Math Times

Altgeld, Illini Hall renovation project moves ahead

The results are in, and yes, it is feasible to develop a world-class research and instructional environment for the Department of Mathematics at the University of Illinois at Urbana-Champaign. DeStefano Partners recently wrapped up their renovation feasibility study, and the results are exciting!

Illini Hall will be transformed into one of the world's premiere environments for discovery and learning in mathematics. While retaining its historic face, the building will be substantially expanded in size, creating numerous spaces for formal and informal collaborative working sessions, including a large commons area. A colloquium room appropriate to the stature of distinguished visitors and classrooms to accommodate the students and learning environments of the future are all part of the renovation plan.

The administrative offices of the Department of Mathematics will remain in Altgeld Hall—the historic 'front door' of the University. Original surfaces inside and outside Altgeld Hall will be restored to a condition worthy of the historic nature of the building. The restoration of the Mathematics Library to its historic grandeur will include reinstallation of a glass dome, replacing one removed in 1956. Classrooms will be modernized for 21st century needs, heating and air conditioning will be updated, and a second elevator will be added to make all portions of Altgeld Hall accessible.

The thorough process of the feasibility study included assessment of current use and condition, extensive conversations with stakeholders, analysis of functional needs, development

Rendering of future Illini Hall Commons by DeStefano Partners.

of proposals, and the formulation of phasing options and cost estimates. The renovation of both Altgeld and Illini Halls will conform to a LEED Gold Rating.

So, what happens next? We are aiming to secure financing for construction to start in 2014, with completion in 2019. Gifting opportunities for this historic renovation effort are being developed and will be communicated to our alumni and friends in future issues of *Math Times*.

If you would like more information about the project, please contact Sheldon Katz (katz@math.uiuc.edu), Mathematics Development Committee Chair, or Matthew Ando (mando@math.uiuc.edu), Mathematics Department Chair, for more information.

Altgeld Hall, University of Illinois at Urbana-Champaign

Illinois Math Reception

The 2012 Joint Mathematics Meetings will be held January 4–7, 2012, in Boston, MA.

The Department of Mathematics of the University of Illinois at Urbana-Champaign will host a reception from 5:30 p.m. to 7:30 p.m. on Friday, January 6, 2012, in Salon J, located on the 4th Floor of Marriott Boston Copley Place.

Everyone ever connected with the department is encouraged to get together for conversation and to hear about mathematics at the University of Illinois.

Alumni job survey to help department better prepare students

We invite your participation in the Alumni Job Survey, which you can complete online at:

www.math.illinois.edu/alumni-job-survey.html

This survey is important to the Department of Mathematics for many reasons. We would like to know what our alumni are doing so that we can become more familiar with the various career paths taken by our graduates. This information will help us better prepare our students for their careers and could help us develop mutually beneficial relationships with the companies that employ our graduates. The survey will also help us become more familiar with our alumni as a group so we can build on our existing alumni events and activities.

We would like to thank the members of the Commercial Track Committee of the Mathematics Development Advisory Board, who helped develop this survey. Thank you for your participation!

From the department chair

It is a privilege to have the opportunity to represent this great department. I'm particularly fortunate for the leadership of my predecessor, Professor Sheldon Katz. Sheldon's enterprising hard work has helped to create exciting opportunities for us, including the feasibility study for the renovation of Altgeld and Illini Halls.

Mathematics continues to grow, with remarkable progress in established areas and exciting expansion into new ones. Our faculty, students, and alumni are contributing actively to that growth. I've always been inspired by our faculty and students. In this issue of the *Math Times* you can read about some of the awards they have won and some of the interesting things they are doing in teaching and research. You can also read about one of our alums, Brad Smith. Part of the fun of being Chair is the opportunity to get to know our alumni and learn about the exciting things they are up to. Please don't hesitate to get in touch—I'd like to hear your story too.

Matthew Ando
Chair, Department of Mathematics

Alumnus Profile: Bradley Smith

by Jim Dey

When he was in high school and considering what to study in college, Brad Smith got some advice from his dad. "He said, 'Why don't you look into actuarial science,'" Smith recalled.

Smith's father was a computer professional for an insurance company who was acquainted with his company's chief actuary. He thought being an actuary looked like a good job. Smith took his dad's word for it, and things worked out.

Now 56 and living in Dallas, Texas, Smith is the chairman of the actuarial firm Milliman, Inc., and the incoming president of the Society of Actuaries. He said his career was boosted by his facility for mathematics, but contends the benefits of his math education at the University of Illinois have less to do with learning complicated formulas than building confidence that he could meet any challenge.

"I think a math-based education teaches you to think and solve problems. What is desirable in the commercial world is the ability to solve problems," Smith said. He said he rarely uses advanced mathematics in his day-to-day business life, but that math education has been a crucial ingredient in his long climb up the corporate ladder.

"Looking back at the success I've had, I think a large part of it is due to the education I got at the University of Illinois," he said. " I owe a tremendous amount to the UI."

To help repay that debt, Smith and his wife, Karen, a UI accounting graduate, recently established a $25,000 scholarship in the math department. "It's not substantial at this point, but we hope to build it," Smith said.

A 1973 graduate of Crystal Lake Community High School in McHenry County, Smith said he grew up a UI sports fan. He recalled attending, along with his dad, UI basketball games played at Chicago Stadium.

"I always wanted to go to the UI. Then I got an academic scholarship, and that pretty much sealed the deal," he said.

Smith graduated from the UI in 1977 and married Karen, his high-school sweetheart. They have a daughter, Emily. After graduation, Smith moved to Dallas and applied his actuarial skills to jobs at a series of insurance companies, all of which were subsequently acquired in mergers.

