ContinuUM

Newsletter of the Department of Mathematics at the University of Michigan 2007

Bass Wins National Medal of Science

University of Michigan Mathematics and Education Professor Hyman Bass received the nation's highest science honor from President George Bush during a July 27 ceremony at the White House. A video of the ceremony is available on the U-M website http://ummedia04.rs.itd.umich.edu/~nis/Bass.mov.

Bass was one of eight National Medal of Science laureates honored. He is the Roger Lyndon Collegiate Professor of Mathematics in the College of Literature, Science, and the Arts, and Professor of Mathematics Education in U-M's School of Education.

Bass is the first U-M researcher to win the honor in 21 years. Five other U-M researchers won the award between 1974 and 1986 for their work in engineering, biological sciences and physical sciences. Bass is the only U-M winner to represent the fields of math and education.

The award citation for Bass states: "For his fundamental contributions to pure mathematics, especially in the creation of algebraic K-theory, his profound influence on mathematics education, and his service to the mathematics research and education communities. With his unique combination of gifts he has had enormous impact over the course of a half century."

"Professor Bass's work is a wonderful example of a gifted mathematician and researcher in the College of Literature, Science, and the Arts working collaboratively with his colleagues in the School of Education to advance mathematical research and teaching skills," said LSA Dean Terrence J. McDonald. "We are very pleased that his work is being recognized with the prestigious award."

Bass said he was "very honored" by the recognition. "My work in mathematics education, with Deborah Ball, Dean of the School of Education, and her researchers, is focused on the problem of helping teachers provide quality mathematics instruction for the full diversity of students in American classrooms," Bass said. "Working together we have focused on the mathematical demands at the elementary level and what this implies about the mathematical knowledge needed for teaching."

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View from the Chair's Office

Tony Bloch

The 2006-2007 academic year was an eventful and exciting one for the Department of Mathematics. The current quality of the Department is reflected in the range and scope of our activities: numerous seminars, exciting colloquia, and interesting conferences. During this past academic year we had 21 long-term visiting scholars, and more than 160 short-term visitors. In addition our faculty members presented numerous lectures at exciting venues all over the U.S. and the world.

Department members organized numerous conferences on various subjects: Algebraic Geometry, Financial Engineering, Teichmueller Theory, and Scientific Computing. There was also the Canary Fest, a series of workshops on Geometry and Topology in celebration of Dick Canary's 45th birthday.

Our weekly colloquium series was very successful, featuring several distinguished University of Michigan alumni, as well as five Fields Medalists.

We were fortunate to have had two excellent visiting lecture series last year: Jerrold Marsden, the Carl F. Bruan Professor of Control and Dynamical Systems at Caltech, gave the Ziwet Lectures in September 2006, on various topics in mechanics including invariant manifolds and coherent structures, numerical integrators, and geodesic flows on finite- and infinite-dimensional groups. Philip Holmes of Princeton University presented the Rainich lectures in November, on neural oscillators, stochastic dynamics, and optimal decisions.

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Notes from the Chair

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The 2007-08 academic year also promises to be exciting with upcoming lecture series including those by Curtis McMullen and Gang Tian, and a colloquium talk by Fields Medalist Vaughan Jones, among others.

We have a remarkable faculty who continue to be recognized both internally and externally. During the 2007-08 academic year, the math department has 68 regular tenured/tenure-track members, 5 non-tenure-track members, and 58 three-year post-graduate positions. One measure of our excellence is that our faculty members currently hold more than 141 federal grants for their research. Other outstanding accomplishments by our faculty are detailed within this newsletter.

As a result of the strength of our faculty, we face intense outside pressure in the form of external recruitment. We were sorry to lose members of our number theory group. However I am happy to report that we were fortunate to retain many of our wonderful faculty in the face of enticing external offers. On the recruitment front we are delighted to welcome as new Assistant Professors in the fall, Volker Elling, who works in partial differential equations, and Victoria Booth, who works in neuroscience and holds a joint appointment in Anesthesiology.

We are happy to welcome two distinguished Gehring Visiting Professors, Keith Ball from University College, London and Blake Temple, from UC Davis. Joseph Marker has joined the Department as the Carl H. Fischer Visiting Professor in Actuarial and Financial Mathematics.

We are proud of our distinguished retired faculty and staff. Recently we were pleased to recognize Lee Zukowski at the Emeritus luncheon by dedicating a plaque for the Mathematics Learning Center (a.k.a. MathLab) in his honor. Lee served the Department wonderfully for many years, both as a valued staff member and as a dedicated teacher and tutor. After his retirement he continued his much appreciated work in the Math Lab. We are very happy to honor him.

We are sad to report that we lost two Professors Emeriti this year, Robert Bartels, who made tremendous contributions to computing at Michigan, and Tom Storer, who will be remembered as a most extraordinary teacher. We would like to remember them here (see page 12).

No report of the Mathematics Department is complete without a mention of our student body. This comprises 139 graduate students and approximately 340 math concentrators. In the fall 2006 term, 7,119 students were enrolled in math courses. In the winter term 2007 there were 5,211 such students. We graduated 133 undergraduate math majors in 2007, and 36 new Ph.D. and Masters graduate students started their degrees in the fall of 2007. There are many outstanding students, several of whom have won the prizes which are awarded internally every year. One of our 2006 Ph.D. graduates, Sam Payne, is currently a Clay Research Fellow at Stanford.

Of course, we are very grateful to the valued alumni of our Department. Our development and fund raising efforts have been successful thanks to the much appreciated generosity of our loyal alumni. Our annual alumni fund-raising letter consistently raises a much needed $16,000 to $20,000. This year these funds allowed us to provide scholarship support to 2 undergraduate students and summer support to 3 graduate students.

What the Department needs more than anything else, at the moment, is endowed chairs. We would like to thank Susan Smith for her funding of an actuarial and financial mathematics chair (sse page 16).

We continue our affiliation with the Inquiry Based Learning program, a program which funds exciting new innovations in teaching, as detailed on page 10.

We are extremely grateful to all who, with their contributions, help to make our Department such an excellent place for teaching, learning, and research.

Bass Medal of Honor

(continued from page 1)

After a 40 year career as a faculty member at Columbia University, Bass joined U-M in 1999. He was named a Collegiate Professor shortly after arriving at Michigan. His research in algebra and geometric group theory has shaped the development of these areas in the last decades. Bass's work has enormous breadth and includes ring theory, commutative algebra, the Jacobian problem, combinatorial group theory, as well as his foundational work in algebraic K-theory. His recent mathematical research has emphasized geometric methods and group theory, including group action on trees and the discrete subgroups of Lie groups. Bass has received much recognition for his mathematical contributions, including election to membership in the National Academy of Sciences in 1982.

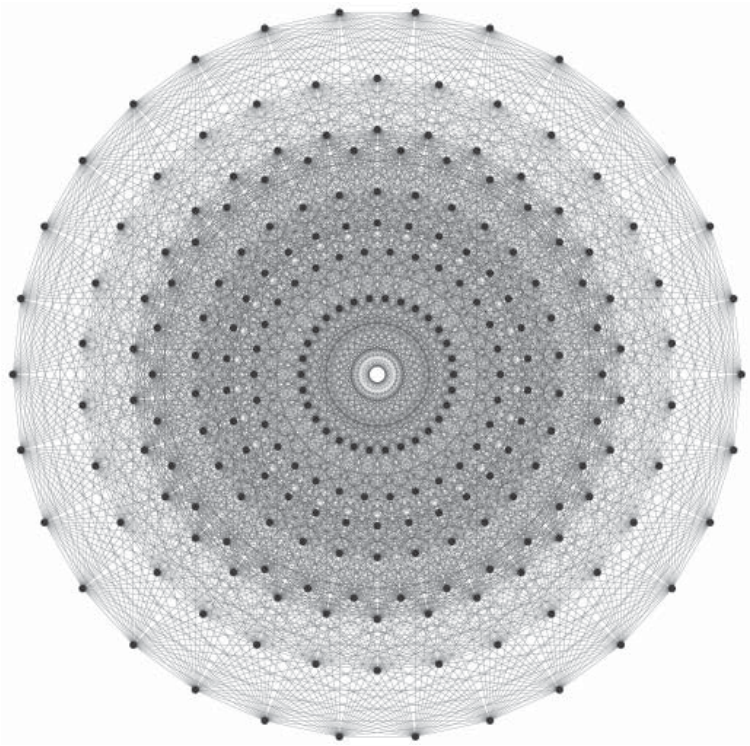
Bass served a two-year term as President of the American Mathematical Society from 2001-2003. He was instrumental in the formation and administration of the Mathematical Sciences Research Institute in Berkeley, CA. In recent years, Bass has taken a leadership role in mathematics education, serving as chair of the Mathematical Science Education Board and president of the International Commission on Math Instruction, which is the educational counterpart of the International Mathematical Union.

The National Medal of Science, established in 1959, honors individuals for pioneering scientific research in a range of fields that enhance understanding of the world and lead to innovations and technologies that give the United States its global economic edge.

See more news of the University of Michigan Department of Mathematics on our website www.math.lsa.umich.edu

Mapping of E_8

Professor of Mathematics John Stembridge is a member of an international team of 18 mathematicians and computer scientists who successfully have mapped the Lie group E_8, one of the largest and most complicated structures in mathematics. The E_8 calculation is so large it would cover Manhattan if it were written out on paper, according to the American Institute of Mathematics (AIM).



