ContinuUM

Newsletter of the Department of Mathematics at the University of Michigan   2006

Mathematical Modeling in Sleep Gene Research

The interdisciplinary research of Assistant Professor Daniel Forger is receiving wide recognition from the scientific community. Forger, who joined the Department of Mathematics this year in the Mathematical Biology program, works in the area of circadian rhythms and the biological clock. The core of his thesis involved the construction of a detailed biochemical model of the mammalian intracellular circadian clock. His model is now the most detailed and realistic one available.

Forger used his model in recent research with collaborators from the University of Utah's Huntsman Cancer Institute. The studies showed that the effect of a mutation in a key gene involved in the regulation of sleep and wake cycles in mammals works in the opposite way from what was previously thought. A paper on the topic appears in the July 11 issue of the *Proceedings of the National Academy of Science*.

The bodies of mammals know what time it is by constantly measuring the concentration of a protein called PER in the body. Drug companies continually investigate ways to manipulate the level of PER in the body to treat sleep disorders, and other disorders impacted by biological clocks.

The degradation of PER is regulated by another protein, called CK1e, whose production is controlled by the gene casein kinase 1, or CK1. It was initially thought that a mutation called "tau" in CK1 led to the production of defective CK1e proteins that break down PER more slowly than is normal, causing the protein to accumulate in the body. This buildup was thought to speed up a mammal's internal clock, causing it to have shorter days.

Forger's computer models had always said that the opposite of the prevailing thinking should be true—that the PER protein should degrade more quickly when the

Daniel Forger

mutation is present. "I had this prediction for a year or two," Forger said. "Basically, people said this is ridiculous, you're a mathematician, what do you know…"

Forger's computer models solve a system of over 50 differential equations. This large number of equations comes from the many states of PER and the fact that many other proteins can bind to PER to regulate its behavior. Every time a new binding partner or state is included, the number of equations significantly increases, perhaps even doubling. He also validated this prediction with a simple linear model for which one can derive a formula for the effect of tau on the predicted period.

Forger met David Virshup, M.D., while giving an invited talk at the University of Utah. Virshup's previous research was on

View from the Chair's Office
Tony Bloch

The Department of Mathematics has had a busy and productive year. During this time, many of our accomplished faculty and excellent students received various honors, some of which are detailed elsewhere in this issue of ContinuUM.

One should be cautious about taking outside rankings too seriously. That said, we are pleased to report that our Departmental ranking in the *US News and World Report* rose from 9th in 2002 to 7th in 2006, tied with the California Institute of Technology, New York University and Yale University. It is a pleasure to be associated with such a distinguished and exciting Department.

The current size and quality of the Department is reflected in the amazing range and scope of our activities. During the 2005-2006 academic year we had more than 180 visitors. Special events for the year included weekly colloquia by distinguished mathematicians from around the world. Department members organized numerous conferences on varied subjects: representation theory, future directions in 3-manifolds (honoring Peter Scott), recent progress in birational geometry, mathematical biology (see story on page 3), and geometric function theory. There was also a lecture series in algebraic geometry, and Mel Hochster's Distinguished University Professorship lecture entitled "The Unexpected Usefulness of Prime Numbers." We have established a new web page to document some of our events and lecture notes at http://www.math.lsa.umich.edu/lecturesmath/index.html. Please feel free to browse the information.

As far as the faculty are concerned, we currently have 68 regular tenured/tenure-track members, 7 other non-tenure-track

Notes from the Chair (continued from page 1)

members, and 49 three-year post-doc faculty positions. Faculty members of the Department currently hold more than 153 federal grants.

The student body comprises 140 graduate students and approximately 285 math concentrators. In the Fall 2005 term, 6596 students were enrolled in math courses. In the winter term there were 4560 such students. There were 90 undergraduate math majors who graduated this year, and 29 new graduate students will be starting their programs in the fall of 2006.

UM Mathematics Department is now tied for 7th in U.S. News and World Report rankings among U.S. public Universities

I have every confidence that we will continue from strength to strength even though the Department continues to face the perennial challenges that have been mentioned here in previous years. In particular, unrelenting budget pressures continue to be a problem in many areas, and especially in the area of faculty retention. This results from the fact that the other best math departments in and out of the country keep trying to lure away our many outstanding faculty members.

We would like to remember here several Department members who are no longer with us: Professors Emeriti James Wendell and Don Higman, and former faculty members Raoul Bott, Hans Samelson and Robert Thrall. Also, our much loved former secretary who was active in the Department until she died, Ethel Rathbun, passed away last fall (see story on pages 12-13). We will miss them all.

Peter Hinman and Pat Shure retired this year (see story on page 6). We wish them all the best for the future, and we thank them for their many years of wonderful service to the Department.

We welcome Erhan Bayraktar who will be a new Assistant Professor in the fall.

Our development and fund raising efforts have been successful thanks to the 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 5 graduate students (see story on page 16). Other fund raising allowed us to continue our affiliation with the Inquiry Based Learning program, a program which funds exciting new innovations in teaching.

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

We are looking forward to a dynamic new academic year with extremely exciting programs. There are several exceptional events planned. One highlight will be our colloquium which, this year, promises to be truly extraordinary: no fewer than 7 Fields Medal winners will be giving lectures!

Another highlight will be the Ziwet and Rainich lecture series to be given in the fall by most distinguished mathematicians. Jerrold Marsden of Caltech will give the Ziwet Lectures in September. Philip Holmes of Princeton will present the Rainich lectures in November. Everyone is invited and encouraged to attend these memorable events, some of which are highlighted on page 17. Additional information on all Department activities can be found on our website www.math.lsa.umich.edu.

Math Problem

Twenty-four delegates sit around a round table. Two delegates can speak to each other if at most four people sit between them. After a break each person sits down again, not necessarily in the same seat as before. Show that there exist two delegates who are able to speak to each other before and after the break.

Answer elsewhere in the newsletter

Mathematical Modeling in Sleep Gene Research (continued from page 1)

the gene involved in circadian rhythms and its role in cancer development. Their experiments had also suggested that genetic mutation caused the protein to degrade more quickly. Virshup suggested they test Forger's simulation.

This new study proves their hypothesis: The tau mutation doesn't slow down PER degradation—it speeds it up. Not enough PER leads to shorter days in animals affected by the gene mutation.

The researchers took cell cultures and observed that for those with the mutated gene, the protein only took a couple of hours to degrade. For the normal gene, it took 8-10 hours.

These findings will have an impact on the development of new drugs for the treatment of disorders such as insomnia, depression, and others that rely on the regulation of the inner body clock.

Forger joined the Department of Mathematics in September 2005. He received his Ph.D. in Mathematics from the Courant Institute at New York University, and was a Sloan Foundation Fellow at NYU in Computational Molecular Biology. From his earliest contact in the Department, Forger impressed his colleagues with his knowledge, energy and enthusiasm.

"Michigan is an ideal place to model circadian clocks," says Forger. "Other great modeling/experimental studies are being conducted by members of the Mathematical Biology Research Group within the Department targeting problems in areas like infectious disease and cancer. Discussions about common modeling techniques within the group are invaluable to model development as are discussions with other Department faculty on how to accurately analyze and/or simulate models. It is also important to mention the large amount of clock research being done on campus including circadian experiments here in East Hall, and a new center for Sleep Science."

