



College of Letters & Science

UNIVERSITY OF WISCONSIN-MADISON

*V³: a newsletter for the space of alumni
and friends of mathematics at UW-Madison*

August 2014

(V³)
Van Vleck
Vector



CONTENTS

2	A Word from the Chair
2	A Word from the Newsletter and Fundraising Committee
3	A Basis Set of Vector Stories
7	Departmental Updates
9	Programmatic Updates
14	Alumni News
15	Emeriti Service
15	Donor Update

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A Word from the Chair



The Department of Mathematics is thriving, even in the midst of growing challenges to colleges and universities nationwide. Our faculty, staff, and students continue to improve what always has been: high-quality research productivity, excellent instructional delivery, and far-reaching outreach activities. In this newsletter, we highlight key categories of departmental activity and impact with what we hope you will find to be engaging stories. We will also provide some facts and figures — after all, we are mathematicians.

I would like to thank some key supporters of mathematics at our university. In the last year, the Office of the Provost and the College of Letters & Science have made substantive investments in the Department of Mathematics in:

(1) new faculty positions to increase the faculty size of the department; (2) new academic and classified staff positions to better help the department respond to challenges and fulfill its mission; and (3) a new program, the Instructional Excellence Program, that will allow us to better prepare our graduate-student teaching assistants to support the instructional mission of the university in mathematics courses that

serve students for almost every major and program on campus.

I also would like to thank the many alumni and friends who have made financial contributions to the department: they are crucial to maintaining our margin of excellence. With state and federal funding of higher education under enormous pressure, your contributions are more important than ever. We appreciate your generosity and continuing support.

On behalf of the mathematics department, I thank you all.

Leslie Smith, Chair

Footnote: Professor Smith finished her term as department chair at the end of May and the new chair is Professor Gloria Mari-Beffa.

A Word from the Newsletter and Fundraising Committee:

This newsletter represents a departure from previous issues. Our goal is to provide readers with a larger selection of what we hope will be important and interesting information. Tell us what you think! We'd appreciate your feedback so that we can better tailor the newsletter to the interests of our alumni and friends.

Please take a moment to fill out the online newsletter-feedback survey at <http://go.wisc.edu/q00996>. Thank you!

A Basis Set of Vector Stories

The Department of Mathematics is fortunate to have the incredibly talented, dedicated, and hardworking faculty, academic staff, classified staff, students, alumni, and friends necessary to make a world-class department. The following are a few interesting stories about a small number of all of these people, organized around some of the important dimensions of the department.

Overall Impact

The more senior faculty of the department typically excel in many different ways: research, teaching, advising, outreach, and administration, to name a few. Jordan Ellenberg and Sigurd Angenent are just two examples.

MATH-WORLD SUPERSTAR:

Jordan Ellenberg

Mathematics professor Jordan Ellenberg got an early start in research (he taught himself to read watching “Sesame Street” at age two) and teaching (he tutored his teenage babysitter in math when he was in second grade). He hasn’t slowed down since.

With AB and PhD degrees from Harvard, Ellenberg was an assistant professor at Princeton before accepting a position in the mathematics department at Madison. His mathematical interests are an eclectic blend of algebra and analysis, with threads of topology, dynamics, and “big data” thrown in for good measure. He’s a novelist, too: his book, “The Grasshopper King” was a finalist for the 2004 Young Lions Award. From giving talks at local high schools to publicizing mathematics in Slate, Wired, the New York Times, the Wall Street Journal, on NPR, the “Today Show,” and Wisconsin Public Television, Ellenberg is a mathematics evangelist for the importance of math in everyday life.

His new book, “How Not To Be Wrong” demonstrates his belief that math “is an atomic-powered prosthesis that you attach to your common sense, vastly multiplying its reach and strength.” An excerpt from “How Not To Be Wrong” was featured in the Summer 2014 issue of *On Wisconsin*.

Ellenberg is a Discovery Fellow at the Wisconsin Institute for Discovery, and he has been honored with a University Houses Honored Instructor award, a Romnes Faculty Fellowship, and a recent lifelong Vilas Distinguished Achievement Professorship Award. He is a co-organizer of the Wisconsin number-theory seminar and coordinates the interdisciplinary Math Seminar, dedicated to interactions between mathematics and other academic areas. ■



THE CALULUS OF CALCULUS: Sigurd Angenent

Those with passion and talent for undergraduate education come in all sizes, ages, career trajectories, and professions. Sigurd Angenent is multi-talented with many passions, and it is fortunate for Madison that research, teaching, and advising are among them. A highly accomplished researcher, Angenent was awarded tenure just two years after joining the department in 1987. His publication record includes 70 publications in journals such as the *Annals of Mathematics*, the *Journal of the AMS*, *Nature*, and *Cell*. He has received the Sloan Award and the Presidential Young Investigator Award and has been named Vilas Associate and Van Vleck Professor.