A graphic depiction of the E_8 plane. Further explation is available at this website: http://www.math.lsa.umich.edu/~jrs/coxplain.html

One of the most symmetrical mathematical structures in the universe, E_8 is an example of a Lie group. Lie groups were invented by the 19th century Norwegian mathematician Sophus Lie to study symmetry. Underlying any symmetrical object, such as a sphere, is a Lie group. Balls, cylinders or cones are familiar examples of symmetric three-dimensional objects. Mathematicians study symmetries in higher dimensions. In fact, E_8 is the group of symmetries of a geometric object like a sphere, cylinder or cone, but the object in this case is 57-dimensional. E_8 itself is 248-dimensional. For more technical details on E_8 visit http://www.liegroups.org/AIM_E8/technicaldetails.html.

"E_8 was discovered over a century ago, in 1887, and until now, no one thought the structure could ever be understood," says Jeffrey Adams, project leader and mathematics professor at the University of Maryland. "This ground breaking achievement is significant both as an advance in basic knowledge, as well as a major advance in the use of large scale computing to solve complicated mathematical problems. The mapping of E_8 may well have unforeseen implications in mathematics and physics which won't be evident for years to come."

"We've determined the basic building blocks that are needed to understand how E_8 is represented in nature," says Stembridge. "This could lead to better understanding of the physical models of the universe."

Stembridge says the way the calculation was achieved—by a group of 18 mathematicians and computer scientists working in intensive collaboration for four years—also is a significant breakthrough. "Mathematicians more typically work in groups of one, two or three," Stembridge says. "We have a large group spread all over the U.S. and in France. That is unusual."

The magnitude and nature of the E_8 calculation invites the comparison with the Human Genome Project, according to AIM. The human genome, which contains all the genetic information of a cell, is less than a gigabyte in size. The result of the E_8 calculation, which contains all the information about E_8 and its representations, is 60 gigabytes. This is enough to store 45 days of continuous music in MP3 format.

The computation required sophisticated new mathematical techniques and computing power not available even a few years ago. While many scientific projects involve processing large amounts of data, the E_8 calculation is very different, as the size of the input is comparatively small, but the answer itself is enormous and very dense.

The E_8 calculation is part of an ambitious project sponsored by AIM and the National Science Foundation, known as the Atlas of Lie Groups and Representations. The goal of the project is to determine the unitary representations of all the Lie groups (E_8 is the largest of the exceptional Lie groups). This is one of the most important unsolved problems of mathematics. The E_8 calculation is a major step, and signals that the Atlas team is well on the way to solving the problem, mathematicians say.

Stembridge says the mapping of E_8 also will create opportunities for students at U-M. "Students might get to work on a cool problem as part of this project."

Stembridge received his Ph.D. in 1985 from MIT. He spent three years as an E.R. Hedrick Assistant Professor at UCLA prior to joining U-M in 1988, and has held Sloan and Guggenheim Fellowships, as well as a Presidential Young Investigator award from the NSF.

He is recognized as a leader in the field of algebraic combinatorics, and has a special interest in representation theory, Coxeter groups, root systems, symmetric functions, and enumeration, as well as in computational problems that arise in these areas.

Faculty Achievements

Fomin Named Collegiate Professor

Professor Sergey Fomin has been named a Collegiate Professor in the College of Literature, Science and the Arts. His professorship will be named in honor of Robert M. Thrall, who was a U-M Mathematics faculty member for 32 years.

R. M. Thrall (1914-2006) joined U-M as an instructor in mathematics in 1937. He became Associate Professor in 1948 and Professor in 1956. He received the Henry Russel Award (1948-49) and the Distinguished Faculty Award (1965). Thrall left Michigan in 1969 to become the founding chairman of Rice University's Department of Mathematical Sciences.

Thrall began his career as an algebraist, making seminal contributions to ring theory, representation theory, and algebraic combinatorics. In the 1940s, he became interested in the emerging field of discrete applied mathematics, and gradually became a widely recognized scholar in operations research and management science. He was the President of the Institute of Management Sciences (TIMS) in 1969-70, and received TIMS's Distinguished Service Medal in 1985. In 2002, he became one of the inaugural Fellows of the Institute for Operations Research and the Management Sciences.

Fomin received his Ph.D. in 1982 from St. Petersburg State University in Russia. He was a faculty member at MIT for 7 years before joining U-M in 1999 as an Associate Professor, and was promoted to Professor in 2001.

Fomin's main research area is combinatorics, especially its applications in representation theory, algebraic geometry, and other areas of mathematics. In recent years, his research has revolved around cluster algebras, total positivity, and Schubert calculus. In particular, his discovery of cluster algebras, made jointly with A. Zelevinsky, has impacted several areas of mathematics.

Griess Elected to AAAS

Professor Robert L. Griess was elected a member of the prestigious American Academy of Arts and Sciences in April, 2007. The Academy honors distinguished scientists, scholars, and leaders in public affairs, business and the arts. Fellows are selected through a highly competitive process that recognizes individuals who have made preeminent contributions to their disciplines and to society at large.

The AAAS citation notes that Griess is best-known for the construction of the Monster sporadic finite simple group. Construction was accomplished by Griess, not only for the first time, but also entirely by hand without the aid of a computer. Discovery of this group has touched science and mathematics very deeply. Connections have emerged with areas as diverse as string theory in physics and, within mathematics itself, in very sophisticated number theory.

In 1973, Bernd Fischer and Robert Griess independently found evidence for the existence of a sporadic group of order $2^{46}\,3^{20}\,5^{9}\,7^{6}\,11^{2}\,13^{3}\cdot 17\cdot 19\cdot 23\cdot 29\cdot 31\cdot 41\cdot 47\cdot 59\cdot 71 = 808017424794512875886459904961710757005754368000000000$. A sporadic group is a finite simple group outside the known infinite families (such as classical groups over finite fields). The first sporadic groups were the five Mathieu groups, found in the 19th century. During the period 1965-1975, twenty-one more sporadic groups were found. They exist because of special number-theoretic, combinatorical and algebraic accidents or special situations. No single theory explains them. A complete and well-understood list of finite simple groups was important to classification program for the finite simple groups. It was not clear how to work with such a large, special finite simple group. On his 1979-80 sabbatical from U-M at the Institute for Advanced Study, Griess found new theories to manage the analysis. The group was constructed as rational matrices in dimension 196883. A recent book by Mark Ronan entitled "Symmetry and the Monster, one of the Greatest Quests of Mathematics" concerns the history of simple groups and gives more details about the sporadic groups for a general mathematical audience.

The research of Professor Griess has involved the classification of finite simple groups, group cohomology, finite aspects of Lie theory and algebraic group theory, nonassociative algebras, lattices in Euclidean space and vertex operator algebras. The 196884-dimensional algebra associated to the Monster has taken on a life of its own, being known as the Griess algebra.

Griess received his Ph.D. from the University of Chicago in 1971. He came to U-M as a Hildebrandt Research Instructor in 1971, and was named Professor in 1981. He received a Guggenheim Fellowship in 1981, presented an invited address at the International Congress of Mathematicians in 1983 and received the Harold R. Johnson Diversity Service Award from the University of Michigan in 2003. The latter award was due to his expanding the Mathematics Department's minority outreach program. Math students and faculty hosted up to four hundred middle school students annually in the U-M's King-Chavez-Parks visitation program. This was the highest level of academic unit participation at the University.

Lazarsfeld Named Collegiate Professor

Professor Robert Lazarsfeld has been named a Collegiate Professor in the College of Literature, Science and the Arts. His professorship will be named in honor of Raymond Wilder, a member of the UM Mathematics faculty from 1926 to 1968 who did pioneering research in topology, and was instrumental in bringing

the department to international prominence. Wilder died in 1982.

After receiving his Ph.D. from Brown University in 1980, Lazarsfeld was a Benjamin Pierce Instructor at Harvard. He joined the faculty of UCLA in 1983, and was promoted to professor there in 1987. He moved to Michigan in 1997. Lazarsfeld won an AMS Research Fellowship in 1980, a Sloan Research Fellowship in 1984, and a five-year Presidential Young Investigator Award in 1985. He was awarded a Guggenheim Fellowship in 1998, and was elected to the American Academy of Arts and Sciences in 2006. In 2005 Lazarsfeld was the Colloquium Lecturer at the annual meeting of the American Mathematical Society—the most distinguished series of lectures sponsored by the Society. Lazarsfeld has served on several editorial boards. Since 2002 he has been one of five editors of the Journal of the American Mathematical Society (JAMS), the premier publication of the AMS, regarded as one of the most prestigious mathematics journals and recently ranked first in terms of its impact on mathematics. He became managing editor of JAMS this year.

Throughout his career, Lazarsfeld has been recognized as a leader in the field of Algebraic Geometry. The field uses geometric methods to study systems of polynomial equations in several variables. In recent years, Lazarsfeld has focused on applying ideas and techniques from higher-dimensional geometry to a number of concrete algebraic and geometric problems. He and his colleagues have helped to develop the theory of multiplier ideals, which are playing an important role in the geometry of higher dimensions. Lazarsfeld recently published a two-volume monograph entitled Positivity in Algebraic Geometry, which summarizes research development in the area over the past 20 years. The books have already formed the basis for courses and seminars at several universities throughout the U.S. and Europe.

While at U-M, and previously at UCLA, Lazarsfeld directed 16 graduate students, several of whom are themselves becoming leaders in the field. He has been instrumental in developing a strong postdoctoral program in algebraic geometry, providing mentoring to some of the best young mathematicians starting their careers at U-M. In 1999 Lazarsfeld was the leader in designing and writing a grant proposal to the National Science Foundation for a five-year VIGRE (Vertical Integration of Research and Education) program that provided $1 million per year in support for graduate students and postdocs. He continued as Director of VIGRE here, designing and administering program activities that were recognized as innovative by the NSF. More recently he was instrumental in securing a Research Training Grant that will provide $2.5 million over a five year period.

Esedoglu Receives Sloan

Assistant Professor Selim Esedoglu has been awarded an Alfred P. Sloan Fellowship, an extraordinarily competitive award involving nominations of the very best young scientists from around the country.

