and Marilyn Simons whose leadership gift is helping make this project possible. We are in the process of raising additional funds to cover as much of the remaining renovation cost as we can. The MIT administration and the Facilities Department have been extremely helpful in working with us to produce a design that meets our needs.

Simons Lectures

This year’s Simons Lectures will take place in May, given by Emmanuel Candès and Raphaël Rouquier.

MITx and edX

In other activities, the Department has been considering ways to participate in edX, the initiative for online education. The edX enterprise is building technology to enhance the learning experience for MIT students and to reach thousands or millions of students worldwide. The potential is extraordinary, but the uncertainties are many. We are excited about the possibilities and we will work on overcoming the challenges.

Visiting Committee

I’ll close by thanking the members of our Visiting Committee, which convened this past spring under the leadership of its new chair, Art Samberg. I also thank my colleagues for their excellent presentations and participation. The meeting was successful, with broad enthusiasm expressed for the results of our recent faculty recruiting efforts and lots of discussion about how the Department could and should participate in edX. The renovation was a major agenda item. Lead architect Ann Beha came and inspired us with her vision for new spaces at MIT. She knows the campus well from her days as an architecture graduate student here. We appreciate the time invested by everyone, as well as their helpful ideas and support.

Have a good year!

Michael Sipser
Department Head
New Faculty

Alice Guionnet, Professor of Mathematics, comes to MIT from École Normale Supérieure Lyon, where she was on the faculty since 2000. Guionnet is a probabilist, specializing in random matrices, large deviations, free probability, and the statistical mechanics of disordered systems. As director at ENS Lyon, she built a top-ranking probability group. Her distinctions include the Miller Institute Fellowship, the Loève Prize, the Silver Medal of CNRS, and Simons Investigator. She received her PhD from ENS Paris under the guidance of Gérard Ben Arous.

Larry Guth, Professor of Mathematics, arrives from NYU’s Courant Institute of Mathematical Sciences. Guth works in systolic and harmonic analysis. He’s made major breakthroughs on several long-standing questions including the endpoint multilinear Kakeya conjecture and the Erdős distinct distances problem in combinatorial geometry. Guth received his PhD at MIT in 2005 under Tom Mrowka. Following appointments at Stanford and the University of Toronto, he joined the Courant Institute as Professor of Mathematics in 2011.

William Minicozzi, Professor of Mathematics, arrives from Johns Hopkins University, where he has been on the faculty since 1994. Minicozzi’s field is geometric analysis. His groundbreaking work with Toby Colding settled several major problems in the theory of embedded minimal surfaces of 3 manifolds. For these contributions, they shared the 2010 Veblen Prize in Geometry. Minicozzi received his PhD from Stanford University in 1994 under Richard Schoen.

Aaron Naber, Assistant Professor of Mathematics, has been a CLE Moore Instructor here since 2009. Naber is a geometric analyst working on the large scale structure of Riemannian geometry, Ricci Flow, singularity theory of harmonic maps, and Kahler geometry. Naber completed his PhD at Princeton University in 2009 under Gang Tian.
Faculty Achievements

Igor Rodnianski was awarded the 2011 Fermat Prize by the Toulouse Mathematics Institute, “for his fundamental contributions to the study of the equations of general relativity and of the propagation of light on curved space-times.” Bonnie Berger was elected fellow of the American Academy of Arts and Sciences, and fellow of the International Society for Computational Biology. Bjorn Poonen was elected fellow of the American Academy of Arts and Sciences. Alice Guionnet and Paul Seidel were chosen to be Simons Investigators by the Simons Foundation. Victor Kac was selected to be a Simons Fellow by the Simons Foundation. Mark Behrens received the 2011 School of Science prize for excellence in graduate teaching. Pavel Etingof was selected to be the next Robert E. Collins Distinguished Scholar. Jacob Fox was selected to be the next recipient of the Edmund F. Kelly Research Award. Michael Sipser was selected to be the next holder of the Barton L. Weller Professorship. Alexei Borodin gave the 2012 London Mathematical Society Lectures at the University of Glasgow, a series of 10 lectures on determinantal point processes and representation theory. Paul Seidel gave the 2012 Mordell Lecture at Cambridge University and the 2011-2012 Distinguished Lecture Series at UCLA. Ju-Lee Kim was promoted to Professor. Abhinav Kumar and Jonathan Kelner were promoted to Associate Professor.

Research Staff Awards

Alejandro Rodriguez and Andrew Sutherland each received the School of Science Infinite Mile Award. Andrew was also awarded the Selfridge Prize for the top paper at the Algorithmic Number Theory Symposium. He was recently promoted to Principal Research Scientist.

Staff Award

Erin McGrath, Director of Development for the Mathematics and Physics departments, received the 2012 MIT Excellence Award in the category of Serving the Client.