Concerned about being judged on his "capabilities and willingness to work hard," Smith said he decided to leave the insurance industry. In 1986, he was recruited by a fellow UI graduate to join Milliman, the world's largest independent actuarial and consulting firm.

Milliman currently operates in 25 countries around the world and employs over 2,500 people. Smith said that roughly 60 percent of the firm's business is actuarial.

Actuarial science, which is taught within the UI's Department of Mathematics, applies mathematical and statistical methods to assess risk in the insurance and finance industries. It includes a number of interrelated subjects, including probability, finance, economics and computer programming.

Smith said the broad sweep of actuarial science means that his company works with many different businesses, including life, property and health insurers and pension systems.

"We help them price their products. We help them determine the (financial) reserves they should have. We help them with mergers and acquisitions," he said.

Ten years after joining Milliman, Smith was elected to the firm's board. He was elected board chairman in 2000. His job requires large amounts of traveling and affords numerous opportunities to speak to student, business and professional groups.

Smith said that many of his overseas clients expect to see him on a regular basis and that he does an "around-the-world trip about three times every two years." Because of that, Smith has built up over 8 million American Airlines Advantage miles. His favorite foreign cities include London, Paris, Beijing and Jerusalem.

Smith's travel schedule has taught him the world is not all that big. "You realize you're less than a day away from anywhere in the world," he said. "I think of Champaign-Urbana as extremely close, and I really enjoy visiting."

When he visits campus, which he does regularly, Smith speaks to business classes and the Actuarial Club, talking about "whatever is on my mind." Smith said he usually speaks without notes, but over the years has received so many requests for copies of his speeches that he reconstructed them for a book, "What Do You Think: Preparing for the Question that All Clients Ask."

One important message Smith delivers to students is that it's important to demonstrate to employers that they are competent, trustworthy and have a passion for the job. "If you're going to excel, it's not a 30-hour week, it's not a 35-hour week," he emphasized.

Smith is in the prime of his career, but he said he's not sure what his future holds. He said he expects to remain at Milliman at least four or five more years, but that he also would entertain a second career as a teacher or even as a candidate for elective office.

"I'm open to possibilities," he said.

Jim Dey is a columnist and editorial writer for the Champaign–Urbana News-Gazette.

NEW FACULTY

Yuliy Baryshnikov
Professor

Ph.D. 1987, Moscow

Yuliy Baryshnikov joined the Department of Mathematics faculty in June 2011. He also holds a joint appointment in the Department of Electrical and Computer Engineering. He received his Ph.D. in 1987 in Moscow, and spent the next 24 years working on various topics in probability, singularity theory, dynamical systems, engineering and mathematical economics at several universities in Germany, Netherlands, France, and, most recently, Bell Laboratories in New Jersey.

Pierre Albin
Assistant Professor

Ph.D. 2005, Stanford

Despite his French name, Pierre was born in California and grew up in Texas and Mexico. After getting his Ph.D. at Stanford in 2005, he was a Moore Instructor and NSF postdoc at MIT, as well as a postdoc at NYU and the Institute for Advanced Study, and a postdoc of the Foundation Sciences Mathématiques de Paris. He enjoys his research in geometric analysis because it allows him to use tools from topology, geometry, analysis, and even number theory. He specializes in analysis on noncompact and singular manifolds and analytic representations of topological invariants. He is married to Kay Kirkpatrick.

Kay Kirkpatrick
Assistant Professor

Ph.D. 2007, University of California at Berkeley

Hailing from Montana, Kay Kirkpatrick received her Ph.D. in mathematics from UC Berkeley in 2007 and then spent time as a postdoc at MIT, NYU, and Université de Paris IX, before joining the mathematics faculty at Illinois. She works in statistical mechanics, at the interface between probability and differential equations. With these tools, and occasionally number theory, she is able to analyze systems that arise in applications to supercooled matter and genetic dynamics. She has also been playing the piano for a couple of decades, and is married to Pierre Albin.

Spencer Dowdall
J.L. Doob Research Assistant Professor

Ph.D. 2011, University of Chicago

Spencer Dowdall received his Ph.D. from the University of Chicago in 2011 under the supervision of Benson Farb. His dissertation explored the relationship between the topological and dynamical complexity of point-pushing homeomorphisms of a surface. His research interests involve surface topology, mapping class groups, the geometry of Teichmüller space, and geometric group theory. Hailing from sunny south Florida, Dowdall moved to the University of Michigan for his undergraduate studies in 2002, where he was also an NCAA pole vaulter.

Jingwei Guo
J.L. Doob Research Assistant Professor

Ph.D. 2011, University of Wisconsin–Madison

After spending nearly all his life in Hefei, China, Jingwei Guo went to the University of Wisconsin–Madison where he received his Ph.D. in 2011 under the supervision of Andreas Seeger. His research interest is in harmonic analysis. In particular he is interested in its applications to the lattice point problem and other problems in analytic number theory.

Xiannan Li
J.L. Doob Research Assistant Professor

Ph.D. 2011, Stanford

Xiannan Li has lived in China, Ireland, Canada and the United States. He obtained his Bachelor's degree in Canada and completed his Ph.D. this year at Stanford University, with Professor Soundararajan as his adviser. His broad area of interest is analytic number theory and his recent research has involved L-functions.

Bernard Lidicky
J.L. Doob Research Assistant Professor

Ph.D. 2011, Charles University

Bernard Lidicky was born in Prague in Czechoslovakia which is now the Czech Republic. He completed his Ph.D. in 2011 at Charles University in Prague under the supervision of Jiri Fiala right before coming to Illinois. His research interests are in combinatorics, graph theory, and algorithms. In particular, graph coloring is his favorite topic. In his free time he likes to play volleyball.