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

Mathematical Biology Research Theme Semester

During the Winter 2006 semester, the College of Literature Science and the Arts and the Department of Mathematics hosted a research theme semester in Mathematical Biology. Mathematical Biology is a fast growing and exciting modern application of mathematics that has gained worldwide recognition. Mathematical models can suggest possible mechanisms underlying specific biological processes, and through their development and analysis one can gain insight into complex biological systems. Proper development and analysis also can lead to predictions that may follow under currently untested conditions. Involving collaborations with scientists from many disciplines across campus, the Mathematical Biology Research Group encompasses expertise in ordinary, delay and partial differential equation modeling, analysis, and simulation, as well as parameter indentifiability, estimation, and sensitivity. The current research also utilizes asymptotic analysis, dynamical systems, and scientific computing. The discipline involves unique collaborations between experimentalists, modelers, and statisticians. The theme semester provided an opportunity for researchers to develop new collaborations and for students to see the rich diversity that is mathematical biology.

Mathematics faculty members **Trachette Jackson** and **Patrick Nelson** organized the semester and hosted many special events to highlight current research in Mathematical Biology, both here at UM and at other universities. The first symposium held in January featured Professor **Michael Reed** from Duke University, who spoke about the difficulties of mathematical biology. Mathematical models can be used to investigate causal mechanisms in biological systems that are exceptionally diverse, complex, and special. The process, however, is fraught with complexity and uncertainty. The event also included presentations from UM faculty in Mathematics and other disciplines on their current research in the area. An informal luncheon for undergraduates interested in learning about a career in Mathematical Biology attracted an enthusiastic audience.

Trachette Jackson and Patrick Nelson

Throughout the semester, other symposia were held to highlight the various applications of Mathematical Biology. The Synthetic Biology Symposia featured a talk by Professor **Ron Weiss** from Princeton University. Synthetic biology is an emerging discipline of engineering that investigates cells and cell behaviors as programmable matter. Synthetic biology will improve our quantitative understanding of natural biological processes and will also have biotechnology applications in areas such as bio-sensing, synthesis of pharmaceutical products, molecular fabrication of biomaterials and nanostructures, and tissue engineering.

The third symposium involved the modeling of infectious diseases. Dr. **Alan Perelson** from Los Alamos National Laboratory gave the keynote talk entitled "Modeling the Kinetics of Hepatitis B and C Viral Infections in Vivo." His presentation showed how mathematical modeling has provided basic insights into the pathogenesis of these viruses and provided a means of quantitatively assessing the effects of therapy. He also highlighted a set of state-of-the-art models that in principle apply to these and other viruses of broad interest such as HIV.

The events of the theme semester attracted faculty and student participants from 15 different disciplines across campus. The topics prompted discussion among all levels of students, researchers and faculty. This additional exposure should increase the visibility of Mathematical Biology at UM, and promote the program as active and innovative to prospective students and researchers.

The Mathematical Biology Research Group, which will continue the interdisciplinary research presentations and collaboration, is comprised of 30 faculty and 50 students from 15 different departments. Nelson and Jackson are the co-founders of the group, and other Mathematics core faculty include **Daniel Burns**, who is Director of the new Bioinformatics Program, **Daniel Forger, Philip Hanlon**, who continues in his appointment as Associate Provost, and **Carl Simon**, who also directs the Center for the Study of Complex Systems. The group supports research in mathematical modeling of infectious diseases, cancer, neurosciences, biological oscillators, ecology, and cell biology. They have developed numerous undergraduate and graduate courses on mathematical biology and now have a very successful undergraduate program in math biology.

The Department of Mathematics, jointly with the Molecular, Cellular and Developmental Biology, and Ecology and Evolutionary Biology, have developed a revolutionary new program titled SUBMERGE—Supplying Undergraduate Biology and Mathematics Education and Research Group Experiences to Students. Intended to train the next generation of interdisciplinary scientists, the program will allow undergraduate students to develop knowledge and acquire skills in research areas that are at the interface of Biology and Mathematics. The National Science Foundation has pledged support to help develop this cutting edge program.

Faculty Kudos

Associate Professor **Jinho Baik** was promoted from Assistant to Associate Professor.

Professor **Hyman Bass**, the Roger Lyndon Collegiate Professor of Mathematics, received the 2005 Yueh-Gin Gung and Dr. Charles Y. Hu Award for Distinguished Service to Mathematics from the Mathematical Association of America. This is the most prestigious award made by the Association.

Professor and Chair **Anthony Bloch** has been awarded a Collegiate Professorship from the College of Literature, Science and the Art. He will hold the Alexander Ziwet Collegiate Professorship in Mathematics for a five-year term.

Assistant Professor **Anna Gilbert** received a 2006 NSF CAREER award for her project "Modeling and Analysis of Data from Massive Graphs." The CAREER awards provide early career development support for faculty with outstanding potential. Anna previously received an Alfred P. Sloan Fellowship, an extraordinarily competitive award involving nominations of the very best young scientists in the country.

Assistant Professors **Anna Gilbert** and **Divakar Viswanath** were invited speakers at the 2006 Abel Symposium in May.

Professor **Robert Lazarsfeld** has been elected a member of the prestigious American Academy of Arts and Sciences. 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.

Assistant Professor **Patrick Nelson** has been elected to the board of directors of the Society for Mathematical Biology effective July/August 2007.

Professor **Gopal Prasad** has been awarded a Humboldt Research Award for Senior U.S. Scientists. This award is given to researchers with internationally recognized academic qualifications, honoring the academic achievements of the award winner's lifetime. Winners are invited to undertake research projects of their choice in Germany in collarboration with colleagues.

A conference honoring Professor **Jeffrey Rauch** was held at the University of Bordeaux, May 18-20, 2006.

Professor **Carl P. Simon** (Professor of Mathematics, Economics, and Public Policy) has been named the 2007 Distinguished Senior Lecturer for the College of Literature, Science and the Arts.

A conference honoring the 70th birthday of Professor **Joel Smoller** was held at Stanford University, April 29-May 6, 2006.

Professor **Kannan Soundararajan** has been awarded the First SASTRA Ramanujan Prize. The prize is given to mathematicians not exceeding the age of 32 for outstanding contributions in areas of mathematics influenced by Ramanujan. The prize was given during the International Conference on Number Theory and Mathematical Physics in December 2005, at SASTRA University in Kumbakonam, the hometown of Ramanujan.

Professor **Sijue Wu** has been appointed the Robert W. and Lynn H. Browne Professor in Science for a five-year renewable term. The Browne Professorship recognizes the recipient's outstanding contributions to science and teaching.

Gehring Recognized for Lifetime Achievements

Frederick Gehring, the T. H. Hildebrandt Distinguished University Professor Emeritus of Mathematics, received one of the highest distinctions in his field from the American Mathematical Society (AMS) in January at a joint meeting in San Antonio.

Gehring is a recipient of the 2006 AMS Leroy P. Steele Prize for Lifetime Achievement, an annual award honoring those who have made outstanding contributions to research in mathematics.

"For over fifty years F. W. Gehring has been a leading figure in the theory of quasiconformal mappings," the AMS prize citation states. "Largely because of Gehring's work, the theory of quasiconformal mappings has influenced many other parts of mathematics, including complex dynamics, function theory, partial differential equations, and topology ... Gehring's mathematics is characterized by its elegance and simplicity and by its emphasis on deceptively elementary questions which later become surprisingly significant."

Gehring also is described as a person of incredible energy and enthusiasm, who generously shared his passion for mathematics and research by mentoring over 70 successful Ph.D. students and postdoctoral fellows during his career.