MLK Visiting Assistant Professor Terrence Blackman

Terrence Blackman is spending this year with us as Dr. Martin Luther King, Jr., Visiting Assistant Professor. Terrence is on the mathematics faculty of Medgar Evers College, CUNY, in Brooklyn, NY. He works in the Jacquet-Langlands correspondence in the Langlands program, and more broadly in representation theory, number theory, and automorphic forms. He’s also interested in promoting diversity in mathematics and science, specifically in the teaching of mathematics in largely African-American settings.

Student Awards

Graduate students Sheel Ganatra, Hoeskuldur Halldorssson, and Alejandro Morales received the Charles and Holly Housman Award for excellence in undergraduate teaching. Steven Sam received the Charles W. and Jennifer C. Johnson Prize for an outstanding paper accepted for publication. Undergraduate Fan Wei ’12 received the Jon A. Bucsela Prize in Mathematics for distinguished scholastic achievement, professional promise, and enthusiasm for mathematics. She also received the Alice T. Schafer Prize for excellence in mathematics by an undergraduate woman in mathematics, given by the Association for Women in Mathematics. Jacob Steinhardt ’12, received a Hertz fellowship to support his graduate studies. George Arzeno ’14, Jon Schneider ’13, Shawn Tsosie ’12, and Fan Wei ’12 were Poster Session Winners at the Joint Meetings of the AMS and MAA.

Another Putnam Record

We had a record-breaking year at the 2011 William Lowell Putnam Mathematical Competition. An astonishing 36% of all high scorers in this North American competition were MIT students. Precisely speaking, of the 81 high scorers (Honorable Mention and higher), MIT had 29, more than the next five schools combined (Princeton 9, Stanford 6, Carnegie-Mellon 5, Harvard 4, and Caltech 3).

Jim and Marilyn Simons have made the lead gift for the renovation of Building 2, creating a new home for our faculty, students, staff and visitors. Jim is well known as a great mathematician and legendary hedge fund manager, but he wasn’t always so successful. When he was 14, Jim got a job at a garden supply store. He was first sent to the stock room, and reports “I was terrible at it.” He couldn’t remember what went where. The couple who owned the store demoted him to floor sweeper. That suited him more. “I loved it,” Jim remembers. “I got to walk and think—and I got paid.” When the job was over, the owners asked Jim about his future plans. He told them he intended to study mathematics at MIT. “My bosses thought this was hilarious, the kid who couldn’t remember where to put the sheep manure wanting to study math.”

Jim completed his undergraduate degree in math at MIT in three years. He went on to Berkeley for a PhD and taught at both MIT and Harvard. He then got a job with the Institute for Defense Analysis, from which he was not just demoted but fired, this time for criticizing the war in Vietnam. Jim went on to become head of the department of mathematics at Stony Brook. He was only 30 years old. Jim’s area of research is in geometry and topology. He received the American Mathematical Society’s

The Walls of Building 2

Building 2 has long been our home, going back to when Mathematics was called “General Studies.” If only these corridors could speak, what stories they could tell. Farewell Building 2. We’ll be back!
astonishing returns. The New—York
prietary models. These generated
that deployed sophisticated pro-
He started an investment business
Then Jim decided to make a change.
the Chern-Simons invariants.
geometric measurements, now called
discovery and application of certain
influential research involved the
and the plateau problem. His most
questions, the Bernstein conjecture
was the settling of two classical
dimensional surfaces. A consequence
work that involved a recasting of the
1975 Veblen Prize in Geometry for
all deeply grateful to them.’’
ment of extraordinary power. We are
changing the perception of math-
and throughout the country, and by
by their extraordinary support at MIT
support of our new home, Jim and
In addition to their magnificent
support of our new home, Jim and
Marily have endowed three profes-
sorships in mathematics: The Simons
Chair, held by Richard Melrose; the
Norman Levinson Chair, held by
Toby Colding; and the Isadore Singer
Chair, held by Tom Mrowka.
As Mathematics Department Head
Michael Sipser says, “Jim and Mari-
lyn have been instrumental in chang-
the landscape of mathematics
by their extraordinary support at MIT
and throughout the country, and by
changing the perception of math-
ematics from ivory tower to an instru-
ment of extraordinary power. We are
all deeply grateful to them.”

From Associate Head Haynes Miller

Barbara Peskin heads the new
Mathematics Academic Services office
Leadership of the newly merged
undergraduate and graduate math-
ematics offices passed in February,
2012, to Dr. Barbara Peskin. Barbara
holds a 1980 PhD from this depart-
ment, under the direction of Mike
Artin. Her academic career included
six years at Mt. Holyoke and several
years at Harvard. She joined Dragon
Systems, moved on to the Interna-
tional Computer Science Institute,
then directed work on clinical trial
simulations with Kaiser Permanente.
We are lucky to have her back in the
MIT fold as Mathematics Academic
Administrator.