Ando, Ahlgren, Muncaster take new leadership roles

Matthew Ando became Chair in August 2011. He received his Ph.D. in 1992 from MIT, and he worked at the University of Virginia and Johns Hopkins before joining the department in 1999. His research area is algebraic topology, and in recent years his research has been in an area where algebraic topology intersects with number theory and physics. In recent years he's also worked with Scott Ahlgren on various projects related to calculus instruction, and enjoyed mentoring both graduate and undergraduate research. He enjoys the opportunity that being Chair offers to communicate to others about the many great projects underway in the department.

Matthew Ando, Chair

Scott Ahlgren became Associate Chair in August 2011. Ahlgren received his Ph.D. from the University of Colorado at Boulder in 1996, and he joined the faculty in 2001. Ahlgren's research is in number theory, and he has been involved in several recent large-scale teaching projects, including the Liberal Arts/Engineering calculus project and a parallel project to revitalize the department's standard second semester calculus course. He believes strongly that quality research and quality teaching go hand in hand, and he looks forward to the opportunity to positively influence the department's collective teaching through his current service as Associate Chair.

Scott Ahlgren,
Associate Chair

Robert Muncaster is the department's new Director of Undergraduate Studies, taking over from Joe Miles who held the position from 2007–2011. Muncaster received his Ph.D. in mechanical engineering in 1975 from The Johns Hopkins University. He was a postdoctoral fellow at Johns Hopkins from 1975–1976 and a research associate at Heriot-Watt University in Edinburgh, Scotland from 1976–1979, before joining the department in 1979. He served as the Associate Chair of the department from 2003–2011. Muncaster is an associate professor in both the Department of Mathematics and the Department of Political Science at Illinois. His specialization is applied mathematics, with current research interests in the area of evolutionary game theory. He has organized several Research Experiences for Undergraduates (REUs) with a focus on evolutionary games and social networking. He is a self-taught Java programmer and has designed an autonomous agent simulator for exploring results about decision-making and its interconnection with social interactions.

Robert Muncaster, Director
of Undergraduate Studies

RESEARCH HIGHLIGHT

Surfaces and me

by Chris Leininger

Since my undergraduate course on differential geometry I have been fascinated by the mathematical theory of surfaces. It wasn't until graduate school however that I began to see the way that surfaces wove their way throughout mathematics. For example, consider the solutions (x,y) to the cubic equation $y^2 = x^3 - 2x + 2$. If we include the point "at infinity" to this curve, then amazingly, one can use intersections of the curve with lines to define a notion of addition that very closely resembles addition of real numbers.

Extending this to the solutions over the complex numbers, one can define addition in a way that resembles addition of the complex numbers. Moreover, the solution set is actually a torus, which can be canonically equipped with a Euclidean geometry. This alternate perspective provides a very elegant description of the way the addition on this torus works.

To see how this change in perspective provides insight in a more general situation, we look back to the 1850's and Riemann's work on complex analytic functions. Riemann observed that it is unnaturally restrictive to require that the domain of an analytic function be a subset of the complex numbers; in the above equation, one cannot make y into an analytic function of x. The "correct" domain for an analytic function is what is now called a *Riemann surface*, which is a surface with some additional structure, as in the torus example above. Then around the turn of the century, Klein and Poincaré formulated and proved the *Uniformization Theorem* which provides an "alter ego" for a Riemann surface. Specifically, the Uniformization Theorem allows one to describe a Riemann surface in terms of Euclidean, spherical, or hyperbolic geometry (the latter two being the *non-Euclidean* geometries), together with a set of symmetries of these geometries. The Uniformization Theorem thus united geometry, complex analysis, and group theory (the study of symmetries) allowing techniques in one or more of the areas to be applied to another to tackle difficult problems.

For example, let's consider Riemann's *moduli space*, a mathematical object which organizes all Riemann surfaces of the same type together into a single, unified, albeit unwieldy, space. By the Uniformization Theorem, one can encode all the data of a Riemann surface by a function from a certain finite set to the set of 2×2 matrices. To do so, one specifies the Riemann surface structure by a representation from the fundamental group of the surface into the 2–dimensional special linear group, and this representation is determined by its restriction to a finite generating set. The simplicity in this encoding does not come without a cost, and the result is that we have "over-counted"—rather than constructing the moduli space we have instead constructed the so-called *Teichmüller space*. Symmetry now enters the story again, and the symmetries of Teichmüller space itself keep track of the over-counting. This group of symmetries is called the *mapping class group* due to its alternate interpretation as "self mappings" of the surface. We can therefore study Riemann's moduli space by studying Teichmüller space and the mapping class group.

I am working on a number of problems involving Teichmüller space and the mapping class group. For example, by viewing elements of the mapping class group as self mappings of a surface and imposing constraints on the dynamics, one can study the effects on the corresponding symmetry of Teichmüller space. I have discovered some surprising results about these effects which have led to new connections between different moduli spaces. In another direction, I have related the geometry of surface bundles—spaces built from continuous families of surfaces—to properties of the mapping class group and Teichmüller space. These investigations have yielded unexpected and fruitful analogies with hyperbolic geometry. Such results continue to inspire my love of surfaces and the fascinating connections they make with the rest of mathematics.
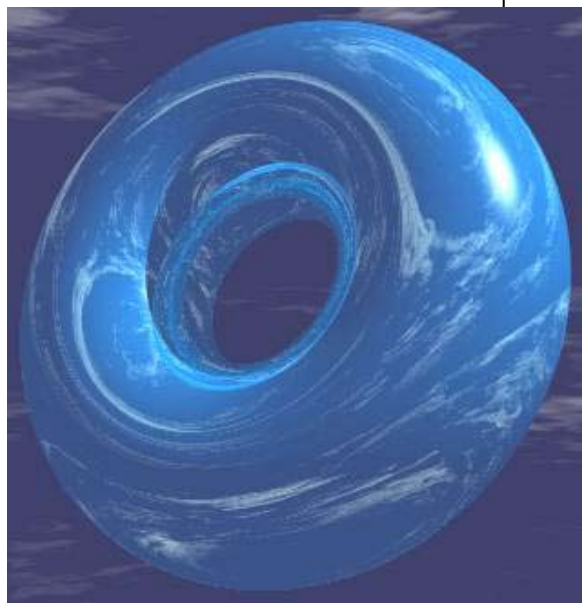
Chris Leininger