Born in Ann Arbor, Gehring's association with the University of Michigan goes back two generations to his grandfather, John Oren Reed, who was a member of the physics faculty and Dean of the College of Literature, Science and the Arts. Gehring joined the U.S. Navy in 1943, and subsequently earned two degrees from Michigan—Bachelor of Science in math and electrical engineering in 1946, and Master of Science in math in 1949. He returned to teach mathematics at Michigan in 1955 after completing his Ph.D. at Cambridge, and spending three years as a Benjamin Peirce Instructor at Harvard. He became a professor in 1962, was named to a collegiate chair in 1984, and became the T.H. Hildebrandt Distinguished University Professor in 1987, one of the University's highest honors for faculty. Gehring's long and distinguished history of service at Michigan includes three terms as chair of the Department. Gehring has received numerous awards, including the Distinguished Faculty Achievement Award, the Sokol Faculty Award, Humbolt Award, Onsager Professorship, and he was the Henry Russel Lecturer for 1990. In 1989 he was elected to the National Academy of Sciences. He has also received honorary degrees from the University of Helsinki, University of Jyväskylä, and the Norwegian University of Science and Technology.

Gehring retired in 1996. A year later the Frederick and Lois Gehring Chair in Mathematics was endowed. Currently the Chair is used to bring prominent young mathematicians to Ann Arbor as visitors to collaborate with Department members.

New Faculty Members

Selim Esedoglu - Assistant Professor of Mathematics

Esedoglu joins the Department from the University of California, Los Angeles. He received a Ph.D. from the Courant Institute at New York University, and then was a Postdoctoral Fellow at the Institute for Mathematics and its applications in Minneapolis. His research involves the use of partial differential equations methods in image processing, involving rigorous mathematical analysis and application. Esedoglu is developing analytical tools and efficient numerical algorithms for hard problems of nonconvex optimization. The input in the problem is a "noisy image," while the solution to the optimization problem provides the "denoised" image.

Daniel Forger - Assistant Professor of Mathematics

Forger joins the Department from the Computational Molecular Biology Department at New York University. He received a Ph.D. from the Courant Institute at New York University. His research in Mathematical Biology on mammalian intracellular circadian clocks included construction of a biochemical model of the clock. His recent discoveries have received much attention from his colleagues and the press (see article on page 1).

Aaron King - Assistant Professor of Ecology & Evolutionary Biology and Mathematics

King joins Michigan from the University of Tennessee. He received his Ph.D. in Applied Mathematics from the University of Arizona. His research interests lie in the interdisciplinary area of theoretical population dynamics, and his primary appointment is with Ecology and Evolutionary Biology. King writes and analyzes mathematical models of particular biological systems in order to understand observed patterns and make predictions. He is deeply interested in the development and analysis of new biological models for concrete systems.

Yongbin Ruan - Professor of Mathematics

Ruan joins Michigan from the University of Wisconsin. He received his Ph.D. from the University of California, Berkeley. He is a widely recognized researcher in the area of symplectic geometry, in particular the development of Gromov-Witten invariants. These invariants have become a mainstay in symplectic topology and gauge theory. Ruan has also worked on significant discoveries in the area of quantum cohomology. His influential joint work on the cohomology of orbifolds has become known as the "Ruan Cohomology."

New Postdoc Assistant Professors

Assistant Professors who joined the Department on term appointments during the past academic year are listed here with their doctoral institutions and area of speciality.

Petter Branden - Chalmers University of Technology/Göteborg University, Combinatorics (Hildebrandt)

Robert Buckingham - Duke University, Partial Differential Equations

Renzo Cavalieri - University of Utah, Algebraic Geometry

Masahiko Egami - Princeton University, Mathematics of Finance

Neil Epstein - University of Kansas, Commutative Algebra (Hildebrandt/NSF)

Grigor Grigorov - Harvard University, Number Theory

Richard Kollar - University of Maryland, Differential Equations

Peijun Li - Michigan State University, Applied Mathematics

Michael Ludkovski - Princeton University, Stochastic Control

Tamar Ziegler - Hebrew University, Dynamical Systems

Solution to Math Problem

In fact, there are two delegates such that there are at most three people between them, before and after the break. Consider five delegates who sit next to each other before the break. Each pair of these five can talk to each other. If there are at least 4 delegates between each two of them after the break, then there will be at least $5 \cdot 4 + 5 = 25$ delegates. Contradiction. One can find two of these five delegates with at most three people in between them after the break.

Two Faculty Members Retire

Peter G. Hinman, Professor of Mathematics in the College of Literature, Science and the Arts, retired from active faculty status on May 31, 2006.

Hinman received his Bachelor's degree in mathematics from Harvard College, and his Ph.D. from the University of California, Berkeley. He came to Michigan in 1966 as a T.H. Hildebrandt Research Instructor, and was promoted through the ranks to Professor in 1983. He held visiting positions in Norway, Germany, Switzerland, Australia and the U.K. He has received internal and external recognition for his work, including a Fulbright-Hays grant, NSF research grants, the AMOCO Good Teaching Award, and four LS&A Excellence in Education awards. He was always considered an exceptional teacher at all levels.

The main area of Hinman's research concerns the subarea of Mathematical Logic known as *Recursion Theory* or *Computability Theory,* which deals with theoretical questions about the computability of functions. It involves the precise relationship between sets of natural numbers which formalizes the intuitive notion of relative effective computability. This area has connections with theoretical computer science and other areas of mathematical logic, especially descriptive set theory. Hinman's early work was primarily about extensions of recursion theory beyond the traditional domain of natural numbers and other finitely described objects. His publications in this area include numerous papers, the research-level monograph "Recursion-Theoretic Hierarchies," and a chapter in the "Handbook of Computability Theory." More recently, he has worked in more classical areas of recursion theory, in particular the study of relative recursive enumerability and of the Medvedev lattice. He was the

recursion theory editor for the "Omega Bibliography of Mathematical Logic," a project that involved classifying by topic the entire literature of recursion theory from its beginnings until 1985. Most recently, he published a graduate-level comprehensive textbook, "Fundamentals of Mathematical Logic."

During his tenure Hinman held numerous administrative positions at the Department, College and University levels. Most notably in Mathematics, he served as Associate Chair for Graduate Studies (1980-83, 1986-87), Mathematics Undergraduate Program Director (1989-92, 1994-2000), Associate Chair for Education (1997-2000), and the inaugural Associate Chair for Faculty Appointments (2002-03). He served on the Department's Executive Committee in five consecutive decades. In 1980 Hinman established the Math Lab, giving mathematics students a venue for learning, tutoring, and working together. He was Chair of the Quantitative Reasoning Task Force that established an undergraduate requirement for quantitative reasoning, and identified a diverse array of courses around LS&A that would contain components to fulfill that requirement. Hinman directed seven doctoral dissertations.

Patricia D. Shure, Senior Lecturer in the Department of Mathematics in the College of Literature, Science and the Arts, retired from active faculty status on May 31, 2006.

Shure is an alumna of the University of Michigan, where she received her Bachelor

of Arts in Anthropology, Masters of Arts in Mathematics, and achieved candidacy status toward a Ph.D. in Mathematics. She taught mathematics in private secondary schools from 1963 to 1981 and came to the University as Mathematics and Science Coordinator for the Comprehensive Studies Program. Shure was appointed as a Lecturer III in the Department of Mathematics in 1983, and was named a Senior Lecturer in 2002. She served as the Associate Director and then the Director of the Department's freshman-sophomore program from 1993 to 2006.

In 1992, Shure became co-principal investigator of an NSF-funded project to develop and implement a reformed calculus program at UM. The resulting program, known nationwide as "Michigan Calculus", has become a model of how to integrate real-life problems, technology, and cooperative learning into a calculus course. For many years Shure supervised the large multi-section introductory courses that serve roughly 3000 students each fall. To strengthen the instruction in these courses, she developed and directed the Department's intensive training program for incoming junior faculty and Graduate Student Instructors.