What's new at OCW?
The launch of MIT OpenCourseWare
a decade ago changed the landscape
of online education. The Mathemat-
ics Department listings are among
OCW's most popular courses. Gilbert
Strang’s Linear Algebra class, for
example, will record its two millionth
hit this fall!
OCW publications are essentially
archives. Over the summers of 2010
and 2011, OCW launched OCW
Scholar, which offers complete
chronologically sequenced online
courses for several science subjects
by augmenting the basic OCW mate-
rial with recitation videos and text.
The OCW Scholar projects in math-
ematics were led by Associate Pro-
fessor Benjamin Brubaker (18.01),
Lecturer Jeremy Orloff (18.02 and
18.03), and Gilbert Strang (18.06),
and involved video recorded “recita-
tions” led by a dozen graduate stu-
dents and postdocs.
The Mathematics Department is
working with MITx to create online
versions of these basic courses.

MITx, edX, and Math
In December, 2011, MIT announced
an initiative in online education
under the name MITx. Five months
later this was expanded to a broader
initiative known as edX, including
Harvard University as an equal part-
ner. Since then, UC Berkeley and
the University of Texas system joined
the consortium. This initiative offers
an exciting prospect of enhancing
our residential education leading
to an MIT degree, while providing
state-of-the-art distance education
to the world.

Unlike OpenCourseWare, edX courses
will be interactive. Students will sub-
mit homework and do exams. We rec-
ognize that producing first-rate edX
courseware will take time. EdX has
hired former Moore Instructor Grace
Lyo to serve as mathematics liaison
and content development manager.
Our current objective is to launch
MITx versions of one or two courses
in fall 2013.

Probability and Statistics
The Mathematics Department has
won a two year grant from the Davis
Educational Foundation to build a
new curriculum and pedagogy for
18.05 Probability and Statistics.
This subject will introduce a new
degree of active classroom engagement
in MIT mathematics. We will be fo-
cusing on techniques and examples
from the life sciences. The Principal
Investigator for this project is Haynes
Miller; the lead content developer
is Jerry Orloff, with assistance from
Moore Instructor Jonathan Bloom
and consultancy by Professor Sanjoy
Mahajan of Olin College of Engineer-
ing and formerly of MIT’s Teaching
and Learning Laboratory.
Department Retreat

Huge thanks to our graduate students for organizing our department retreat. Chief organizer Rosalie Belanger-Rioux coordinated the planning and participated at every level. Others involved include: Michael Donovan – sign-up, buses, Dana Mendelson – rooming list, food and drinks, John Binder – venue finding, buses, Yasha Berchenko-Kogan – venue, food and drinks, Anand Oza – food and drinks, Xuwen Zhu – survey, campfire, Efrat Engel-Shaposhnik – rooming list, Hannah Alpert – minutes, hikes, Ailsa Keating – venue finding. Activity planners: Jonathan Bloom, Ben Elias, Pavel Etingof, Katrin Wehrheim, Roberto Svaldi, Yasha Berchenko-Kogan, and others.


Tsao-Hsien Chen, “Character Sheaves and Geometric Harmonic Analysis,” under Roman Bezrukavnikov. Tsao-Hsien is a postdoc at Princeton University and at IAS.

Sheel Ganatra, “Fukaya Categories of General Symplectic Fibrations and an Open-Closed Structure for the Wrapped Fukaya Category,” under Denis Auroux. Sheel is now a postdoc at Stanford.


Yoon Suk Hyun, “On Affine Embeddings of Reductive Groups,” under James McKernan. Yoon Suk is now a postdoc at KAIST.

Nikola Kamburov, “A Free Boundary Problem Inspired by a Conjecture of De Giorgi,” under David Jerison. Nikola is now a postdoc at the University of Arizona.

Joel Lewis, “Pattern Avoidance for Alternating Permutations and Reading Words of Tableaux,” under Alexander Postnikov. Joel is now a postdoc at the University of Minnesota.


Alejandro Morales, “Combinatorics of Colored Factorizations, Flow Polytopes and Matrices over Finite Fields,” under Alexander Postnikov. Alejandro is now a postdoc at the University of Quebec.


Su Ho Oh, “Combinatorics Related to the Total Positivity of the Grassmannian,” under Alexander Postnikov. Su Ho is now a postdoc at the University of Michigan.


Steven Sam, “Free Resolutions in Combinatorics and Geometry,” under Richard Stanley. Steven is now a postdoc at the Miller Institute, UC Berkeley.


Peter Speh, “Hermitian Forms on the Minimal Globalizations of Representations,” under David Vogan. Peter is now at Jane Street Capital.


Fucheng Tan, “Families of p-adic Galois Representations,” under Barry Mazur. Fucheng is now a postdoc at McMaster University.