Chris Leininger is an Associate Professor in the Department of Mathematics at the University of Illinois at Urbana–Champaign. He received his Ph.D. in 2002 from the University of Texas at Austin, and joined the faculty at Illinois in 2005 after a postdoctoral position at Columbia University in New York City. Leininger was named the 2010–2011 Helen Corley Petit Scholar in the College of Liberal Arts and Sciences, and the 2011–2013 Lois M. Lackner Faculty Scholar in the Department of Mathematics. In addition, he has appeared on the List of Teachers Ranked as Excellent 6 times and was the 2008 recipient of the N. Tenney Peck Teaching Award in Mathematics.

Read more about Leininger at his website www.math.illinois.edu/~clein/.

Logic and Mathematics 2011

The Logic and Mathematics 2011 conference was held September 3–4 at the Department of Mathematics at the University of Illinois at Urbana-Champaign. This meeting, the fifth in the series, honored Ward Henson who recently retired from the department. The organizers were Lou van den Dries and Slawomir Solecki.

The conference series has been in existence since 2003 and has become a well-known event in mathematical logic attracting leading researchers in the field and in related areas. There were seven invited lectures at this year's conference delivered by mathematicians from around the world whose work is at the cutting edge of recent developments in logic and its applications: Itai Ben Yaacov (Lyon), Gregory Cherlin (Rutgers), Julien Melleray (Lyon), Anand Pillay (Leeds), Christian Rosendal (UIC), David Sherman (Virginia), and Henry Towsner (UCLA).

In connection with the conference, Arkady Leiderman (Ben-Gurion University) gave a talk at the model theory/descriptive set theory seminar. The talks reflected rich connections between mathematical logic and various other areas of mathematics—combinatorics, operator algebras, Banach space theory, and topological dynamics.

Commutative Algebra and Algebraic Geometry Conference

The Department of Mathematics hosted a conference on Commutative Algebra and Algebraic Geometry the weekend of November 4–6. The conference was supported by the NSF "Special Algebra Meetings in the Midwest" grant, and drew over 130 participants, mostly from regional institutions (Notre Dame, Purdue, Michigan, Kentucky, Minnesota, Chicago, Kansas, Missouri and Ohio), but participants also came from as far away as California and New York. The organizers were Claudia Polini (Notre Dame), Alberto Corso (Kentucky), and Sankar Dutta and Hal Schenck (University of Illinois).

The conference kicked off on Friday with a special joint conference/Mathematics Colloquium talk by Bernd Ulrich (Purdue), who spoke on "Multiplicities and Equisingularity." Overall, there were 11 conference talks given by Donu Arapura, Dale Cutkosky, Hailong Dao, Florian Enescu, Melvin Hochster, N. Mohan Kumar, Jinjia Li, Gennady Lyubeznik, Bangere Purnaprajna, Lucien Szpiro and Bernd Ulrich. The conference included a large number of young researchers (including 10 graduate students from Illinois), and a number of participants remarked on the connections they made. There was a conference banquet at Kennedy's on Saturday night, and things wrapped up with a trio of talks on Sunday morning.

Gathering for Gardner

On October 21 the University of Illinois Department of Mathematics, in conjunction with Wolfram Research, participated in the Gathering for Gardner, a worldwide celebration of Martin Gardner's 97th birthday and the mathematics he brought to the world through puzzles and games. The event consisted of lectures on a wide variety of topics related to Gardner's interests, and presentations on various mathematical puzzles. The event was attended not only by mathematicians, but also by members of the local community including children and their parents.

Ed Pegg of Wolfram Research and mathpuzzle.com presented an introduction to Martin Gardner's work, and the audience was then given a series of puzzles. All of the puzzles were presented in such a manner that members of the general audience would be able to understand, and mathematicians and children alike got to try to solve problems such as: "use six matches to form exactly four equally sized equilateral triangles without allowing the matches to overlap" (presented by Aleksandra Kwiatkowska, a graduate student in mathematics) and "find a triangulation of a square whose triangles are acute-angled" (presented by Piotr Przytycki, a visiting scholar in the mathematics department). Other puzzles were presented by Mark Abordo (an undergraduate at the U of I), Marcin Sabok (a visiting assistant professor in the mathematics department) and Pete Glaze (a graduate student in mathematics).

Mathematicians and graduate students gave talks on a wide variety of topics related to Martin Gardner's interests and philosophy of mathematics. Bruce Reznick, John P. D'Angelo, Bruce Carpenter, Jayadev Athreya, M. Tip Phaovibul, and Ken Stolarsky gave talks about subjects ranging from fun tricks to play with matrices in "Matrix Magic" by M. Tip Phaovibul, to real current research translated to a language that the general population could understand with "Generalized Diagonals for the Golden L" (presented within the context of the movements of Pac-Man by Jayadev Athreya).