Shure was a leader in the development of pedagogy and pedagogical tools. She is the co-author of a widely used pre-calculus textbook, and recently was co-principal investigator of an NSF-funded project to create web-based skills enhancement tools for college and high school students. She worked in the area of high school mathematics curriculum design at the state and national level.

Recognition of her achievements includes the LS&A Excellence in Education Award (each year 1991-1997), the Matthews Undergraduate Teaching Award in 1986, the Sarah Goddard Power Award from UM in 2000, and the Louise Hay Award for Contributions to Mathematics Education from the Association for Women in Mathematics in 2001. Her presentation "The Scholarship of Learning and Teaching," given as the 2001 Falconer Lecure, was a highlight of the summer meeting of

Recent Ph.D. Recipients

Ilesanmi Adeboye completed his thesis "*Volumes of Hyperbolic Orbifolds*" under the direction of Dick Canary. He will be an Assistant Professor at UCLA.

Alina Andrei completed her thesis "*The Parameter Space of a Family of Quadratic Polynomial Maps of $\mathbf{C}^2$*" under the direction of John Erik Fornæss. She will be a Postdoctoral Fellow at the University of Wisconsin.

Trevor Arnold completed his thesis "*Anticyclotomic Iwasawa Theory for Modular Forms*" under the direction of Chris Skinner. He will be an Assistant Professor/VIGRE Fellow at University of Washington.

Yann Bernard completed his thesis "*The Coupling of Gravity to Yang-Mills Fields and Fermions in Static Spherically Symmetric Spacetime*" under the direction of Joel Smoller. He will be an Assistant Professor at ETH Zurich.

Sebastien Chivoret completed his thesis "*Properties of Multiple Stochastic Integrals with Respect to Fractional Brownian Motion and Applications to Nonlinear Filtering*" under the direction of Charles Doering. He will be an Associate with Goldman Sachs.

Jungmin Choi completed her thesis "*Partial Hedging in Financial Markets with a Large Agent*" under the direction of Mattias Jonsson.

Serban Costea completed his thesis "*Strong A^∞-Weights and Scaling Invariant Besov and Sobolev-Lorentz Capacities*" under the direction of Juha Heinonen. He will be a Postdoctoral Fellow at the University of Helsinki.

Hailong Dao completed his thesis "*Homological Properties of Modules Over Complete Intersections*" under the direction of Mel Hochster. He will be an Assistant Professor at the University of Utah.

Peng Gao completed his thesis "*N-Level Density of the Low-Lying Zeros of Quadratic Dirichlet L-Functions*" under the direction of Hugh Montgomery. He will be a Postdoctoral Fellow at the University of Montreal.

Milena Hering completed her thesis "*Syzygies of Toric Varieties*" under the direction of William Fulton. She will be a Postdoctoral Fellow at the Insitute for Mathematics and its Applications in Minnesota.

Thiradet Jiarasuksakun completed his thesis "*On Expander Graphs and Hypergraphs*" under the direction of Andreas Blass. He will be a Lecturer at King Mongkut's University of Technology in Bangkok.

Leon Kaganovskiy completed his thesis "*Adaptive Hierarchical Tree-Based Panel Method for 3-D Vortex Sheet*" under the direction of Robert Krasny. He will be an Assistant Professor at the New College of Florida.

Bart Kastermans completed his thesis "*Cofinitary Groups and Other Almost Disjoint Families of Reals*" under the direction of Andreas Blass. He will be an Assistant Professor at the University of Wisconsin.

Krzysztof Klosin completed his thesis "*Congruences Among Automorphic Forms of the Unitary Group $U(2,2)$*" under the direction of Chris Skinner. He will be an Assistant Professor at the University of Utah.

Nam-Hoon Lee completed his thesis "*Constructive Calabi-Yau Manifolds*" under the direction of Igor Dolgachev.

William Andrew Lorenz completed his thesis "*A Self-Adaptive Random Walk Algorithm to Identify Genetic Epistatic Effects*" under the direction of Philip Hanlon.

Lu Lu completed his thesis "*Bounds on the Enstrophy Growth Rate for Solutions of the 3D Navier-Stokes Equations*" under the direction of Charles Doering. He has a position with Wachovia Capital Markets.

Afsaneh Mehran completed the thesis "*Even Eight on a Kummer Surface*" under the direction of Igor Dolgachev. Afsaneh will be a Postdoctoral Fellow at the University of Geneva.

Samuel Payne completed his thesis "*Toric Vector Bundles*" under the direction of William Fulton. Sam will be a Research Fellow at the Clay Mathematics Institute.

Benjamin Schmidt completed his thesis "*Weakly Hyperbolic Group Actions*" under the direction of Ralf Spatzier. Ben will be an NSF Postdoctoral Fellow at the University of Chicago.

Graduate Recruiting

The Michigan Mathematics Graduate Office had another busy admissions season. There were a total of 417 applicants for the Ph.D. program, of which 75 applied to the AIM (Applied and Interdisciplinary Mathematics) program. For the 2006-07 academic year, the Department admitted 93 students and received 29 acceptances, with 18 in the pure program and 11 in the AIM program. Among those who accepted are 12 women (7 Pure, 4 AIM).

Five Research Science Award offers were made to students, with 2 acceptances. The total number of applicants from historically underrepresented groups was 14. When taking deferrals into account, the incoming class will have 30 students (19 Pure, 11 AIM). Of these there are 18 U.S. citizens (12 Pure, 6 AIM) and 12 women (8 Pure, 4 AIM).

In March the Department hosted a Recruiting Weekend, bringing 24 potential graduate students to campus. Of those who visited, 16 students accepted our offer. This is an encouraging statistic.

Sreekar Shastry completed his thesis "*The Drinfeld Modular Jacobian $J_1(N)$ Has Connected Fibers*" under the direction of Brian Conrad. Sreekar will be a Postdoctoral Fellow at the Tata Insitute for Fundamental Research in India.

Cornelia Yuen completed her thesis "*Jet Schemes and Truncated Wedge Schemes of Monomial Schemes and Determinantal Varieties*" under the direction of Karen Smith. She will be a Postdoctoral Fellow at the University of Kentucky.

Graduate Program Fellowships & Awards

Allen L. Shields Memorial Scholarship

Serban Costea

Alice Webber Glover Math Fellowships

Dennis Clark
David Constantine
Leo Goldmakher
Hester Graves
Geri Izbicki
Brian Jennings
Jason Kutch
Aaron Magid
Johanna Mangahas
Kevin Tucker
Marshall Williams

Arthur Herbert Copeland, Sr. Memorial Scholars

Jose Gomez-Guerra
Johnson Jia
Marc Krawitz
Hyekyung Min
Tomoki Ohsawa

A.V. Flint Memorial Scholarship

Tigran Ananyan

Cameron & John Courtney Scholarship

Jose Gonzalez
John Mackay
Nicholas Rupprecht

Carroll V. Newsom Scholars

Jonathan Bober
Aubrey da Cunha
Oscar Fernandez
Daniel Hernandez
Felipe Ramirez
Chelsea Walton