Mustata Receives Packard

Associate Professor Mircea Mustata received a Packard Fellowship for Science and Engineering. These extremely competitive Fellowships, awarded annually by the David and Lucille Packard Foundation, recognize and support outstanding young scientists early in their careers. Mustata is working on a project using techniques such as spaces of arcs, D-modules or positive characteristic techniques to understand questions on invariants of singularities coming from the classification theory of higher dimensional varieties.

Faculty Promotions

Peter Miller was promoted to Professor.

Anna Gilbert was promoted to Associate Professor wth tenure.

Kristen Moore was promoted to Associate Professor wth tenure.

Divakar Viswanath was promoted to Associate Professor wth tenure.

New Faculty Members

Assistant Professor Victoria Booth

Booth came to U-M in 2004 on an NSF ADVANCE award with a joint appointment in Math and Anesthesiology. She will continue her joint appointment on the tenure track within the Applied and Interdisciplinary Mathematics program. Booth received her Ph.D. in applied mathematics from Northwestern in 1993. She was a researcher at the National Institutes of Health, and then joined the faculty of the New Jersey Institute of Technology. Booth studies mathematical and biophysical modeling of the electrical firing behavior of neurons. She develops and analyzes models based on electrophysiological data. The research entails mathematical analysis of neural models using singular perturbation techniques, bifurcation theory and methods of nonlinear dynamics.

Assistant Professor Volker Elling

Elling received his Ph.D. from Stanford University in 2005. He was a Prager Assistant Professor of Mathematics at Brown University prior to coming to U-M. Elling's research is concerned with the study of the partial differential equations which occur in the theory of gas dynamics. He has worked on numerical computation of solutions, rigorous mathematical analysis of numerical algorithms and on proving existence theorems for solutions.

Recent Ph.D. Recipients

Mahesh Agarwal completed the dissertation "*p-L* Function for *GSp*(4) x *GL*(2)" under the direction of Chris Skinner. Mahesh will be a postdoctoral fellow at McMaster University.

Amy Bauer completed her dissertation "A Multi-Scale Cell-Based Model to Simulate and Elucidate the Mechanisms Controlling Tumor-Induced Angiogenesis" under the direction of Trachette Jackson. She will be a postdoctoral research associate at Los Alamos National Laboratory.

Bryden Cais completed his dissertation "Correspondences, Integral Structures, and Compatibilities in p-adic Cohomology" under the direction of Brian Conrad. He will be a postdoctoral fellow at Centre de Reserches Mathematiques in Montreal, Canada

Mark Conger completed his dissertation "Shuffling Decks with Repeated Card Values" under the direction of Divikar Viswanath.

Sarah Crown completed her dissertation "The Homology of the Cyclic Coloring Complex of Simple Graphs" under the direction of Phil Hanlon. She will be an Assistant Professor at Dennison University.

Hualong Feng completed the dissertation "Vortex Sheet Simulations of 3D Flows Using an Adaptive Triangular Panel/Particle Method" under the direction of Robert Krasny. Hualong will be an instructor at Huaihai Institute of Technology in China.

Sukmoon Huh completed the dissertation "Moduli Spaces of Stable Sheaves on a Plane and an Embedded Curve" under the direction of Igor Dolgachev. Sukmoon will be a researcher at Korea Institute for Advanced Study.

Paul Jeray completed his dissertation "Explicit Matrix Representations for Type D Coxeter Groups" under the direction of John Stembridge.

Rizwanur Khan completed the dissertation "Non-Vanishing of the Symmetric Square L-function" under the direction of Kannan Soundararajan. Rizwanur will be a NSF Postdoctoral Fellow/Hendrick Assistant Professor at UCLA.

Hyekyung Min completed the dissertation "Stochastic Control Models of Optimal Dividend and Capital Financing" under the direction of Joe Conlon. Hyekyung will be a postdoctoral fellow at the University of California Santa Barbara.

Charles Mueller completed his dissertation "On the Varieties of Pairs of Matrices Whose Product is Symmetric" under the direction of Mel Hochster.

Alvaro Pelayo completed his dissertation "Symplectic Torus Actions" under the direction of Alejandro Uribe. He will be a NSF postdoctoral fellow at MIT.

Feng Rong completed his dissertation "Critically Finite Maps, Attractors and Local Dynamics" under the direction of John Erik Fornæss. He will be a postdoctoral fellow at Syracuse University.

Khachik Sargsyan completed the dissertation "First Passage Times in the Near-Continuum Limit of Birth-Death Processes" under the direction of Charlie Doering. Khachik will be a research postdoctoral fellow at Sandia National Laborary.

Matthew Smith completed his dissertation "On Solution-Free Sets for Simultaneous Additive Equations" under the direction of Trevor Wooley. He will be a postdoctoral instructor at the University of Georgia.

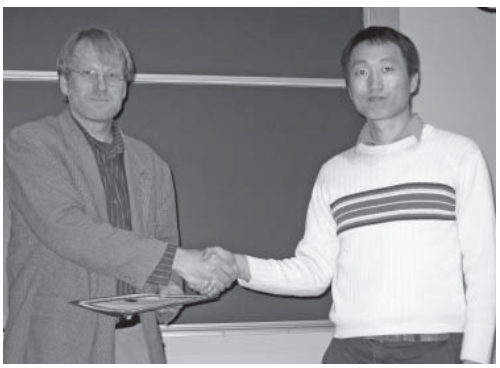
Andrew Stein completed his dissertation "Mathematical Models for Glioblastoma Invasion in Vitro" under the direction of Trachette Jackson. He will be a postdoctoral fellow at the Institute for Math and its Applications.

Janis Stipins completed his dissertation "On Finite *k*-Nets in the Complex Projective Plane" under the direction of Igor Dolgachev. He will be a software engineer at Google.

Ellen Veomett completed her dissertation "The Computational Complexity of Convex Bodies" under the direction of Alexander Barvinok. She will be an assistant professor at California State University.

Kevin Wildrick completed his dissertation "Quasisymmetric Parameterizations of Two-Dimensional Metric Spaces" under the direction of Mario Bonk. He will be a postdoctoral research fellow at the University of Jyväskylä.

Eric Zupunski completed his dissertation "A Bound on the Complexity of the JSJ Decomposition in the Bounded Case" under the direction of Peter Scott.



Professor Juha Heinenen with (l-r) Kevin Wildrick, Mark Conger and Feng Rong at the Mathematics Awards Ceremony.

2006-07 Graduate Program Fellowships & Awards

Alice Webber Glover Math Fellowships

Taeyong Ahn
Xueying Hu
Wansu Kim
John Mackay

Arthur Herbert Copeland, Sr. Memorial Scholars

Russell Golman
Darragh Rooney

Cameron & John Courtney Scholarship

Nathan Totz
Crystal Zeager

CONACYT Fellowship

Gerardo Hernandez

Fulbright Scholarship

Richard Vasques

G. Cleaves Byers Endowment

Brian Jacobson
Craig Spencer
Hao Xing

Lucent Fellowship

Ellen Eischen

Luther Claborn Mathematics Fellow

Kyle Ormsby

Mathematics Alumni Scholarship

Eugene Einsenstein
Ashley Selegue
Lindsey Selegue

Mathematics Department Graduate Fellowship

Catherine Dupuis
Timothy Ferguson
Leo Goldmakher
Geri Izbicki
Brian Jennings
Harlan Kadish
Ryan Kinser
Austin Shapiro
Paul Shearer
Benjamin Weiss
Nina Shite

Mathematics Scholarship Fund

Nicholas Rupprecht

National Physical Science Consortium Fellowship

Marie Snipes

National Defense Science and Engineering Graduate Fellowship

Brian Wyman

National Science Foundation Fellows

David Constantine
Ellen Veomett

Natural Science & Engineering Research Council of Canada Scholarship

Luis Serrano
Xinyun Sun

Rackham International Fellowship

Zhengjie Xu

Rackham One-Term Dissertation Fellows

Sara Heusel
KyungYong Lee
Giancarlo Urzua

Rackham Predoctoral Fellows

Bryden Cais
Alvaro Pelayo

Rackham Science Award (RSA)

Jonathan Bober
Aubrey da Cunha
Oscar Gernandez
Tamara Flournoy
Daniel Hernandez
Ricardo Portilla
Felipe Ramirez
Chelsea Walton

Regents' Fellowship

Johanna Mangahas

Research Training Grant (RTG) Algebra

David Anderson
Kyle Hofmann
Yogesh More
Hannah Robbins
Susan Sierra
Joe Stubbs
Kevin Tucker

Research Training Grant (RTG) Geometry

Jasun Gong
Christopher Hammond
Diane Vavrichek
Marshall Williams

2006 Sumner B. Myers Memorial Prize for the Best Thesis

Yann Bernard
Samuel Payne

Graduate Departmental Scholarship Spring 2007

Clara Blakelock
Henry Boateng
Kelli Carlson
Sohhyun Chung
Jiarui Fei
Jose Gonzalez
Mark Iwen
Stephanie Jakus
Fidel Jimenez
Paul Johnson
Shin-Yao Jow
Brian Jurgelewicz
Hyosang Kang
Daniel Kneezel
Marc Krawitz
Cagatay Kutluhan
Michelle Lee
Michael Lieberman
Victor Lozovanu
Aaron Magid
Ray Maleh
Gregory McNulty
Ajinkya More
Tomoki Ohsawa
Jordan Sahattchieve
Alan Stapledon
Elizabeth Twentyman
Giancarlo Urzua
Liz Vivas
Ting Wang
Emily Witt
Szymon Wojczyszyn
Qian Yin
Hsu-Wen Young

Congratulations to our 2006-07 Mathematics Bachelor of Arts/Science Degree Recipients