Graduate Student Combinatorics Conference to be held in April 2012

The 8th Annual Graduate Student Combinatorics Conference will be held April 13–15, 2012 at the Department of Mathematics of the University of Illinois. The purpose of this conference is to bring together graduate students in combinatorics and related areas to learn about new topics, present original research, and network with students from across the country.

Keynote speakers include László Babai and Alexander Razborov from the University of Chicago. Members of the organizing committee are Jane Butterfield, Kyle Jao, Bill Kinnersley, József Balogh, and Douglas B. West.

Learn more about this upcoming conference at www.math.illinois.edu/gscc2012/.

STUDENT NEWS

REGS Day 2011

The annual REGS Day marks the culmination of our summer Research Experiences for Graduate Students (REGS) program. This year we reached the halfway point in the NSF-funded grant supporting REGS. As part of the evaluation of this grant we invited an External Assessment Committee to visit the department for two days. The committee consisted of three distinguished mathematicians: George Andrews (Penn State), Brooke Shipley (UIC), and Doron Zeilberger (Rutgers).

From left: Daniel McDonald, Victoria Blumen, Brian Ray, and Brian Benson.

The committee attended the REGS Day talks by graduate students, interviewed faculty and students, discussed issues with the PIs of the grant (Steve Bradlow, John D'Angelo and Randy McCarthy), and met with the Dean of the Graduate College (Deba Dutta) and the Mathematics Department Chair (Matt Ando). The committee's positive report will be sent to NSF; its suggestions will help fine-tune our REGS program and support future proposals.

On REGS day, October 4, 2011, four graduate students presented the work from their summer research projects. A pizza party where prizes were awarded followed. The speakers were:

- Brian Benson: Agol's Improvement to Buser's Inequality and Arithmetic Surfaces.

- Victoria Blumen: Applied Dynamics: 3-period Orbits in Billiards on the Surfaces of Constant Curvature.

- Daniel McDonald: List Rankings of Paths, Cycles, and Trees.

- Brian Ray: Non-rigidity of Cyclic Automorphic Orbits in Free Groups.

Brian Benson earned first prize ($200), Brian Ray and Victoria Blumen tied for second prize ($150 each), and Daniel McDonald received third place ($100).

REGS Dissertation Completion Fellowship recipients

Steve Avsec, Jesse Beder, and Jane Butterfield are the recipients of 2011–2012 REGS Dissertation Completion Fellowships. These one year fellowships are intended to launch the research careers of the recipients. Funding comes from the departmental NSF grant supporting REGS.

Steve Avsec is originally from Austinburg, Ohio. He graduated from Princeton University with a degree in math. He joined the department in fall 2006 and began working with his advisor, Marius Junge, during his first year. His research interests include noncommutative harmonic analysis, noncommutative probability, and von Neumann algebras. Steve recently attended a workshop entitled "Von Neumann algebras and ergodic theory of group actions" at Institut Henri Poincaré in Paris.

Jesse Beder graduated from the University of Wisconsin in 2006 with a double major in math and physics. He is now studying commutative algebra with Sankar Dutta. Jesse's research interests have ranged from the algebraic (homological conjectures) to the geometric (Chow groups). His primary focus is a number of conjectures on modules of finite projective dimension over local rings. He recently coauthored a paper

entitled "Ideals with larger projective dimension and regularity" in the *Journal of Symbolic Computation*. This collaboration with other young mathematicians developed at the Mathematics Research Community in Snowbird, Utah.

Jane Butterfield grew up in Washington and received her B.S. in Mathematics at the University of Puget Sound. She joined the department in fall 2006 and immediately began pursuing research in the area of combinatorics. Since starting work with her advisor, József Balogh, she has published two papers (and submitted two more) on the subject of extremal graph theory. Jane is particularly interested in Ramsey-type problems, random graphs, and games played on graphs; her thesis will combine all three topics. She is also interested in education, and earned an M.S. in Mathematics Education from Illinois in May. She is treasurer of the Illinois chapter of SIAM and of the Women in Math group this year. Jane is happy to be back in Illinois after spending a month in Budapest, participating in the Memphis-Budapest Summer School in Combinatorics.

Record turnout at U of I fall math contests

This year's fall math contest season began with the U of I Freshman Math Contest on September 26, 2011, followed by the U of I Mock Putnam Exam, held on September 28, 2011. A total of 50 students participated in these contests—a new record for participation in local contests.

The U of I Mock Putnam Exam is a long-running local version of the infamous Putnam Exam, known as the "world's toughest math test." The exam consists of six challenging math problems, similar in nature to problems on Putnam contests, but a bit easier.

Meng Guo, a senior in mathematics and consistent top performer on local contests, and Wenmian Hua, a sophomore in electrical and computer engineering and relative newcomer to the local contest scene, tied for the highest score as co-winners. They will each receive $300 in prize money and be recognized as the 2011 U of I Mock Putnam Champions at the departmental awards ceremony next spring. Honorable Mention went to Danyang Zhuo, a junior in electrical engineering and co-winner of the 2011 U of I Undergraduate Math Contest, who placed third out of the 28 students who participated in this contest.

The U of I Freshman Math Contest is a new addition to the local math contest offerings. Somewhat easier than the Mock Putnam Exam, and restricted to freshmen, it provides incoming students an opportunity to show their problem solving skills in direct competition against their peers. With 22 students taking on this challenge, the contest was an unqualified success and will likely become a mainstay among our contest offerings.

Ding Zhang, a freshman in computer science and statistics, was the winner of this contest and the recipient of the $300 top prize. Honorable Mentions went to the second and third place finishers, Robert Weber, a freshman in mathematics and computer science, and Fan Fei, a freshman in mathematics.