CONACYT Fellowship

Gerardo Hernandez

Edwin Wilkinson Miller Scholarship

Michael Lieberman

Fulbright Scholarship

Richard Vasques
Mario Boudalha-Ghossoub

Gabrielle & Sophie Rainich Fellows

Harsh Jain
Craig Spencer

Lucent Fellowship

Ellen Eischen

Luther Claborn Mathematics Fellow

Ray Maleh

Mathematics Alumni Scholarship

Kelli Carlson
Sarah Crown
Russell Golman
Christopher Hammond
Kyle Hofmann

Mathematics Department Graduate Fellowship

Catherine Dupuis
Kristin Shaw
Benjamin Weiss

National Physical Science Consortium Fellowship

Marie Snipes

National Defense Science and Engineering Graduate Fellowship

Brian Wyman

National Science Foundation Fellows

Ryan Kinser
Ellen Veomett

Natural Science & Engineering Research Council of Canada Scholarship

Luis Serrano
Xinyun Sun

Rackham International Fellowship

Alan Stapledon

Rackham One-Term Dissertation Fellows

Mark Conger
Nam-Hoon Lee
Alvaro Pelayo

Rackham Predoctoral Fellow

Ivan Middleton

Research Training Grant (RTG) Algebra

David Anderson
Bryden Cais
Susan Sierra

Samsung Fellowship

Jungwoon Park

2005 Sumner B. Myers Memorial Prize for the Best Thesis

Calin Chindris (pictured above)

Graduate Departmental Scholarship Spring 2006

Henry Boateng
Jasun Gong
Mark Iwen
Fidel Jimenez
Shin-Yao Jow
Brian Jurgelewicz
Hyosang Kang
Rizwanur Khan
Wansu Kim
Cagatay Kutluhan
Kyungyong Lee
Victor Lozovanu
Gregory McNulty
Yogesh More
Alvaro Pelayo
Jordan Sahattchieve
Matthew Smith
Giancarlo Urzua
Diane Vavrichek
Liz Vivas
Lei Wang
Emily Witt
Hao Xing
Zhengjie Xu
Bo Yang
Hsu-Wen Young

Rackham Outstanding Graduate Student Instructor Award

Yann Bernard

Congratulations to our 2005-06 Mathematics Bachelor of Arts/Science Degree Recipients

Bryan Abbe
Ruchir Agarwal
Shailesh Agarwal
Murat Ahmed
Hye-Youn Baek
Amy Baker
Brett Barna
Karen Barr
Brian Berends
Joseph Bertram
Kenneth Beyerlein
Timothy Bodiya
Andrea Busch
Stephanie Calandro
Kenneth Charette
Omer Chowdhry
Charles Crissman
Christopher Cunningham
Michael Dombrowski
Spencer Dowdall
Julia Driessen
Andre Edwards
Matthew Elsey
Jonathan Falk
Mildred Fernandez
Chi Wang Fong
Ashley Frazier
Catherine Free
Robert Gaunt
Teow Lim Goh
Edward Grant

Sarah Haberman
Peter Hach
Daniel Hidlay
Robert Hines
Daniel Hirschman
Rebecca Jackson
Nathan Jhaveri
Rishabh Jhunjhunwala
Marit Johnson
Michael Kagan
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Sun Kim
Michael Koss
Keith Kwiatkowski
Christina Kyrtsos
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Chin-Swan Liew
Rebecca Lynch
Keith Maciejewski
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Jason Miller
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Maggie Mulcrone
Alexander Nagle
Randolph Pistor
Rachel Platte

Bradley Polizzano
Steven Privasky
Michael Radakovich
Mustafa Rangwala
Amy Rice
Robert Rizzo
Benjamin Ruskin
Benjamin Salvette
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Rajiv Shende
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Benjamin Sonday
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Michael Turner
Asad Usman
Anish Vora
Karl Weintraub
Amanda Wilke
Christopher Wing
Pak Hin Wong
Richard Yarger
Mark Yeo
Jeffrey Zheng
Jonathan Zimbler

The Mathematics Graduate Student Soccer Team was victorious over the team from Physics in 2006 to win the Intramural Sports Indoor Mini Soccer tournament. Team members were:
front row, l-r: Jose Gonzalez, Jose Gomez-Guerra, Henry Boateng, Fidel Jimenez
back row, l-r: Aubrey da Cunha, Brian Wyman, Alan Stapledon

2006 Undergraduate Award Recipients

The Department's team for the William Lowell Putnam Mathematics Competition placed 29th out of 395 teams in the event. This year's team was comprised of **Christopher Cunningham, Fernando Delgado Salas** and **Spencer Dowdall.** The individual competition included 3545 students from across North America. **Fernando Delgado Salas** received an honorable mention, placing the highest of UM students at 57. **Jeffrey Madsen** and **Christopher Cunningham** also finished in the top 300.

The winner of the 23rd Annual University of Michigan Undergraduate Mathematics Competition was **Jeffrey Madsen.** Tied for second place were **Timothy Heath** and **Nathan Stiennon.**

The following students received **Mathematics Alumni/Alumnae Scholarships** for the 2005-06 academic year:

> Ruchir Agarwal
> Kevin Wilson

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

> Joseph Golden
> Zachary Maddock
> Timothy McQuade
> Richard Turner
> Erin Wood

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

> Karen Boore
> Andrew Danielsky
> Scott De Orio
> Christopher Kurdelski
> John Shepard
> Seth Siegel
> Malorie Spunger
> Laura Ventimiglia
> William Wilcox
> Suellen Yin

Randolph Pistor received the **Leon P. Zukowski Prize** for outstanding service in the Mathematics Learning Center (formerly known as the Math Lab).

Professor Ralf Spatzier (left) with some recipients of the Outstanding Achievement in Mathematics Award. l-r: Breanna Turcsanyi, Teow Lim Goh, Chi Wang Fong, Murat Ahmed, and Jeffrey Zheng.

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

Outstanding Achievement in Mathematics Awards went to the following seniors:

> Murat Ahmed
> Matthen Elsey
> Chi Wang Fong
> Teow Lim Goh
> Daniel Hirschman
> Breanna Turcsanyi
> Michael Turner
> Pak Hin Wong
> Jeffrey Zheng

The **Otto Richter Memorial Prize in Actuarial Science** was presented to **Keith Kwiatkowski.**

The **CIGNA Award in Actuarial Science** was presented to **Wei Heong Koh.**

Department Chair Tony Bloch with Outstanding Graduating Senior Benjamin Sonday.

The **Irving Wolfson Award in Actuarial Science** was presented to **Rebecca McQuillan.**

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

Charles Crissman and **Benjamin Sonday** were named the **Outstanding Graduating Seniors.**

Jason Miller 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.

Professors Curtis Huntington and Stephen DeBacker with Bychinsky Award recipients Joseph Golden and Zachary Maddock.

Math Undergrad Awarded Prestigious Churchill Scholarship

Mathematics Major **Charles Crissman** was one of 11 American students awarded the elite Winston Churchill Foundation Scholarship this year. The extremely competitive scholarships are awarded based on an applicant's academic record, score on the Graduate Record Examination and letters of recommendation.

Crissman graduated in May with a Bachelor's degree, majoring in math, linguistics and Italian. The scholarship will send Crissman to the University of Cambridge, where he will spend the next year studying mathematics.

After graduating from high school in Midland, MI, Crissman initially considered studying biochemistry at Michigan, leading to medical school. In his sophomore year he realized that he was truly inspired by math.

Crissman said he is looking forward to learning about another culture and taking more specialized math classes. "My real interest is doing research in something related to modern algebra," he said. Upon completion of his year at Cambridge, Crissman intends to pursue a Ph.D. in mathematics working toward a career in academia.

In addition to his interest in modern algebra, Crissman's studies are well rounded, as evidenced by his triple major. He is a member of a snowboarding club at the University, and an editor at the student publication the *Every Three Weekly*. He is an avid scholar of five foreign languages: Russian, Finnish, Italian, French and ancient Greek.

The Churchill Scholarship, established in honor of the former British prime minister, annually offers 75 colleges nationwide the opportunity to nominate two students for consideration by the foundation. Other participating institutions include Boston College, the University of Chicago and Michigan State University. Selected students pursue graduate study in the fields of engineering, science and mathematics.