Mohd Abd Rahim
Heather Abraham
Ruchir Agarwal
Matthew Arnold
Thomas Babinec
Emily Beam
Matthew Becker
Marc Bell
David Benjamin
Stephanie Bercaw
Daniel Blazevski
Janai Brodnax
Bradley Bykowicz
Richard Chang
Thomas Choi
Mi Ra Cho
Yen Leng Chua
Andrew Clark
Andrew Coleman
Aalok Dave
Fernando Delgado Salas
Michael Dobbs
Andrew Douglass
Jeffrey Druce

Ryan Edgar
Brendon Eisner
Keary Engle
Anthony Fader
Ryan Fisher
Benin Fitzpatrick
Hau Voon Foo
Ashley Frazier
Jujhar Gahley
Yuan Geng
Jennifer Gerber
Joseph Golden
Varun Gupta
Melissa Halfon
Thomas Halvorson
Christopher Hankinson
Adam Hanlon
Shannyn Hart
Christine Henderson
Daniel Hidlay
Lisa Houston
Ashley Hovenkamp
Joe Hsieh
Ann Hughes
Julie Inwood
YuanYuan Jiang

David Kalita
Arman Kayupov
Noora Kazanji
Jacob Ketchum
Muhammad Khairir
Katherine Kiefer
Andrew Kirchner
Melinda Kleczynski
Nicole Klever
Wei Heong Koh
Robert Kovats
Esha Krishnaswamy
Sudono Kusuma
Lakeita Larkins
Edward Lee
Jaekeun Lee
Ji Hyun Lee
Sean Lenhard
Lisa Lentz
Wing Ki Leung
Huey Fang Lim
Kevin Ly
John Madonna
Christopher Marsh
Laura Matney
Joshua Maurice
Michael Mayhew

Betty McColor
Kyle McGuffin
Timothy McMillen
Caitlin McNicholas
Rebecca McQuillan
Michael Miller
Ruth Miller
Alexander Mirkin
Rohin Moza
Alexander Nagle
Danny Ng
Mui Keng Oh
Jeffrey Parker
Anthony Pinter
Nicholas Posavetz
Rupert Pun
Ethan Rein
Danielle Rogers
David Sabatini
Hanis Syahrilla Salim
Ryan Scharwath
Geum Chu Seo
Marc Sherman
Liza Shiffman
Paul Siegel
Daniel Sikora
Nicole Smith
Noah Smith

Rachel Snider
Jiesi Song
Elena Spatoulas
Nathan Stiennon
Joseph Stierman
Ethan Street
Brandon Strom
Zachary Szpiech
Ya-chin Tang
Cameron Thomas
Ernest Travis
Stephanie Trezza
Gina Uhrich
Elisabeth Uible
Alison VanDerKolk
Nathan Wade
Julie Waldman
Allen Weiss
Richard White
Tiffany Wong
Erin Wood
Lindsey Worcester
Natalie Wowk
Zhenghao Wu
Lin Ye
John Yoon
Ahmad Idzuddin Yusuf
William Zasadny
Meng Zhong

Clockwise from top left: Professor Stephen DeBacker with Allison Frayer; Paul Siegel with Professor Stephen DeBacker; Professor Harm Derksen with Jeffrey Madsen; Professor Curtis Huntington with Voon Seng Lai; David Benjamin with Professor Harm Derksen.

2007 Undergraduate Award Recipients

The Department's team for the William Lowell Putnam Mathematics Competition placed 22nd out of 401 teams in the event. This year's team was comprised of **Fernando Delgado Salas, Timothy Heath** and **Jeffrey Madsen.** The individual competition included 3640 students from across North America. **Timothy Heath** placed the highest of UM students at 140. **David Benjamin** and **Jeffrey Madsen** also finished in the top 200.

The winner of the 24th Annual University of Michigan Undergraduate Mathematics Competition was **Jeffrey Madsen**, who also won last year. **Timothy Heath** placed second and **Zili Huang** came in third.

The following students received **Mathematics Alumni/Alumnae Scholarships** for the 2006-07 academic year:

SeHyoun Ahn
Zachary Maddock

The following students received **Evelyn O. Bychinsky Awards,** which recognize underclass students who show exceptional promise in mathematics:

SeHyoun Ahn
Sam Espahbodi
Allison Frayer
Timothy Heath
Jeffrey Madsen

The following students received **Margaret S. Huntington Awards in Actuarial Outreach:**

Hui Ying Chin
Athena Eyster
Su Jane Ling
Johnson Mei
Philip J. Minaudo
Steven Moses
Meelap Shah
Rebecca Sunde
Tiago Szvarca
Wan Ying Teoh

Paul Siegel received the **Leon P. Zukowski Prize** for outstanding service in the Mathematics Learning Center (formerly known as the MathLab).

The **William LeVeque Award in Number Theory** was presented to **Zachary Maddock**. The award recognizes a student who is at most a junior and excels in the study of number theory.

The Sumner Myers Award in Analysis was awarded to **Richard William Turner**.

Outstanding Achievement in Mathematics Awards went to the following seniors:

Thomas Babinec
Emily Beam
Matthew Becker
David Benjamin
Daniel Blazevski
Andrew Clark
Wei Heong Koh
Huey Fang Lim
Rupert Pun
Noah Smith
Richard White

The **Otto Richter Memorial Prize in Actuarial Science** was presented to **Wei Heong Koh**.

The **CIGNA Award in Actuarial Science** was presented to **Kai Kiat Chooi**.

The **Irving Wolfson Award in Actuarial Science** was presented to **Voon Seng Lai**.

The **Lois Zook Levy Memorial Award** was presented to **Rachel Snider**. The award recognizes an outstanding Mathematics student who plans to pursue a career in K-12 Mathematics education.

The following students were named **Michigan Mathematics Merit Scholars**:

Fernando Delgado Salas
Melinda Kleczynski
Nathan Stiennon

Michael Miller and **Ethan Street** were named the **Outstanding Graduating Seniors.**

Kevin Wilson received the **Wirt and Mary Cornwell Prize**, recognizing a student who has demonstrated the greatest intellectual curiosity, given the most promise of original study and creative work in math, and also shows an interest in music.

Professor Curtis Huntington with Margaret S. Huntington prize winners Wan Ying Teoh, Meelap Shah, Hui Ying Chin, Athena Eyster, Su Jane Ling and Steven Moses.

Inquiry Based Learning at Michigan

Linear algebra MATH 372. East Hall 931 at 9 am: The students gather for their class. Professor Algamma enters, returns work, states today's topic, and slowly and carefully proceeds with stating the theorem of the day and explaining its meaning. Then Professor Algamma gives its proof. Possibly an application follows. Once in a while a brave student asks a question which gets a brief answer.

This is your typical good math class. Most learning happens when students do their homework and try to use the ideas and tools they heard about in class. It's a good way to learn and excellent at transmitting lots of information. However, it's a very passive way of learning, and provides little opportunity to train mathematical and more generally analytical thinking. Real understanding of concepts often falls behind the learning of particular techniques. While the latter is important, especially for applications, it is really the proper understanding of the concepts that will allow for creative applications of the tools. This is particularly true in this day and age of sophisticated computer programs that can do even complicated mathematical tasks in a split second. Understanding the meaning of the concepts behind these techniques, what they do for an application, is becoming more and more important.

As an antidote, the Department has invested in an alternate way of learning, Inquiry-Based Learning (IBL), that will supplement our many traditional classes. About three years ago, the Department started its Center for Inquiry Based Learning. It is one of five national centers of this kind which were established with initial funding from foundations, private sources and the universities involved. Other centers are at the University of Chicago, Harvard University, the University of Texas and UC Santa Barbara.

IBL classes engage the students in ways not normally seen in a typical undergraduate course. They use discovery, analysis, and investigation to gain sophisticated understanding of the subject matter and its applications. Students learn through guided exploration with the help of experienced instructors and assistants. Actual implementation of this technique varies greatly. The goal however is always the same: get the students to think and understand mathematics on their own, with the help and guidance of the instructors. To achieve this goal, we use enriched homework sets, group work both inside and outside of class, experimentation with computers in a lab as tools. Interaction between the students, and with the instructors is crucial. To make this possible, we often have assistants help teach these classes. The numerous benefits include increased availability of instructors and training of postdoctoral fellows and graduate students in this learning method.

We currently offer five classes in our IBL program. They are directed at a wide range of interests: MATH 175: introduction to Cryptology is a Freshman Seminar. Students learn about encrypting techniques, and en route about various number theoretic and combinatorial ideas. It is widely popular to the extent that we are offering two sections this Fall semester. MATH 351: Principles of Analysis is a core class for math majors about the underpinnings of calculus. It is heavily concept oriented and ideal for the IBL approach. Two of these classes, MATH 385 and MATH 489, are for future elementary and middle school teachers.

Our most experimental and thoroughly IBL class is MATH 389: Explorations in Mathematics. Students at all levels work on open ended yet accessible problems in groups of three or four students. The course shows the students how new mathematics is actually created: how to take a problem, make models and guesses, experiment with them, and search for underlying structure. It is suitable for students at many levels. This course serves also to develop useful skills, including how to write and typeset a math paper, making an oral presentation, and computing with a mathematics software system such as Mathematica or Maple. The problems display interesting phenomena, but do not necessarily have a particular result in mind. The students are not told precisely what to compute or to prove. This class is modeled after one taught by Professor Michael Artin (MIT) who taught it here while on sabbatical. MATH 389 has been very well received, and serves as a bridge to our undergraduate research program during the summers.

Longer term plans include expansion of our course offerings at all levels. Every mathematics major should be able to take one of these classes to get the experience of thinking mathematics at a high level. We also hope to offer a critical mathematical thinking class to non-math majors so that they are better equipped to understand important mathematical ideas and phenomena. Mathematics enters today's world in a myriad of ways, and our students need to be educated. Besides teaching IBL classes, the Center is heavily involved in training future teachers in these methods. The Department has the largest postdoctoral training program in the country, and one of the largest graduate programs. Our former students and postdocs teach at all levels in universities and colleges throughout the country, and will surely take their IBL experiences with them.