The median scores on these two contests were 15, resp. 11, points out of 60; about two thirds of all participants received 10 or more points, the equivalent of solving one of the six problems correctly. For comparison, the median score on the Putnam Exam is usually 1 or 2 points out of 120, and solving a single one of the 12 problems on a Putnam Exam is typically enough to place in the top third of all contestants nationwide.

The contests were organized by Professor A.J. Hildebrand, with the assistance of graduate student M. Tip Phaovibul.

Read more about math contests on the department website at http://www.math.illinois.edu/contests.html.

Meng Guo receives prestigious national award

Meng Guo, a senior in mathematics, received an Honorable Mention for the 2012 Alice T. Schafer Prize of the Association for Women in Mathematics (AWM), the most prestigious national prize for undergraduate women in mathematics. She is one of only four students nationwide to be honored in this manner this year. She will be recognized at the 2012 Joint Mathematics Meetings in Boston, MA.

Named after Alice T. Schafer, a founding member and former president of the AWM, the prize has been awarded annually since 1990. The vast majority of recipients have come from elite schools such as Harvard, MIT, and Berkeley. This is the first time that an award of this type has gone to a U of I student. Past recipients include Kay Kirkpatrick, who joined the Department this year as an Assistant Professor.

Since arriving at the University of Illinois in Fall 2008, Meng Guo has turned in a most impressive academic performance. By the end of her second year, she had completed all undergraduate requirements in mathematics while taking some of the most challenging math courses in the undergraduate curriculum and earning A+ or A grades in all. In her junior year, she began taking graduate level math courses, again earning top grades. By the end of the Fall 2011 semester she will have completed an astonishing 13 graduate courses, the largest such number by an undergraduate in recent history.

In addition to her exceptional coursework, Meng also distinguished herself as a top performer on the local math contest scene and through independent research projects. She was co-winner of the 2011 U of I Mock Putnam Contest and received the third-highest score among local participants in the 2009 and 2010 Putnam Competitions. For the past two years, Meng has been involved in several independent research projects in algebraic topology and dynamical systems under the direction of Professors Matthew Ando, Eugene Lerman, and Charles Rezk.

Meng Guo's accomplishments have been recognized locally with the Salma Wanna Award in 2010, given to the best continuing junior, and the H. Roy Brahana Prize in 2011, the department's most prestigious undergraduate award. Following graduation in May, 2012, Meng Guo plans to attend graduate school. The national recognition she received through the AWM award caps a most remarkable undergraduate career.

DEPARTMENT NEWS

Junge named Romano Scholar

Professor Marius Junge has been named to a three-year term (2011–2014) as the Richard and Margaret Romano Professorial Scholar. Dean Ruth Watkins of the College of Liberal Arts and Sciences selected Professor Junge for this honor, in recognition of his outstanding achievements in research and his service to the campus.

Professor Junge's research includes groundbreaking work in operator spaces, operator algebras, noncommutative probability, noncommutative harmonic analysis, and most recently, in quantum information theory. Junge was a 2010–2011 Associate in the Center for Advanced Study and was appointed a J.L. Doob Scholar by the Department of Mathematics in 2011.

Richard Romano and his wife, Margaret, have generously served and supported the University of Illinois for over thirty years. In addition to providing annual financial support to the College of LAS, in 2003 the Romanos created the Romano Professorial Scholar Program. This program provides significant support for the research of some of the College's most outstanding faculty members across many disciplines. The Department of Mathematics congratulates Marius and thanks the Romanos for this award.

RETIREMENTS

Zoltán Füredi

Zoltán Füredi retired from the department this past spring. He received his Ph.D. in 1981 from the Mathematics Institute of the Hungarian Academy of Sciences. He joined the mathematics faculty at the University of Illinois in 1991 and has published more than 200 papers in his main field of interest in the theory of finite sets with applications in geometry, designs, and computer science. He is a member of the Hungarian Academy of Sciences. In 1994 Füredi gave an Invited Lecture at the International Congress of Mathematicians held in Zurich, Switzerland.

Leininger named Lackner Scholar

Associate Professor Chris Leininger has been appointed the Lois M. Lackner Faculty Scholar for 2011–2013. Professor Leininger will receive $5,000 in each of the next two years to support his efforts. Dr. Leininger is an outstanding scholar and teacher. He is a dynamic and popular instructor who has appeared six times on the List of Teachers Ranked as Excellent and is devoted to student understanding, both in and out of the classroom.

Leininger has been doing groundbreaking work in recent years on geometric and algebraic questions related to the topology of 2-dimensional surfaces, with a focus on mapping class groups, Teichmüller spaces, and the complex of curves. He has published 11 papers since 2009 in top mathematics journals such as *Inventiones Mathematicae* and *Journal für die reine und angewandte Mathematik*.

A strong teacher, he received the department's N. Tenney Peck Teaching Award in 2008 and has given several week-long lecture series at workshops for graduate and undergraduate students. He has had two Ph.D. students graduate in the past few years, and is currently the advisor for three more.

The Lois M. Lackner Faculty Scholar appointment has been made possible by a generous gift from University of Illinois alumna Dr. Lois M. Lackner. Dr. Lackner holds three degrees from the University of Illinois: B.S. in the Teaching of Mathematics (1957), M.S. in the Teaching of Mathematics (1958), and Ph.D. in Education (1968).

Ahlgren receives Provost honors

Scott Ahlgren has been recognized by the Office of the Provost and Vice Chancellor for Academic Affairs as a scholar whose contributions are "truly noteworthy and exceptional in terms of quality of work and overall achievement." Ahlgren, who serves as Associate Chair of the Department of Mathematics, was recently promoted to professor. Each year the Campus Committee on Promotion and Tenure identifies particularly excellent cases during the promotion review process. In a field of approximately 100 faculty who received promotion, Ahlgren was one of four scholars chosen to receive this honor. The Provost's Office will provide a discretionary fund of $3,000 to support Ahlgren's scholarly activities.