Undergraduate and Actuarial Program News

The **Student Actuaries at Michigan** (SAM) group had an active year. More than 250 members regularly received information and about half that number participated in activities. The group's activities included a balance of athletic, social, academic, and professional agendas.

Highlights of their year included visiting two local actuarial consulting firms, organizing 10 information sessions sponsored by national firms, and hosting a well-attended meeting of the Michigan Actuarial Society involving participation in the current industry-wide CRUSAP (Critical Review of the United States Actuarial Profession) research project. In Winter 2006, 31 actuarial related companies conducted on-campus recruiting visits. SAM continued to hold semester-long study groups for the May professional actuarial examination, led by experienced students.

SAM decided to take $1,000 of accumulated surplus and return it to the University in appreciation for past services by funding one of the Huntington Scholarships for first year students that was presented this year. This act of generosity by an undergraduate student group was somewhat unusual and greatly appreciated.

The **Undergraduate Math Club** continued their weekly meetings this year with presentations on a variety of pure and applied mathematics topics. One of the speakers this year was an undergraduate, and in the second semester the majority of talks were by graduate students and junior faculty, as opposed to faculty in the first semester. A well-attended movie night was held to view "The Proof." The undergraduates all seem to appreciate the informative talks, discussion, camaraderie, and pizza.

The Undergraduate Scholarship Committee was fortunate to be able to award scholarships to 42 students for the 2005-06 academic year, totalling $107,194. Individual scholarship amounts ranged from $3000 to $6000.

The **Inquiry Based Learning** (IBL) initiative continues to develop and grow. Several courses were taught during the 2005-06 academic year which incorporated the inquiry-based concept in which students are encouraged to learn mathematics by actively "doing" mathematics under the guidance of an experienced and dedicated mentor, while testing their understanding of concepts using their own capacity for clear, logical reasoning. The program is funding a postdoc position in the Department for 2006-07 who will help to develop more courses and teaching methods.

The **Mathematics Learning Center** (MLC-formerly MathLab) in the basement of East Hall continues to offer free tutoring to math students, and administer computerized gateway exams which are required to ensure the acquisition of algebraic and computational skills in the various levels of calculus courses. Students made more than 25,000 visits to the MLC during the 2005-06 academic year. During this time more that 23,000 gateway exams were given for students in four levels of calculus courses (Math 105, 115, 116, 215). The MLC also maintained an outpost at the Ross Academic Center in the Athletic Department.

In Memorium

Professor Emeritus of Mathematics **Donald G. Higman** passed away in February, 2006. Higman was born in Vancouver, in 1928. He attended college at the University of British Columbia, then did graduate work at the University of Illinois, where he studied with Reinhold Baer, an important figure in modern algebra in the mid twentieth century. After his doctorate in 1952, he spent two years as a National Research Council Fellow at McGill University, then two years on the faculty of Montana State University. Thereafter, he accepted an assistant professorship at the University of Michigan and became professor in 1960.

Higman made basic contributions in several areas of algebra, starting in the theory of finite groups, then moving through group-inspired geometries to work in abstract combinatorics. He was recognized as a worldwide expert in this latter area during the last three decades.

In early work on homological aspects of group representation theory, Higman established the important concept of a relatively projective module and gave a criterion, which bears his name, for relative projectivity. His result that boundedness of degrees of indecomposables in characteristic p is equivalent to cyclicity of the Sylow p-group is a basic result in the theory of modules for group algebras. He did some of the earliest computations of degree 1 cohomology of classical groups as part of his study of flag-transitive groups. His theory of the focal subgroup of a Sylow subgroup was a basic tool in local analysis in finite group theory. Works with UM colleague Jack McLaughlin on low rank classical groups were models for later theories on characterizing finite simple groups and their geometries.

Higman's theory of rank 3 permutation groups gave a simple and elegant theory which assisted in the discovery of several of the sporadic simple groups, the most elusive and provocative of the finite simple groups sought so intensely in the 1960s and 1970s. An initial application of his theory was the Higman-Sims simple group, of order 44,352,000, and a rank three graph on 100 vertices using the combinatorics of the Mathieu group on 22 letters. It is a testimony to the elegance of his theory and the wit of Higman and collaborator Charles Sims that this sporadic group was envisoned and elegantly constructed in a single day!

Besides these, Higman made numerous contributions to groups and combinatorics, including studies of intersection matrices, calculations of degrees of irreducible constituents of permutation representations, work on the Krein condition, bounds for parameters of generalized polygons and a monomial version of Scott's modular theory for permutation representations.

His 1970s philosophy of "geometry without groups" stressed the essential combinatorial ideas which recurred in studies of groups and geometries. It led to the significant theory of coherent configurations. These are essentially association schemes, and Higman was one of the first to emphasize the value and interest outside their statistical and graphical origins, particularly in group theory. Thus he was one of the founders of the area now referred to as "algebraic combinatorics."

Higman served extensively on Department committees, notably the executive, the doctoral, and master's committees, and on the University's grievance committee. He supervised 15 doctoral theses.

Professor Higman's academic honors include giving an invited lecture to the 1970 International Congress of Mathematicians in Nice, where he presented his theory of rank three groups, and the 1975 receipt of the Alexander von Humboldt Stiftung Prize. He spent sabbatical and academic leaves in Eindhoven and Giessen, was a visiting professor at Frankfurt, a visiting senior scientist at Birmingham and Oxford and a visiting fellow at the Institute for Advanced Study in Canberra, Australia.

Donald Higman, wife Betty and their five children were generous hosts to members of the mathematical community on many social occasions. Don was for many years an active member of the Flounders and the Ann Arbor Track Club. After retiring, the Higmans designed and built a home on the shore of Grand Traverse Bay in the northwest corner of Michigan's lower peninsula, where they enjoyed spending summers. Higman had cancer and volunteered to be part of an experimental research study at the UM Comprehensive Cancer Center, contributing in whatever way he could to find a cure for the disease. It was important to him to be a contributing member to society even as he went through his own personal struggle with the disease.

Ethel M. Rathbun, former assistant to several Associate Chairs and Chairs in the Department of Mathematics, died in November 2005 after returning home from a vacation in Germany. She was 73.

Rathbun joined the mathematics staff in 1967 and quickly became a major supporting pillar of its activities. She represented the Department to faculty, visitors and students for 27 years before retiring in 1994.

Her skills and warm spirit rapidly endeared her to all who came through the department. Rathbun became known throughout the world's mathematical community because of her concern for all members of the Department and the many students and international faculty constantly flowing through Ann Arbor.

One current faculty member reports that, when he saw former students, visitors or faculty, their first query was "How's Ethel?" Her friendships ranged from members of the National Academy of Sciences to beginning graduate students. Indeed, one department chair referred to her as die Herr of Mathematics. She retired after a distinguished career during which she gave her behind-the-scenes competence and compassion to all with whom she made contact.

Rathbun was born in 1932, in Fairfield Township, MI, the daughter of Leland and Florence Davenport Rathbun. After an early education in a one-room school, she graduated in 1950 from Sand Creek High School, and from Cleary College in Ypsilanti in 1951. From 1960-67 she lived and worked in Germany.

She enjoyed travel and was fortunate enough to have visited all provinces in Canada, except Prince Edward Island, and countries on all continents but Antarctica.

Memorial contributions may be made to the Scholarship Fund at Cleary University, 3750 Cleary Dr., Howell, MI, 48843, the American Heart Association, or the American Cancer Society.