Roman Travkin, “Classical and Geometric Satake Correspondence,” under Roman Bezrukavnikov. Roman is now a research scholar at the Clay Mathematics Institute.

Jethro van Ekeren, “Modular Invariance for Vertex Superalgebras,” under Victor Kac. Jethro is now a postdoc at IMPA, Brazil.


Inna Zakharevich, “Model Categories and Relative Categories,” under Michael Hopkins. Inna is now a postdoc at the University of Chicago.
Alumni Corner

Memories of Dirk J. Struik and Norbert Wiener

I was an undergraduate at MIT during the mid-fifties, where my bachelor’s thesis advisor was the geometer and historian of mathematics, Dirk J. Struik. Struik was then sixty-two, recently reinstated after his refusal to cooperate with the House Un-American Activities Committee. I studied elementary differential geometry with him for a semester, wrote my bachelor’s thesis under his tutelage, but never sniffed a whiff of his Marxist ideology. His love of knowledge and appreciation of its unity and beauty, on the other hand, was a fragrance I could sense. His teaching combined mathematical precision with an appreciation for intuitive foundations. I once asked him to explain the concept of an osculating plane, which came up in his discussion of curves in space. “I like to hike on Mt. Washington,” Struik replied. “The trail I take has large flat rocks. Since I am an old man, I choose to walk along a path—a curve—for which the rocks are osculating planes, because it is easiest.”

I took elementary calculus from Norbert Wiener. One day he asked for questions about the homework. A student raised his hand and said that he knew the answer to a particular problem because it was in the back of the book, but “would Professor Wiener please work the problem” because the student could not see how to do it. Wiener nodded, paced back and forth, at the front of the classroom for a moment, turned to the board, and wrote the answer. “I know the answer,” the student reminded him. “But how do you work the problem?” Wiener nodded apologetically, briefly paced back and forth again, then turned to the board and wrote the answer a second time. The student became upset, whereupon Wiener, out of patience, exploded. “What do you want? I’ve worked the problem two different ways for you!”

Both Struik and Wiener appreciated the deep role mathematics has played in the evolution of civilization. One day I was in Struik’s office when Wiener tapped on the door and Struik invited him in. They sat on the only two chairs in the small office, and I sat on the floor in a corner. The two great men launched into a wide-ranging discussion about scientific developments in twelfth-century Europe, ignoring me completely. Finally Wiener ended a monologue with the expression “Cœur de Lion.” He then turned to me, bent down and said, “Richard the Lionhearted.”

—H. L. Resnikoff

RSI, SPUR, PRIMES, and PRIMES Circle

PRIMES (Program for Research in Mathematics, Engineering and Science) is starting its third year with tremendous momentum and success. This program gives local area high school students an opportunity to work with MIT researchers on exciting unsolved problems in mathematics, computer science, and computational biology. RSI and PRIMES students have been recognized with numerous honors for their accomplishments. Recently David Ding and Xiaoyu He won Davidson Fellowships. All 2012 Siemens regional finalists were PRIMES students. Thanks to Chief Research Advisor Pavel Etingof and Program Director Slava Gerovitch for these wonderful results.

In the fall of 2012, PRIMES opens a new section, PRIMES Circle, for talented sophomores and juniors from public high schools of Boston, Cambridge, and Somerville. The Circle students will work under the guidance of MIT undergraduate student mentors to study mathematics beyond the high school curriculum. The students will practice problem solving, expository writing, and presentation skills. The goal of this program is to increase diversity in the mathematics community by helping strong students with disadvantaged backgrounds develop their interest in mathematics and set them on a path toward pursuing a math major in college.

Dr. Chelsea Walton, an NSF postdoctoral researcher and Mathematics Department Moore instructor, is the PRIMES Circle Program Coordinator.

In Memory of Daniel Quillen

The world lost a great mathematician on April 30, 2011, with the passing of Daniel Quillen. Quillen began at MIT as a Moore Instructor in 1964 and served as Professor of Mathematics from 1971 to 1984, when he left for Oxford University. In 1978 he won the Fields Medal for his work on the cohomology of groups and the creation of higher algebraic K-theory. While at MIT, he was known for his beautifully crafted courses. He enjoyed teaching 18.075 Mathematical Methods for Scientists and Engineers, using Francis Hildebrand’s book.

MIT hosted a conference in memory of Dan Quillen over the Columbus Day weekend: http://math.mit.edu/quillen. Thirteen speakers and about 150 participants discussed current research in some of the areas deeply influenced by Quillen’s work.

Upcoming


MIT Department of Mathematics

Department of Mathematics
Massachusetts Institute of Technology
Building 2, Room 236
77 Massachusetts Ave.
Cambridge, MA 02139-4307

Telephone: 617-253-4831
Fax: 617-253-4858
Web: math.mit.edu