Yong receives CMS G. de B. Robinson Award

Assistant Professor Alexander Yong is the recipient (with Hugh Thomas) of the 2011 G. de B. Robinson Award given by the Canadian Mathematical Society for their paper "Multiplicity-Free Schubert Calculus" published in the *Canadian Mathematical Bulletin*.

Yong received his Ph.D. from the University of Michigan in 2003 under the direction of Sergey Fomin. He held postdoctoral positions at the University of California at Berkeley, the Fields Institute and the University of Minnesota before he joined the mathematics faculty at Illinois in 2008. His research is in algebraic combinatorics.

Lamzouri awarded CMS Doctoral Prize

Youness Lamzouri, a J.L. Doob Research Assistant Professor in the department, is the recipient of the 2011 Doctoral Prize given by the Canadian Mathematical Society (CMS). The prize recognizes outstanding performance by a doctoral student. Lamzouri received his award and presented a plenary lecture at the 2011 CMS Winter Meeting in Toronto.

Lamzouri, whose research is in the area of analytic number theory, received his Ph.D. in 2009 from the University of Montreal under the direction of Andrew Granville. After receiving his Ph.D., Lamzouri received an NSERC postdoctoral fellowship, and participated in the 2009–2010 special year on Analytic Number Theory at the Institute for Advanced Study in Princeton. He was the recipient of the 2004 Jean-Maranda Award for the best finishing undergraduate student in mathematics from the University of Montreal, and the 2006 Carl Herz Prize from the Institut des Sciences Mathématiques.

McNeilly receives ICTM Post-Secondary Mathematics Teaching Award

Jennifer McNeilly has been awarded the Illinois Council of Teachers of Mathematics 2011 Post-Secondary Mathematics Teaching Award for outstanding teaching in her position here at the University of Illinois. Jennifer was also recognized for her leadership in the Merit Program in Mathematics and the impact she has had on training teaching assistants to deliver student-centered instruction.

Since earning both her Bachelors and Masters in the Teaching of Mathematics from the University of Illinois, Jennifer has been an instructor in the department, teaching large lecture introductory courses such as College Algebra and Preparation for Calculus. She is also a co-PI on a 5-year, $2 million NSF grant to fund an expansion of the successful Merit Program, a support initiative for underrepresented STEM students. Learn more about the Merit Program at www.merit.illinois.edu.

Woods receives Wolfram's Innovator Award

Debra Woods, Director of NetMath in the Department of Mathematics, was awarded an Innovator Award for her innovations in using *Mathematica* in online teaching at the 2011 Wolfram Technology Conference held in October. The first online courses at University of Illinois were taught by the NetMath program in the Department of Mathematics in the early 1990's. The program makes use of Jerry Uhl's award-winning "Calculus&*Mathematica*" courseware. NetMath also employs mentors to deliver high-quality, undergraduate mathematics courses in a flexible and accessible online environment and to provide excellent personal attention to each student enrolled. Over the years, NetMath has taught thousands of students from all over the world. Dr. Wolfram commented on the array of outstanding students Woods had introduced to him over the years and the number of them who now have careers at Wolfram research. Woods has been with the department since 1994.

NSF funds research network

The National Science Foundation has announced the funding of a new $5M Research Network in Mathematical Sciences with central hubs located at the University of Illinois at Urbana-Champaign, the University of Maryland and Stanford University.

The Network Director and Director of the Illinois hub is mathematics professor Steven Bradlow (University of Illinois). The Stanford University hub will be directed by mathematics professor Steven Kerckhoff (Stanford), and the University of Maryland hub will be directed by mathematics professors William Goldman (University of Maryland), Richard Wentworth (University of Maryland), and Anna Wienhard (Princeton University).

Called GEAR (GEometric structures And Representation varieties), the network will link together researchers at 46 nodes in the U.S., Canada and Europe. The research focus of the network is the interplay between the topology of low-dimensional spaces and the geometric structures that can be built on them. This subject impinges on many areas of mathematics and mathematical physics. The GEAR network will facilitate collaborations across traditional mathematical boundaries and will open new possibilities for graduate student training.

The Network will fund short-term visits, exchanges, network retreats, border-crossing workshops, as well as focused and regional workshops. Approximately half of the resources are dedicated to training graduate students and postdocs. Graduate fellowships and a Summer Research Experiences program modeled on the Illinois REGS (Research Experiences for Graduate Students) program will enable young scientists to intern with a research group anywhere in the network. GEAR Junior Retreats will bring together groups of graduate students and postdocs. The resources will benefit mathematicians from under-represented groups in the mathematical sciences, as well as active researchers at institutions that lie outside the traditional established centers.

Next summer the U of I Department of Mathematics will host the first GEAR Network Retreat. This week-long meeting will bring together participants from all GEAR nodes to discuss current research and emerging areas of interactions between the diverse fields of mathematics encompassed by the network. The local organizers include Chris Leininger and Jayadev Athreya. The Retreat will be preceded by the first Junior Retreat, also at Illinois, for GEAR graduate students and postdocs.

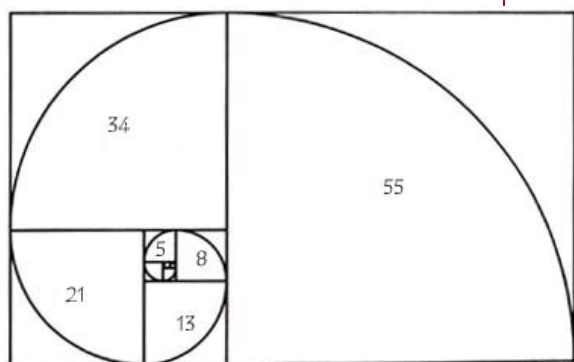More information about the network can be found at the GEAR website http://gear.math.illinois.edu/.