Robert M. Thrall, former University of Michigan Department of Mathematics faculty member for 32 years, died at his home in Philadelphia, PA in April, 2006, at age 91. Professor Thrall joined the faculty in Ann Arbor in 1937 and served until 1969. In 1947, he received the Henry Russell Award from the University of Michigan and in 1965 received the Distinguished Faculty Award. He received an honorary Doctor of Sciences degree from his alma mater, Illinois College, in 1960.

Professor Thrall left UM in 1969 to become the founding Chairman of the Department of Mathematical Sciences at Rice University in Houston, TX where he was appointed the Distinguished Noah Harding Professor of Mathematical Sciences. Early in his career Professor Thrall became interested in applying mathematics to problems of the real world. His book "Decision Processes" (John Wiley and Sons, 1954, New York), co-edited with UM colleagues Clyde C. Combs and Robert L. Davis, chronicled a unique initiative that brought mathematicians, statisticians, psychologists, economists and philosophers together to both create and test mathematical formulations in behavioral science theory, including the theory of games. Early, seminal contributions by two Nobel laureates in Economics, Gerard Debreu (1983) and John Nash (1994), appeared in the book.

Professor Thrall remained active in research well into his eighties and looked at his latter years as the most interesting and productive period of his career. He focused on the emerging discipline of data envelopment analysis and contributed over 35 publications on the topic after his formal retirement.

Professor Thrall's wife of 68 years, Natalie, preceded him in death in 2004. He is survived by three children, three grandchildren and three great-grandchildren. In lieu of flowers contributions may be made to Illinois College, 1101 W. College Ave, Jacksonville, IL 62650

Professor Emeritus of Mathematics **James G. Wendel**, 83, died of complications from cancer in January, 2006 in Portland , OR. He was born in Portland on April 18, 1922, where he lived until graduating from Reed College in 1943. His collegiate years were interrupted by World War II, an effort to which he contributed through his work on defense-related proj-

ects, including a stint in Linus Pauling's laboratory. Following completion of his Ph.D. in mathematics at California Technical University in 1948, Wendel had academic appointments at Yale and Louisiana State University, prior to moving to Ann Arbor in 1955 to join the faculty of the UM Department of Mathematics. He was named Professor in 1961, and retired in 1987.

During his tenure at Michigan, Wendel served as Associate Chairman for a total of eleven years, was a member of SACUA and was its Vice-Chairman in 1966-67. His research was in the area of probability, and he was well known as a brilliant teacher and for his great breadth of knowledge. Wendel was an inveterate problem solver, who loved the challenge and was often called to set problems for collegiate competitions. A popular lecturer, he received many invitations from abroad, and was a visiting professor in Denmark , England , Australia, and Israel. Following his retirement, Wendel moved to Palo Alto , CA , where he stayed until 2000, at which point he returned to his original home of Portland.

Jim Wendel was a man of great intellect, possessing not only a life-long love of mathematics, but an impressive depth and breadth of understanding of history, science, art, literature, culture, language, and music. He had an insatiable curiosity, and his many interests seemed to be matched by an equal diversity of talents. Wendel loved to travel and was moved deeply by music, the former reflected in his interest in linguistics and in learning foreign languages and the latter expressed most fully through his playing of the accordion and piano. He also was fond of his after-work martini.

Wendel was preceded in death by his younger brother Thomas in 2004 and his wife of 56 years, June (nee Herzog), in 2000. He is survived by his sister, and by six children and 12 grandchildren

Donations to honor his memory may be sent to Reed College, 3203 SE Woodstock Blvd., Portland , OR 97202-8199 .

Former Department of Mathematics Professor **Hans Samelson** passed away in September 2005. He was 89 years old. A native of Germany, Samelson left in 1936 for Zurich, where he studied at the Swiss Federal Institute of Technology, receiving his doctorate in 1940.

Samelson joined UM in 1946 and was promoted through Professor in 1955. His

teaching has been described as inspirational and awe-inspiring, and he was considered one of the most erudite of faculty members at the time. Samelson left the Department in 1960 for a position at Stanford University.

Samelson was one of the world's leading figures in the mathematics research areas of differential geometry, topology and the theory of Lie groups and Lie algebras—important in describing the symmetry of analytical structures. He was the author of many research articles and two widely used textbooks—an undergraduate book about linear algebra and a graduate text on the theory of Lie algebras.

On the occasion of his 70th and 85th birthdays, conferences were held in his honor at Stanford, attended by the world's leading figures in mathematics research, including many of his former students and colleagues. This was a small measure of the great esteem in which he was held by his students, colleagues, and the entire mathematics community.

Samelson was married twice, to the late Renate Reiner in 1940 and to Nancy Morse in 1956. He is survived by his wife, Nancy, a brother, Franz, three children and two grandchildren. Donations in Samelson's memory can be made to the Samelson Memorial Fund, Department of Mathematics, Stanford University, Bldg. 380, 450 Serra Mall, Stanford, CA 94305-2125

Former Department of Mathematics Professor **Raoul Bott** passed away in December, 2005. A native of Hungary, Bott studied engineering at McGill University in Montreal, then received his Ph.D. in science from the Carnegie Institute of Technology in Pittsburgh. He joined UM in 1951, and was promoted through Professor before accepting a position at Harvard in 1959. He formally retired in 1999.

Bott had a tremendous influence in the development of topology and differential geometry and their application to Lie groups, differential operators and mathematical physics. His contributions to this area were considered as great as any one person.

Among the mathematics awards Dr. Bott received were the National Medal of Science in 1987, the Wolf Prize in 2000, and two from the American Mathematical Society—the Oswald Veblen Prize in 1964 and the Steele Prize for lifetime achievement in 1990.

Many Thanks to our Generous Supporters

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Dr. Donald E. Sarason
Mr. and Mrs. Clayton Timmons
Ward D. Bouwsma Trust
Dr. Smilka Zdravkovska and
 Professor Daniel Burns

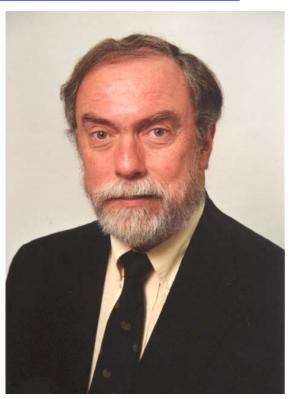# Huntington Endows Actuarial Scholarships

Curtis E. Huntington (AB 1964, MAS 1965), Associate Chair of the Department of Mathematics and director of its actuarial studies program, has made a gift of $500,000 to the Department through a charitable remainder unitrust to endow the Margaret S. Huntington Actuarial Scholarship.

The contribution, made in memory of his mother, strengthens the scholarship he previously created and will provide 10 promising first-year students with $1,000 awards.

Recipients are evaluated based on their strong performance in introductory calculus and their appreciation for the actuarial field as demonstrated in their answers to questions in the scholarship application. Between 40 and 80 students a year have applied for the scholarships since they were first offered in 1999.

"The goal is to get good young mathematicians to consider the actuarial field as a career option," said Huntington, a Boston native and still a part-time resident, who worked as an actuary for New England Mutual Life for nearly three decades before joining the Department in 1993. Huntington's father was an actuary, and his mother, also a mathematician, took actuarial course work. Actuaries use financial mathematics to evaluate the probability of future events for businesses and organizations and develop programs to avoid projected risks or reduce their impact.

"We are so honored that Curtis has decided to permanently endow this scholarship fund" says Tony Bloch, Department Chair. "His tireless efforts on behalf of the actuarial program and the Department of Mathematics are paramount to a successful program. In his recent role of Associate Chair of Education, Curtis has truly shown his genuine concern for the students and the educational process."