Professor Ralf Spatzier
IBL Director

Visit the IBL Website at http://www.math.lsa.umich.edu/ibl/index.html

Actuarial Program News

Enrollments in both Actuarial Mathematics and Financial Mathematics classes continue at record rates as the number of students declaring these subjects for their major grows. As a result, all of our classes are running at full capacity and whenever we add a new section, it fills up very quickly. As an example, we have more than 50 students enrolled in the core Actuarial Mathematics class (Mathematics 520) in the Fall 2007 semester.

To accommodate all of this growth, we continue to welcome new faculty members. Last year, Ahmet Duran, Ph.D. (Pittsburgh) and Semih Sezer, Ph.D. (Princeton) joined the financial mathematics faculty as postdoctoral fellows. In the Fall, 2007, Joseph Marker, FCAS joined the actuarial mathematics faculty as the Carl H. Fischer Visiting Professor, and will begin developing courses in the property and casualty insurance area, an area that we have long hoped to cover more fully. Marker's career spans over thirty years as a practicing actuary. He was Vice President and Chief Actuariy for Citizens Insurance, and Senionr Vice President and Chief Actuary with Pronational Insurance Company. Most recently he was the visiting Lincoln National Group Distinguished Professor of Actuarial Science at Ball State University, and a private consultant through Marker Actuarial Services.

Using the Weltha McLachlan Van Eenam Memorial Fund, established by Marjorie Van Eenam Butcher and her late husband, Robert W. Butcher, A. Haeworth Robertson delivered an address to a joint meeting of the Michigan Actuarial Society and the Student Actuaries @ Michigan in April 2007. Mr. Robertson, a former Chief Actuary of the Social Security Administration titled his address "Uncommon Perspectives on Social Security and Medicare." The acknowledgment for this address gives a fascinating history of the individuals involved and, once again, reinforces the extraordinary impact of the Michigan Actuarial Program over the years (see column at right). Copies of Robertson's address are available from my office upon request.

In 1963, Susan Smith graduated, with $75, from the U-M actuarial program and went on to a career at Towers, Perrin. She has recently given $1.5 million to establish the Susan Meredith Smith Professorship in Actuarial Science (see story on page 16). This creates the third endowed faculty position in Actuarial Mathematics in the Department (the others being the Nesbitt and Fischer professorships) and will allow us to add strength to our program as we recruit new faculty. Ms. Smith also gave the first Nesbitt Commencement address five years ago.

Our April 2007 Cecil J. Nesbitt Commencement Lecturer was Gabriel L. Shaheen (BA 1976, MAS 1977), Principal, NxtStar Ventures LLC. His message of listening well and getting along with people as you continue learning and serving the public was well-received by an enthusiastic audience of this year's graduates (and their families). This was the fifth event in this series and is rapidly becoming a highlight of the actuarial academic year.

The student-run club renamed themselves as the Student Actuaries @ Michigan (or SAM) a year ago. SAM maintains an active schedule of academic, sporting and social events. With more 100 members, this group is rapidly becoming one of the more active academically-focused groups on campus. This past year, CNA in Chicago hosted an on-site visit for members of the club as we continue to seek ways to expand the casualty aspects of the profession.

A meeting of the Actuarial Alumni/ae Leadership Council is scheduled for October of this year and we are looking forward to meeting the members and discussing future directions for the Michigan Program.

The faculty and students look forward to hearing from you with any comments, questions or suggestions you might have. And, if your travels bring you through Ann Arbor, please let us know so that we can host a visit with us in our East Hall home.

Curtis E. Huntington (BA 1964, MAS 1965), FSA, FCA, MAAA, APM
Professor of Mathematics
Director, Financial & Actuarial Mathematics Programs, Director MPET Program

A Family Actuarial History at U-M

Weltha McLachlan studied mathematics and graduated from the University of Michigan in 1918. She then became a qualified actuary, married Neil Van Eenam, and in 1936 became the first staff actuary of the newly enacted Social Security system, from which she retired in 1959.

Mrs. Van Eenam's daughter, Marjorie, also studied mathematics and graduated from the University of Michigan with a BA in 1947 and an MA in 1949 in (actuarial) mathematics. She married a fellow graduate student, Robert W. Butcher, and they both became qualified actuaries—at the time, a relatively rare occurrence. Weltha and Marjorie became the first, and so far only, mother-daughter pair of actuaries in the U.S.

Bob Butcher went on to a 31-year career at The Travelers Insurance Companies in Hartford, CT. Marjorie had a 33-year career at Trinity College (Hartford) teaching mathematics (including actuarial advising) and became its first-ever female teacher and female full professor.

While the two were graduate students, both before and after their marriage, Bob and Marjorie taught actuarial mathematics at Michigan. During 1951-53, one of their students was Haeworth Robertson (see article at left). In his career, Robertson continued Weltha McLachlan Van Eenam's work with the Social Security Administration.

Marjorie Van Eenam Butcher
(photo courtesy of Trinity College)

In Memoriam

Professor Bob Bartels

Robert C. F. Bartels was a Professor Emeritus of Mathematics at the University of Michigan and retired director of the University of Michigan Computing Center. Bartels was born the second of three sons to German immigrant parents in New York, and he grew up in humble surroundings both in Brooklyn and in rural New York. His mother's strong will that her children should be educated led to the three brothers each earning a Bachelor's degree, Robert Bartels' degree being in engineering.

Because of his training, he was able to find a position as a junior technician with Bell Telephone Laboratories in New Jersey, a prize of some consequence during the Depression. When Bell instituted a program of educational support that offered people at his rank the opportunity to return to college and earn a post-graduate degree, he took advantage of this to enter the graduate program in electrical engineering at the University of Wisconsin in Madison. Unfortunately for Bell, he dropped into a mathematics lecture one day on the advice of a friend, became interested in what he saw, and changed his major.

In 1938 he earned a Ph.D. in mathematics, married Virginia F. Terwilliger, of Madison, Wisconsin, and accepted his first academic position at the University of Michigan. From that year until the summer of 2006, with a time-out in World War II to work on research with the Navy in Washington DC, he has been a resident of Ann Arbor and a Professor of Mathematics (active or retired) with the University of Michigan. In late 1958, when the University of Michigan planned to move its small computer operation off campus and discontinue general computer access to students and faculty, he embarked on a successful campaign to reverse this decision and to establish a viable central computing facility to support teaching, research, and administration. He became the Computing Center's first director in 1959 and remained at its helm until his retirement in 1978. During that time he actively promoted the University's development of Computer Science education and research. Important advances in programming languages and operating systems were nurtured in the computing environment he established. Bartels was also responsible for organizing an important series of short courses and lectures during a 15-year period with the U-M Engineering Summer Conferences in the late 1950's and early 1960's that encouraged some important early developments in the theory and software for computer mathematics.

In 1978, when he retired, he took up an interest together with his wife in American Art Glass, and during the course of the next 20 years they established an impressive private glass collection, guided by the considerable historical knowledge of American Art Glass that they acquired. Robert Bartels departed peacefully in his sleep at the Swan Creek Retirement Village in Toledo, Ohio, on the night of September 9, 2006. He is survived by his wife, Virginia; by his sons, Richard (Renate) Bartels and Albert (Jacqueline) Bartels, by his grandchildren, Robert, Adrienne, and Ainslee; by his great-grandchildren, Ziggy, Ansel, and Isabel and by numerous nieces and nephews.

Professor Tom Storer

Thomas F. Storer, Professor Emeritus of Mathematics in the College of Literature, Science and the Arts, passed away on November 9, 2006.

A familiar face on campus for 35 years, Tom was one of the first Native Americans to receive a Ph.D. in mathematics. He joined the University of Michigan faculty as a T.H. Hildebrandt Research Instructor in 1965 after receiving his M.A. and Ph.D. degrees from the University of Southern California, and a B.A. degree from the University of California at Los Angeles. He was promoted through the ranks to Professor in 1979. Tom's research area was primarily in combinatorics, more specifically cyclotomy. His monograph "Cyclotomy and Difference Sets" (1967) became a standard reference. He also conducted research in modeling of long-term memory and recognition and directed the thesis work of numerous doctoral students.

Tom is most remembered in the Mathematics Department as an outstanding teacher and counselor who inspired his students and left a lasting impression. He was a dedicated instructor for Honors Calculus for many years. His courses were among the most rigorous, and his distinctive teaching style, coupled with great intellectual excitement, drew students to his classes. In recognition of his teaching skills, he was awarded the Amoco Foundation Good Teaching Award in 1985.

Tom also had a great impact on students in his role as an undergraduate counselor in the Honors Program, a position he held for 32 years. It was in that role where his integrity, sensitivity, patience, and empathy for students enabled him not only to guide them academically, but also to help them become well-rounded individuals. He touched the lives of students in many fields, and is well remembered as a strong influence in their lives. "Tom Storer took a personal interest in his students' lives; you knew it was genuine even if you never had the pleasure of meeting him outside the classroom," writes Susan Kolodziejczyk (BA 1993, Senior Researcher, National Geographic Society). "Anywhere you found him—in his office, on a bench in the sun, at a favorite corner of the Brown Jug—he welcomed every smiling face."

It has been said that Tom was always teaching. He himself left the following legacy on his door upon retirement: "From where the sun now stands, I will teach no more forever." Besides mathematics and the honors program, Tom was an educator in U-M courses on Native American culture and the Ojibwa language.