TEACHING HIGHLIGHT

Math and art workshop

by Jayadev S. Athreya

During my new faculty orientation last year, I met a representative of the Krannert Art Museum. Since I was teaching Math 402, Non-Euclidean Geometry, and have always enjoyed the visual and artistic aspects of geometry, I thought it would be a nice opportunity to take my class on a field trip to the museum to look at examples of isometries, symmetries, and perspective in art. Over the course of the semester, I toured the museum together with Krannert staff to develop a better idea of what we'd do in our hour there. The day of the tour, I got a pleasant surprise—the Director of Education at the museum, Anne Sautman, came out to lead the tour personally. Anne, who was an undergraduate engineering major, was intrigued by the idea of combining math and art, and in post-tour discussions, she invited me to do an educational workshop for elementary, middle, and high school art teachers at the museum during fall semester. We decided to focus on two themes—symmetry and the golden ratio.

The workshop was held on Saturday, October 29, at the Krannert Art Museum. Anne had prepared an excellent powerpoint presentation, and we integrated it with hands-on and gallery activities. In the first part of the workshop, we discussed symmetries, in particular visually defining the four kinds of Euclidean isometries—rotations, translations, reflections, and glide reflections. We illustrated various patterns with images from the Alhambra and also architectural examples in the museum itself. We also asked the teachers to think about the symmetries of various letters in the alphabet. Afterward, we went through the museum's Peruvian art gallery, which had wonderful examples of symmetry in sculpture and textiles, asking the teachers to find different kinds of symmetry. One teacher even found an example of a glide reflection! We also had the teachers work with some colored magnetic tiles to create designs with rotational and reflectional symmetry. At the end, we described the phenomenon of how having two different lines of reflectional symmetry guaranteed extra symmetry—a rotation in twice the angle between the intersection point if the lines are not parallel, and a translation if the lines are parallel.

After a short break, we resumed by discussing the ubiquity of the golden ratio—we observed that the proportions of the face in the Da Vinci's Mona Lisa were governed by the golden ratio, and that it occurred elsewhere in renaissance art. We also showed images of the Fibonacci sequence, and showed how, using Fibonacci rectangles, one can draw a spiral (see figure at left) which shows up in nature (snails, sunflowers, etc.). Later, the teachers measured images of different 'famous faces' to see if they fit into golden ratio proportions. My recollection is that the singer/actress Beyoncé had the most 'Golden' face!

To conclude the program, Jean-Luc Thiffault, a professor of applied mathematics at University of Wisconsin-Madison (who was visiting the U of I Mechanical Engineering Department) gave a short multi-media presentation on how the golden ratio shows up in the analysis of various mechanical mixing systems—for example, machines to knead bread dough or pull taffy.

Comments by the workshop participants were overwhelmingly positive. One participant said, "Great community engagement on many levels." I am certainly planning on continuing to work together with Anne Sautman and the Krannert Art Museum. I will be taking my Math 402 class there again this fall, and certainly hope to do a similar workshop in the future. Also, I have hopes that our nascent Illinois Geometry Lab (http://www.math.illinois.edu/igl/) will be able to create interesting mathematical art that can someday be showcased through Krannert.

Jayadev Athreya

Jayadev is an Assistant Professor in the Department of Mathematics at the University of Illinois at Urbana–Champaign. He received his Ph.D. in mathematics from the University of Chicago in 2006 and was a National Science Foundation Postdoctoral Fellow at Princeton University and Yale University, before coming to the U of I in 2010. Athreya works on problems at the interface of geometry and dynamics. In his research, he studies the long-term behavior of geometric objects such as surfaces or lattices which evolve dynamically. These problems relate to a diverse collection of areas of mathematics and their applications.

Read more about Athreya at his website www.math.illinois.edu/~jathreya/.

HOMECOMING

Homecoming 2011

A record turnout of alumni, faculty, staff and students attended the 4th annual Department of Mathematics homecoming party held on Saturday, October 1, following Illinois' win over Northwestern on a beautiful fall day on campus. Please plan to join us next year on Saturday, October 27, 2012. Details will be posted at www.math.illinois.edu/homecoming/ and on Facebook.

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*This donor list was provided by the University of Illinois Foundation.

Special *IJM* volume to honor Donald Burkholder

by Phillip Griffith, Editor-in-Chief

Early in 2012, the *Illinois Journal of Mathematics* looks forward to adding another volume in its recent series honoring retired University of Illinois mathematics faculty. The latest volume will celebrate Donald Burkholder's distinguished career at the U of I from 1955 until his retirement in 1998, and the fundamental impact of his research contributions to probability theory (theory of Martingales), functional analysis and Fourier analysis. He was elected to the National Academy of Sciences in 1992 and became a Professor in the U of I Center for Advanced Study in 1978.

The recent series of dedicated volumes follows a tradition that began in 1986 with a special issue in memory of William Boone, a distinguished logician on the U of I mathematics faculty (1958–1983). Then followed memorial volumes dedicated to renowned faculty members Irving Reiner (1988) and Kuo-Tsai Chen (1990). In 1998 the proceedings of a conference at Northwestern University that honored the highly productive career of Alexandra Bellow (U of I faculty 1964–1967) was published as a special dedicated volume.

More information about this series is available on the *IJM* website at http://ijm.math.illinois.edu/.