Alumni/ae Scholarship Recipients

Ruchir Agarwal is from Calcutta, India, and is a double major in mathematics and economics. He chose math for its beauty and the rigorous thinking and discipline required. His financial need was desperate, and with the help of this scholarship, Ruchir was able to graduate as scheduled in May. "There are far fewer funding opportunities available for foreign students," he says, "and I am extremely grateful for this support." Ruchir will be attending Harvard for graduate studies.

Kevin Wilson just finished his second year at UM. He grew up on a dairy farm in rural Simpsonville, KY. Kevin challenged himself in high school, finished Calculus II in his sophomore year, and did much self-directed study thereafter. The excitement of working out proofs to problems solidified his interest in mathematics. Besides helping to alleviate the financial burden on Kevin's family, he says the scholarship is an "immense honor that the Department has given me…and shows their faith in me by entrusting me with an award that represents the collective weight of all alumni."

Kellie Carlson is from Romeo, MI, and will be in her third year of graduate studies this fall. She is studying combinatorics and hopes to work with Sergey Fomin or John Stembridge. Kellie has been interested in math since she was very young, and is particularly drawn to its artistic aspects. This summer she will finish her QR requirements and begin to study preliminary exam material.

Sarah Crown is from Needham, MA, and just finished her fourth year of graduate study in algebraic combinatorics with Phil Hanlon. Sarah credits her interest in math to a wonderful high school pre-calculus teacher. "It was then that I decided that I'd like to teach math, and after taking a combinatorics class in college, I decided to go to graduate school."

Russell Golman is from Orangeburg, NY and received a BS in math from Stanford. Russell completed his second year in the Applied and Interdisciplinary Math PhD program, studying game theory under Scott Page in the Complex Systems Department. He chose the AIM program "because it lets me explore various interests, from physics to economics, that share a common grounding in the precision of mathematics."

Christopher Hammond is a second year graduate student from Ohio. He received his BS from Ohio State University, but emphasizes that he much prefers attending UM! Chris is currently working with Berit Stensones in several complex variables. The scholarship will allow him to continue his research toward his thesis and prepare for his oral exams.

Kyle Hofmann is from San Francisco, CA, and received his undergraduate degree from the University of California, San Diego. He is in his third year, studying singularities using jet schemes with Mircea Mustata. Kyle became interested in math in high school when a mathematically-minded friend suggested Walter Rudin's "Principles of Mathematical Analysis." Kyle says "I love the precision and structure of mathematics. Trying to understand the structures of mathematical objects forces me to make precise statements, and trying to make my intuition precise leads me to a thorough understanding of the structures involved."

Upcoming Events

Please visit our website for additional information on these and other events in the Department.

www.math.lsa.umich.edu.

Maxwell Reade at 90

In April 2006, Professor Emeritus of Mathematics Maxwell Reade celebrated his 90th birthday. His children organized a gala party for him which included friends, family, and many members of the mathematical community. Guests were asked to bring bumper stickers for Maxwell which were appropriate to the occassion and/or supportive of one of Maxwell's causes.

A few years ago, former Mathematics staff member Lee Zukowski established a fund in Maxwell's honor. The fund is intended to help support diversity within the Department by providing funding for student recruiting, direct support of students, and other activities related to this area. Lee wanted Maxwell's past efforts in this area to be remembered and celebrated. "Maxwell did so much for so many students over his years as Graduate Chair and LSA Scholarship Committee Chair," says Lee. "He would make visits to high school students, help people with entry into the country and their visas, and assure family members that students would be taken care of at Michigan. He really worked hard to find the best students."

Lee donated enough money for the fund to reach endowment status to begin earning interest. In 2005 the Department of Mathematics began actively soliciting donations to the fund. There was a leadership gift from an alumnus of $15,000, plus gifts from faculty members and friends of the Department. While the fund has now reached a level where the interest can be awarded to a student or used for support of recruiting, the Department will continue efforts to grow the fund to higher levels.

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, November 3, 2006
- 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

Alumni/ae Updates

Sister M. Bibiana Lewis (MS 1940) celebrated her 100th birthday in April, joined by more than 80 nieces, nephews, grandneices and grandnephews. She spent her career teaching in the colleges and high schools in Minnesota. In retirement she enjoyed bowling, ping-pong and bridge, and was the subject of several Novi programs.

William R. Averill (BA 1946) writes "I never really felt confident in my math ability, so after graduation I took a job working as an advertising copywriter, a far cry from math." He feels he made the right decision, as he has had a successful career. "My math training was EXTREMELY valuable, however, as it ingrained in my brain an attitude that there is an answer for every problem! That math attitude helps me every single day. Thanks, UM!"

Roger H. "Si" Simonsen (MS 1960) retired in 1995 from his position as Manager of Advanced Technology Assessment with Boeing. His avocations include directing a choral group for 35 years and singing with the Seattle Symphony Chorale. Si bred and raised Whippets for 25 years, achieving top dog in U.S. three times and over 30 AKC champions, with many dual champions. He moved to Oregon where he is still active in the church choir, and enjoys riding horses and fishing in the beautiful high desert.

Alan Wilde (BS 1970, MS 1973) is a member of six scientific organizations and will be in the 2006 Empire Who's Who.

Tovey C. Bachman (PhD 1985) is currently a research fellow with LMI Government Consulting. He was recently awarded the Barchi Prize for the best paper presented at the 72nd Military Operations Research Society Symposium. His paper, "Reducing Aircraft Down for Lack of Parts with Sporadic Demand," describes an ordering policy he developed for repair parts with sporadic demand patterns. The Military Operations Research Society, or MORS, seeks to enhance the quality and effectiveness of military operations research to better support decision making in the Department of Defense. Since joining LMI in 1989, Tovey has been extensively involved in developing mathematical models for analyzing complex systems. They include a simulation model for analyzing the performance of large-scale inventory and financial systems, an economic model that uses empirical repurchase probabilities to make retention versus disposal decisions for spare parts, and a hybrid analytical-parametric model for estimating the mass and volume of spares for future space missions.

Ernst Mayer (MA 91, PhD Aero 93) moved to Silicon Valley in 1999 and has been doing algorithm and software development for a series of high-tech programmable-logic startups there. In the plentiful spare time that leaves him, he tries to find time for his other mathematical avocation, computational number theory. The highlight of his work in the latter area was (together with Crandall and Papadopoulos) establishing the composite character of the twenty-fourth Fermat number a few years ago. More information about his recent personal and professional doings is available at his homepage, http://hogranch.com/mayer/home.html.

Professor Emeritus Wilfred Kaplan has published a biography of his life with his wife **Heidi** (PhD 1944). The first volume, entitled "Heidi and Bill: Beginning of our lives together," highlights two years of their courtship. The books is being distributed by Kolossos Printing, and can be purchased online at the following webste: www.kolossosprinting.com.

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
Development/Planned Giving
734-647-6000**

Pat Shure (BA 1958, MA 1960, pictured above third from left) retired this year from the University of Michigan Department of Mathematics. Pat is celebrating her 100th exam with some instructors for the introductory calculus courses. l-r: Graduate Student Instructors Tomoki Ohsawa, Marshall Williams, Pat, Jose Gonzales, Hyosang Kang, and Dr. Nkem-Amin Khumbah of the Comprehensive Studies Program.

What Are You Doing?

We'd like to hear from you! Please complete and return this form for our alumni/ae files. You may mail it to the address below, fax it to 734-763-0937, or email the information to math.mich@umich.edu.

Name_____

University of Michigan Degree(s) with years & advisors

_____

Degrees from other Universities/Years

_____

Home Address_____

City, State Zip_____

Home Phone_____ E-mail_____

Firm/Institution_____

Position_____ Business phone_____

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