Robert Megginson, Professor of Mathematics and Associate Dean for Undergraduate and Graduate Education in the College of Literature, Science, and the Arts, remembers Tom fondly. "Tom was a remarkable individual who cared deeply about students. In my travels I have found it amazing how many former U-M students, American Indians and others, will find out that I am a U-M

mathematician and then tell me of the difference Tom made in their lives and careers. We have lost one of our great educators and mentors, and he will be sorely missed."

For many years, Tom was the principal faculty spokesman for Native Americans. He worked closely with the U-M and Ann Arbor Native American community. His commitment to diversity and dedication to promoting equity and justice for all people was reflected in his receipt of the Dream Keeper Award. Throughout his life, Tom shared his love and knowledge of string figures from around the world and became a leading authority. He pursued many different athletics during his lifetime, and taught several Mathematics Department members to play tennis. He had a deep love for freestyle Frisbee, and displayed his prowess regularly on the Diag. His Dalmatians were his constant companions.

Tom leaves behind his wife, Karen; children, Eileen (Charles) Storer Smith and Jeannie (Trevor) Thrall; mother, Betty Tauer; and six grandchildren. He will always be remembered as being a true "Renaissance Man" filled with deep passion and joy. Several years ago, a fund was established in the Department of Mathematics in Tom's name. The Thomas F. Storer fund supports mathematics honors program and its students. Donations can be sent to the Department of Mathematics, University of Michigan, Ann Arbor, MI 48109-1043.

Math Problem

A UFO lands at a random spot on a large square, which is paved with square tiles of size 1ft × 1ft. The UFO leaves a disc-shaped burn mark of radius 10ft. What is the expected number of tiles that have to be replaced because they are damaged by the UFO?

(Answer elsewhere in the newsletter)

Share Your Stories

Did you know that the first math classes were taught at U-M in 1841 by Reverend George P. Williams? Which member of the U-M Department of Mathematics faced charges from the House Unamerican Affairs Committee in the 1950s, and was dismissed from the University because of it? How did a "secret" weekly meeting of faculty members evolve into the Mathematics Colloquium?

You can find these and other fascinating historical information on our newly established history webpage www.math.lsa.umich.edu/information/depthistory.shtml. We have recently begun in earnest to collect and share some of our Department's history. Over the years many documents have been written about the educational, scholarly, administrative and research activities of U-M mathematics, and we invite you to share the history.

Beyond the facts, figures and remembrances of faculty members, the history of the Department is contained in its students. We are interested in your memories of your time as a student. What impressed you about your first or hardest math class? Did a discussion during a seminar help to establish the direction of your significant research? Who were your most memorable instructors? Do you have a story about one of the faculty members that might enlighten others to their spirit? How did they help shape your educational career and influence your life? Do you have a story about Tom Storer, Maxwell Reade, T.H. Hildebrandt, George Piranian, or any other Department member that stands out in your memory?

Don Lewis (PhD 1950) recounts this story about the first course he had with T.H. Hildebrandt: "He had given us our second problem set, and I noted that one problem was false, it didn't make sense. When I told him about it, Hildebrandt giggled and scratched his head. Then he said 'There's a true theorem there somewhere, go find it and prove it!'"

Please send us your remembrances and we will make an effort to share them with others. We will include a history column in this newsletter. We will also find a spot on our website to include memories from alumni.

The newly designed enewsletter Michigan Today is also seeking your stories. You can share them on this website http://michigantoday.umich.edu/heritage.php.

Honors Math Students from the '50s, '60s, and 70s

If you took the 90s sequence of Honors Math during that era, we'd like to hear from you. If you are interested in getting together for a reunion to discuss the trials, tribulations and triumphs of honors math students, please contact the math department at math.mich@umich.edu, or Don Lewis at djlewis@umich.edu. We'd love to hear from you!

Many Thanks to our Generous Supporters

The following individuals, foundations and companies made contributions to the Mathematics Department between June 1, 2006 and September 1, 2007

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Alumna Endows Professorship

Susan M. Smith is giving $1.5 million to U-M to establish the Susan Meredith Smith Professorship in Actuarial Sciences in the Department of Mathematics. She started the fund modestly several years ago and had originally planned to fund the professorship through a bequest gift. When Smith learned that the U-M President's Donor Challenge would match her $1.5 million gift with an additional $500,000, she decided the opportunity to fulfill the Professorship now was too good to miss. "Doing it now gives the University that many more years of an endowed professorship," she said.

After earning a Regents' Scholarship for tuition, Smith started at U-M in 1959. She put herself through school, working a part time job and summers. She graduated in 1963 with a B.S. degree in mathematics and $75 to her name. Having taken nearly all of the actuarial courses required for a Master's degree, she interviewed for actuarial positions in the spring of 1963. "It was difficult to be considered a serious candidate," Smith said. "One interviewer told me, 'You will just get married and have babies'." At that point, Smith ended the interview.

Smith joined Towers Perrin in Philadelphia in July 1963 as part of their actuarial support staff, and was transferred to the Chicago office in late 1965. In 1978, she became an Associate in the Society of Actuaries and was named a Consultant in 1978. She was soon named a principal and was one of the first women to have worked her way up from a support staff position. Smith became Assistant to the firm's Chief Actuary, which necessitated a move to Philadelphia in May 1983, and was named a Vice President in 1984. Smith joined the Detroit Office of Towers Perrin in 1987, and retired in 1992 after nearly thirty years of service.

A long-time supporter of U-M and actuarial mathematics, Smith has been an active member of the Department's Actuarial Alumni/ae Leadership Council. She was recognized for her giving to U-M with membership in the President's club in 1984 and the Angell Society in 2007. Her U-M legacy counts 47 U-M graduates in her extended family, as well as four others who are currently working on their degrees. "The University of Michigan has been good to me and my family," Smith said, "and it was time to give something back."

Since retirement, Smith met and married Robert H. Gray, who is a Professor Emeritus of the U-M School of Public Health. She stays active volunteering in many local organizations, gardening and entertaining their friends and family.

"This gift is important," said Curtis Huntington, Actuarial Program Director and Professor of Mathematics, "because it provides the resources to enable us to compete with industry to recruit another top professional to the program to teach and conduct research."

The Actuarial Mathematics program in U-M's College of Literature, Science, and the Arts (LSA), is the oldest in the nation and prepares students to enter a field that the *Wall Street Journal* ranks as one of today's "best" career choices in terms of job security and lucrative salaries.

Professor Curtis Huntington, Susan Smith, her husband Robert Gray, and Chair Tony Bloch at a luncheon honoring our emeritus faculty and friends of the department.

Development Updates

The Department is continuing with its fundraising initiative for various causes. We are happy to have the new Susan Smith Professorship, helped via the President's Challenge program. In addition to providing support to endowed professorships at U-M, the President's challenge will match donations to needs based scholarship funds for undergraduates. To qualify for the match, gifts and pledges must be made by December 31, 2007.

Phase 2 of the President's Challenge will target funding for graduate and professional student fellowships. A 50% match will be provided for expendable or endowed gifts to funds supporting these students. This match is available for gifts and pledges made through December 31, 2008. More information is available on the Michigan Difference website www.giving.umich.edu/where/presidents_challenge.htm. During the coming year we will begin fundraising for graduate student support so that we may fully realize the benefit and generousity of the President's Challenge matching funds.

The Pension Protection Act of 2006 has created an extraordinary, cost-effective way to support U-M. Through the end of 2007, donors may make IRA gifts to charity and exclude these contributions from their gross income. Donors must be 70½ years of age or older. The transfers must go directly from IRAs to qualified charities. The gifts must be outright, and cannot exceed $100,000 per taxpayer per year. For further details, contact the Gift Planning Office at 866-233-661. Combining this option with the matching incentives above provides a unique opportunity to maximize the potential of a significant contribution.

Department Annual Giving

The annual solicitation of faculty, emeriti and friends received gifts from 28 individuals. The funds collected were contributed mainly to the Maxwell Reade fund and the Tom Storer funds, although some faculty supported other initiatives.

The Alumni/ae Scholarship Fund provides direct support to undergraduate and graduate students. It is not an endowment, and any funds collected provide direct support to students. Following is some information on some of the students supported this year.

SeHyoun Ahn is a senior this year. He studies math because of "the simplicity wrapped in complexity. Many things in math are hard and complex. For example, how can one know that every number can be written as a sum of four squares? Once one proves something, then it becomes simple." SeHyoun appreciates the personal attention he has received from the mathematics faculty, as well as the staff in the office.

Zachary Maddock is a 4th year undergraduate from Brighton, MI. His father is a math teacher, so he always liked solving problems and working on math. "It wasn't until I took Math 295 here at the University when I realized that learning rigorous mathematics was both challenging and rewarding," Zach says. He also notes that the faculty and staff have been very support and helpful in his undergraduate career. The financial support has helped Zach and his family with tuition and expenses. "With two younger brothers, my family is ever grateful for the scholarship."

Ashley Selegue is a second year graduate student from Ohio studying financial and actuarial math. She has found that studying math is fun while still challenging. Ashley also credits the department as having very supportive professors and staff, and welcomes the encouragement of the other graduate students. The scholarship allowed her to continue her studies during the summer.

Lindsey Selegue is a second year graduate student from Ohio studying financial math, and is Ashley's twin sister. She credits some great high school math teachers for helping her to develop an interest in math. Ashley finds the program in the department interesting and challenging, and all of the people have been friendly and supportive.

Upcoming Events

Department Colloquium

Every Tuesday at 4:00

Michigan Reception

Joint Mathematics Meetings
American Mathematical Society
San Diego, CA
January 8, 2008, 5:30-7:00 p.m.

G.Y. Rainich Lectures

January 15-17, 2008
Professor Gang Tian
Princeton University

Alexander Ziwet Lectures

February 5-7, 2008
Professor Curt McMullen
Harvard University

2008 Michigan Math and Science Scholars Summer Program

Two sessions for qualified high school students:
June 29 - July 11 and
July 13 - July 25

Mathematics Career Conference

Fall, 2008

Please visit our website for additional information on these and other events in the Department.
www.math.lsa.umich.edu.

The Story of Two Alumnae in the High Tech World

In the world of corporate high-technology today, women still account for less than 25% of the workforce. Two U-M math alumnae have achieved significant success in the field, albeit in different generations and roles. Frances Allen (MA 1957), a pioneering researcher at IBM, and Elizabeth Charnock (BS 1987), a successful entrepreneur, had vastly different experiences and paths to success.

The Fair Lady of Big Blue

Frances Allen received her bachelor's degree in education from the New York State College for Teachers. She wanted to teach math, and went to the University of Michigan for her master's in math. As the computing field was taking flight at that time, tech companies were recruiting heavily from college campuses. Allen, who had taken a single engineering course at U-M, was hired as a programmer for IBM at their research center in New York. "I had that one course, and I was probably more experienced than most of the people they hired," Allen says. "I took the job to help pay off debts, and then go back to my first love, teaching." At that time, there were many women programmers in the workforce at IBM.

Because of her teaching background, Allen was asked to teach the just-invented computer language Fortran to IBM's scientists. To teach it, she had to learn it, and that made her fascinated with how software worked. In the late 1950s, she started working on compiling systems—software that translates the computer languages used by programmers into code the computer's hardware can understand. Allen eventually developed ways for compilers to produce much faster codes, and that helped make high-performance computing successful. Her pioneering compiler work culminated in algorithms and technologies that are the basis for the theory of program optimization today and are widely used throughout the industry.

By the mid-1960s, as computer science emerged as a profession, Allen saw the percentage of women in the field shrink. "New hires were expected to have professional credentials and the engineering schools were the primary source of trained people. That meant that many of the new hires were men. That led to a big change in the workplace—in who was doing what." By the end of the 1960s, Allen says, "I'd go into a full auditorium (for a meeting or lecture), and I could count the women on one hand. It was a tough period for women."

During her tenure at IBM, Allen had a long career of personally imprinting the lives of her colleagues. Her ability to cultivate relationships was a stepping-stone to her success. Allen considers herself lucky to have had many mentors to provide guidance along her 45-year journey at IBM Research. Allen prides herself on her involvement with IBM's mentor program. She recalls that when she first joined IBM Research the idea of mentoring was not widespread outside of the executive track. However, through formal and informal mentoring, Allen began seeking out new employees to guide them along their own personal paths to success. IBM was so overcome with Allen's commitment to mentoring that they established an award in her name, as an effort to promote the careers of technical men and women in IBM who have demonstrated "exemplary commitment to mentoring of technical women." In 2000, Allen, herself, was the first recipient of the "Frances E. Allen Women in Technology Mentoring Award."

Allen's pioneering contributions to the field of computing have received significant recognition. In 1989, she was the first woman to be named an IBM fellow, the highest technical honor bestowed by the company. She received the Grace Hopper Celebration of Women in Computing Award as one of the most successful women in the computing field. Allen is also the 2002 recipient of the Ada Lovelace award for her "outstanding scientific and technical achievements and extraordinary service to the computing community through her accomplishments and contributions on behalf of women in computing." Most recently, Allen was honored with the 2006 A.M. Turing Award from the Association for Computing Machinery. Considered the Nobel Prize of computing, the Turing Award cited her contributions that fundamentally improved the performance of computer programs in solving problems, and accelerated the use of high performance computing. She retired from IBM as a Fellow Emerita in 2002.

The Possibilities of Math

Elizabeth Charnock came to the University of Michigan at the age of 16, enrolling in the Honors Program. At the urging of a former classmate who attended U-M, Elizabeth began the "90s sequence" of honors theoretical mathematics. She found the courses to be exciting and knew after a short period that she would major in math. "I took honors courses in many other subjects, but none of them were as good or as well presented as the math courses," she says.

After graduating in 1987, Charnock began applying for jobs in Michigan, and secured an interview with Unisys Corporation. Surprisingly, the manager with whom she interviewed was familiar with the U-M honors math program, in particular the requirements of the theoretical math option, as his son had been researching universities. Charnock was hired, and considered herself lucky at the time. "I had no computer science or engineering classes at U-M," Charnock

notes. "It was somewhat discouraged for honors students since the quality of the classes was not at the level of other honors offerings. Had I known how hard it was to get a job with a degree in math, I might have reconsidered. Many of my friends and colleagues were waiting tables at the time." At Unisys she ran the human factors laboratory.

After Unisys, Charnock moved on to management and senior engineering positions at large international high tech companies such as Hewlett-Packard and Sun Microsystems. With those companies she survived the "bubble bursting" in Silicon Valley, and witnessed the decline of their industry influence. "It was apparent that we were doing good work at those companies, but the work would not significantly influence anything. I was at a point where I wanted my work to make a difference in a real world sense."

Charnock's first venture as an entrepreneur was as CEO and founder of Troba, an industry leading customer relationship management software company. Her partner in that company also went through the 90s sequence math at U-M. The company was funded through venture capital, and she sold it in 2001.

In 2002, Cataphora was founded by Charnock and three other employees, including her partner in Troba. The company's genesis was a fundamental insight that she had about a revolutionary approach to information retrieval. Funded entirely by revenues from clients and without outside investment, the company has grown to over 100 employees with offices in California and Washington, DC. Cataphora was recognized as one of the top 25 start ups of 2002 and has reached annual revenue of $30 million.

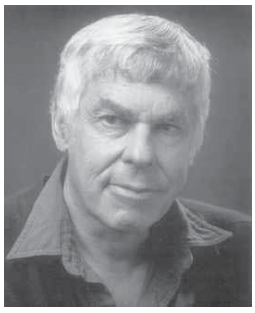
Cataphora is both the pioneer and industry leader in the burgeoning field of evidence analytics, or the management and analysis of electronic data from an evidentiary perspective. They are considered the world's authority on the implications of personal and organizational behavior as evidenced by the use of electronic media. In 2006, Cataphora was awarded a broad patent for fundamental technology to reconstruct causally related items and events into searchable units or discussions. Charnock says of her work "We actually use a significant amount of math in the analysis of data, patterns, and graphs." Her members of her staff regularly explore combinatorial theory, especially graph theory, and also does work in linear algebra, category theory, and probability theory. Charnock is proud that over 20% of the Cataphora workforce hails from U-M.

Charnock laments that the number of women she sees in her industry is small—in her experience, she estimates less than 10%. She is unsure of the impact her gender has had on her success. "I guess that, as a woman, I was seen as 'different' in large companies, but I don't know if being different was a help or a hindrance." Charnock is still a big fan of the honors theoretical math sequence, and the opportunities it presented. "Because of my theoretical and analytical background, I had something that other people didn't. It made many more things possible in my career."

Alumnus Smale Receives Wolf Prize

The 2007 Wolf Prize in Mathematics was awarded to Stephen J. Smale (BS 1952, PhD 1957). Smale was recognized for his ground breaking contributions that have played a fundamental role in shaping differential topology, dynamical systems, mathematical economics, and other subjects in mathematics. The Prize is awarded by the Wolf Foundation of Israel to promote science and art for the benefit of mankind.

Smale held appointments at the University of Chicago and the Institute for Advanced Study before joining the University of California, Berkeley, in 1964, where he continues as a Professor of Mathematics in the Graduate School. He is currently at the Toyota Technical Institute in Chicago. A highly recognized mathematician, Smale's honors include the 1966 Fields Medal, a Veblen Prize from the American Mathematical Society, the 1967 University of Michigan Sesquicentennial Award, Membership in the American Academy of Arts and Sciences and the National Academy of Science, the Chauvenet Prize from the Mathematical Association of America, and the Von Neumann Award from the Society for Industrial and Applied Mathematics.



Early in his career, Smale contributed greatly to the development of differential topology, a field then in its infancy. His results of immersions of spheres in Euclidean spaces still intrigue mathematicians. His proof of the Poincaré Conjecture for dimensions bigger or equal to 5 is one of the great mathematical achievements of the 20th Century. His h-cobordism theorem is probably the most basic tool in differential geometry. Smale reshaped the view of the world of dynamical systems. His theory of hyperbolic systems remains one of the main developments on the subject after Poincaré, and the mathematical foundations of the so-called "chaos-theory" are his work as well. Smale's work contributed dramatically to change in the study of the topology and analysis of infinite-dimensional manifolds.

Smale's later research turned to mechanics and economics, to which he applied his ideas on topology and dynamics. For instance, his notion of "amended potential" in mechanics plays a key role in current developments in stability and bifurcation of relative equilibria. In economics, Smale applied an abstract theory of optimization for several functions, which he developed, to provide conditions for the existence of Pareto optima and to characterize this set of optima as a sub-manifold of diffeomorphic states to the set of Pareto equilibria.

Most recently Smale has been working on the theory of computation and computational mathematics. Against mainstream research on scientific computation, which focused on immediate solutions to concrete problems, Smale developed a theory of continuous computation and complexity (akin to that developed by computer scientists for discrete computations), and designed and analyzed algorithms for a number of specific problems. Some of these analyses constitute models for the use of deep mathematics in the study of numerical algorithms.

Alumni/ae Updates

Wendy Lichtman (BA 1966) has written a math novel for teens that was published by HarperCollins. "Do The Math: Secrets, Lies and Algebra" is written from the perspective of an 8th grade girl who sees the world through mathematical metaphors. Wendy says "Although I graduated from Michigan, in December 1966 with a major in mathematics, I became a writer, so I surprised myself when I returned to my math training to write this book." It is the first in a series—the second one, "Do The Math: The Writing on the Wall" will be published in summer 2008. You can find more information at www.wendylichtman.com

Dr. Renate McLaughlin (PhD 1968) recently retired as Provost and Vice Chancellor for Academic Affairs and Professor of Mathematics in the College of Arts and Sciences (CAS) at U-M-Flint. She joined the University in 1968. She was a dedicated teacher and role model for women students of mathematics, teaching nearly every course offered by the math department. In 2005, the student government honored her by establishing the Renate McLaughlin Academic Achievement Award. McLaughlin is currently studying organ at U-M with Marilyn Mason.

George H. Brown, Jr. (BA 1971, MA 1973) passed away last year. His brother, **James Ward Brown** (PhD 1964), who is on the faculty at U-M Dearborn, shared this sad news.

J. Paul Austin (BS 1973, MA 1975) has received the Distinguished Leadership Award from Leadership Michigan, a program of the Michigan Chamber Foundation. He was selected because of his exceptional leadership qualities; his achievement in both professional and civic activities; his ability to create and articulate a vision and effect change; and his significant contribution to the development of future leaders. Austin is a Senior Vice President at Blue Cross/Blue Shield of Michigan.

Dr. Christopher Swanson (PhD 1999), associate professor of mathematics at Ashland University, received the Henry L. Alder Award for Distinguished Teaching by a beginning college or university mathematics faculty member. The award was presented by the MAA at MathFest in Knoxville, TN. The award was established in 2003 to honor extraordinarily successful teachers whose influence extends beyond the classroom. Winners must have taught full time in one of the mathematical sciences in the United States or Canada for at least two, but not more than seven, years since receiving a Ph.D. Swanson, who just completed his seventh year at AU, has created new courses and has introduced Ashland students to the Putnam competition and to Pi Mu Epsilon. Despite a four-course teaching load each semester, he has directed four honors theses (two of which received awards) and has had the theses writers present their work at conferences. He was invited to give both a plenary and after-dinner talk at the Spring 2005 meeting of the Ohio Section of the MAA, and is now serving as co-chair of Ohio NExT. The biographical note in the prize booklet distributed at MathFest listed one of his spare time activities as "annoying Ohio State Buckeye fans by flying his University of Michigan car flags while blaring 'Hail to the Victors' with his car windows down."

In 2006, the editors of all three of the Mathematics Association of America journals were mathematicians who had received their doctorates from Michigan:

American Mathematical Monthly: **Bruce Palka** (PhD 1972) University of Texas, and currently at the Division of Mathematical Sciences, National Science Foundation.

Mathematics Magazine: **Allen Schwenk** (PhD 1973), Western Michigan University.

College Mathematics Journal: **Lowell Beineke** (PhD 1965) Indiana University-Purdue University Fort Wayne.

Considering a Donation to UM?

If you are contacted by the University of Michigan for a donation, you can earmark your gift to the Department of Mathematics. Simply tell the caller to designate your gift to mathematics or write Mathematics Department on the pledge card you are sent. We greatly appreciate all of your support, and we hope we can count on you to support future fundraising projects.

Estate Gifts

You may include the Department of Mathematics in your estate plan. Please call us at 734-647-4462 for information on charitable trusts and bequests to the department, or contact:

University of Michigan
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734-647-6000

Photos by UM Photo Services, the Department of Mathematics, or personally submitted by the subjects.

We Need You!

Want to get involved with the UM Department of Mathematics? Here are some areas where alumni participation is vital. Let us know if you are interested in working with us on these initiatives.

- Recommend the UM mathematics program to students interested in undergraduate or graduate studies
- Participate in our annual Career Day, held each year in late October or early November
- Visit the Department for afternoon tea (3:45 sharp) if you are in town for the weekend, including Homecoming, Parent's weekend, or the Presidential Society weekend
- Be a mentor (in person or via email) to a current student
- Set up a recruiting program with your company for graduating students
- Offer internships in your company to mathematics students
- Allow groups of mathematics students to visit your company
- Give an informal talk to mathematics students about how you have used your math degree

Email math.mich@umich.edu or call 734-647-4462

Answer to Math Problem

Assume that the center (p, q) of the disc is uniform distributed over $[0, 1]\times[0, 1]$. The tile $T_{x,y} := [x, x + 1] \times [y, y + 1]$ $(x, y \in \mathbb{Z})$ intersects the disc if and only if the point $(p - x, q - y)$ has at most distance 10 to $[0, 1] \times [0, 1]$. So the probability that $T_{x,y}$ intersects the disc is the area of $T_{-x,-y} \cap S$ where S is the set of all points with distance ≤ 10 to $[0, 1] \times [0, 1]$. Summing over all $x, y \in \mathbb{Z}$ shows that the expected number of tiles intersecting with the disc is the area of S. The set S is the union of a cross-shaped region

$$\{(x, y) \mid 0 \leq x \leq 1, -10 \leq y \leq 11\} \cup \{(x, y \mid 0 \leq y \leq 1, -10 \leq x \leq 11\}$$

which has area 41 and its complement, consisting of four quarter discs of radius 10, whose area together is 100π. So the expected number of tiles that have to be replaced is $100\pi + 41$.

2007-2008 Mathematics Department Faculty

Professors

David E. Barrett
Alexander Barvinok
Hyman Bass, *Roger Lyndon Collegiate Professor*
Andreas R. Blass
Anthony Bloch, *Chair, Alexander Ziwet Collegiate Professor*
Mario Bonk
Daniel Burns
Richard Canary
Joseph G. Conlon
Brian Conrad
Charles Doering
Igor Dolgachev
Peter Duren
Sergey Fomin, *Robert Thrall Collegiate Professor*
John Erik Fornæss, *Frederick W. Gehring Collegiate Professor*
William S. Fulton, *M.S. Keeler Professor*
Robert L. Griess
Philip J. Hanlon, *Associate Provost, Donald J. Lewis Collegiate Professor*
Juha Heinonen
Mel Hochster, *Jack E McLaughlin Distinguished University Professor*
Curtis E. Huntington
Lizhen Ji
Smadar Karni
Robert Krasny
Igor Kriz
Jeffrey Lagarias
Robert Lazarsfeld, *Raymond L. Wilder Collegiate Professor*
John W. Lott
Robert Megginson, *Associate Dean, LSA*
Peter Miller
Hugh L. Montgomery
Gopal Prasad
Jeffrey B. Rauch
Yongbin Ruan
G. Peter Scott
Carl P. Simon
Peter Smereka
Karen Smith
Joel A. Smoller, *Lamberto Cesari Collegiate Professor*
Ralf J. Spatzier
J. Tobias Stafford
John Stembridge
Berit Stensones
B. Alan Taylor
Alejandro Uribe
Arthur Wasserman
David J. Winter
Sijue Wu, *Robert W. and Lynn H. Browne Professor*
Virginia Young, *Cecil J. Nesbitt Professor*

Associate Professors

Jinho Baik
Stephen DeBacker
Hendrikus Derksen
Anna Gilbert
Trachette Jackson
Mattias Jonsson
Kristen Moore
Mircea Mustata
Divakar Viswanath

Assistant Professors

Erhan Bayraktar
Victoria Booth
Volker Elling
Selim Esedoglu
Daniel Forger
Aaron King
Patrick Nelson
Martin Strauss
Juan Souto
Dale Winter

Lecturers

Irina Arakelian
Mark Conger
Carolyn Dean
James Epperson
Gavin LaRose
Karen Rhea

Postdoctoral Assistant Professors

Robert Buckingham
Renzo Cavalieri
Xiaojun Chen
Bin Cheng (Hildebrandt)
Tatyana Chmutova
Cecilia Diniz Behn
Ahmet Duran
Neil Epstein (NSF/Hildebrandt)
Farkhod Eshmatov
Joel Fish (Research Training Grant)
David Gammack
Mohar Guha
Jonathan Handy (Research Training Grant)
Kenneth Harris
Benjamin Howard (NSF/Hildebrandt)
Tatiana Howard (Research Training Grant)
Valentina Joukhovitski
Amanda Knecht (Research Training Grant)
Richard Kollar
Radu Laza
Lina Lee
Anna Lenzhen
Peijun Li
Zhi Lin
Larsen Louder (Hildebrandt)
Michael Ludkovski
Hannah Markwig
Daniel Meyer (NSF/Hildebrandt)
Djordje Milicevic (Hildebrandt)
Carl Miller (Research Training Grant)
Sophie Morier-Genoud (Hildebrandt)
Carl Mummert
Lan Nguyen
Pekka Pankka
Thomas Petersen (IBL Postdoc)
Ivan Petrakiev (Research Training Grant)
Pavlo Pylyavskyy (Hildebrandt)
Nicholas Ramsey (NSF/Hildebrandt)
Sonmez Sahutoglu (Research Training Grant)
Karl Schwede (NSF/Hildebrandt)
Semih Sezer
Anna Siano
Loren Spice (NSF/Hildebrandt)
Jack Waddell
Katherine Walker
Richard Yamada
Stephanie Yang (NSF/Hildebrandt)
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Joseph Marker, Ball State University/ Marker Acutarial Services

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Keith Ball, University College of London
Blake Temple, University of California-Davis

Emeriti

Morton Brown
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Frederick W. Gehring, *Distinguished University Professor*
Jack Goldberg
Peter Hinman
Wilfred Kaplan
Wilfred Kincaid
James Kister
Eugene F. Krause
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Maxwell Reade
Ronald Rosen
Art Schwartz
Chung-Tuo Shih
Patricia Shure
Charles Titus
Howard Young

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Name_____

University of Michigan Degree(s) with years & advisors

_____

Degrees from other Universities/Years

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City, State Zip_____

Home Phone_____ E-mail_____

Firm/Institution_____

Position_____ Business phone_____

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Information about yourself or comments on the newsletter:

(unless you request otherwise, we will feel free to mention any of this in future ContinuUM News editions)

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