Research is clearly his passion. So is undergraduate education.

Angenent has been at the center of the current Madison Initiative for Undergraduates project to reform the calculus sequence, for which he wrote the three textbooks that the department currently uses. (He saves students around \$300,000 per semester by donating the copyright and offering his textbooks free online.) His introductory classes make him one of the most popular teachers in the department. He is also a first-rate undergraduate adviser. This year the university recognized his extraordinary commitment as an undergraduate adviser with the Faculty Excellence in Undergraduate Advising Award, a highly competitive, campus-wide award, and his excellence in teaching has been recognized this year by the Chancellor’s Distinguished Teaching Award. ■

Interdisciplinary Impact

One measure of interdisciplinary impact is the number of faculty whose work crosses disciplines. There are more math faculty involved in interdisciplinary work than ever before. We've highlighted two examples of the activity that helps keep mathematics vital, relevant, and important to other disciplines.



SPLIT RESEARCH: Sam Stechmann

After one of the coldest and most brutal winters in memory, it's pleasant to contemplate tropical air flow, as Professor Sam Stechmann does in his research paper "Climate Science in the Tropics: Waves, Vortices, and PDEs." Climate is one of a number of interdisciplinary topics that Stechmann studies.

Stechmann received his PhD in applied mathematics from the Courant Institute in 2009. Before joining the UW mathematics department in 2010, he held two prestigious postdocs: the NSF Mathematical Science and the National Oceanic and Atmospheric Administration Climate and Global Change Fellowships. His research focuses on climate change, one of the most pressing problems of our time. One area of his research focuses on modeling and predicting extreme precipitation, and another looks at the role of clouds in climate change and air pollution.

A formidable computation component underlies all of Stechmann's research. One of his first achievements (in collaboration with a colleague) was to derive a minimal mathematical model for what is known as the Madden-Julian oscillation, a traveling wave pattern coupling tropical "deep convection" with global atmospheric circulation. In addition to improving prediction, such models have potential relevance to a broad range of applications.

Although he does not have a formal appointment in other departments, Stechmann interacts regularly with researchers in atmospheric and oceanic sciences, both here at Madison and elsewhere. In recognition of his achievements, he has been awarded a 2014–15 Sloan Fellowship. ■

SPLIT TIME: Julie Mitchell

"The Road Not Taken" by Robert Frost
"... Two roads diverged in a wood, and I —
I took the one less traveled by,
And that has made all the difference."

Or, to also quote the famous Yogiism:

"If you come to a fork in the road, take it."

Professor Julie Mitchell faced a quandary when she received her BA from San Jose State in 1992. She has always been torn between her love for mathematics and her love for the biological sciences. She was advised to choose between them. Despite this early professional advice, she pursued a postdoc at UC-San Diego in computational biology after completing a PhD in math at Berkeley.

When she accepted a position at UW-Madison, she again ignored the advice to choose one department — that an assistant professor would be committing tenure suicide by accepting a split appointment in two different departments, especially two departments in different colleges. In fact, her split appointment in mathematics and biochemistry has allowed her to pursue creative and important research. Mitchell has had particularly impressive results in her work on predicting the effects of mutations and has helped to develop computational tools used to facilitate the design of novel mutations, which in turn help to decipher the mechanism of a large class of protein-protein interactions. These interactions can be further extended to predict the protein-protein interactions that underlie cellular processes.

And as far as the tenure-suicide advice? This year the two departments have forwarded to the colleges and divisional committee their strong recommendation of promotion of Julie Mitchell to the rank of full professor. ■





Demographic/Cultural Changes

TIME SPLIT: Melanie and Philip Wood

The late Mary Ellen and Walter Rudin were the original mathematics power couple, and there have been several since then. Melanie and Philip Wood, both assistant professors, brought a new twist.

Both Melanie and Philip Wood spent time at Cambridge and Stanford before joining the department here. Melanie's research involves number theory and algebraic geometry while Philip's research focuses on probability theory and combinatorics. She's interested in explicit descriptions of moduli spaces for algebras and modules for those algebras; he's interested in random matrices and their eigenvalue distributions, Markov chains, structural behavior in sumsets, and using computers to explore problems in probability theory and combinatorics.

What's the twist? They turned down the first tentative offers of 100% assistant professorships in the department and asked instead for one 100% position that they would share. The department and the College of Letters & Science worked together to design a custom position for them and for the department. ■

Programmatic Impact

TEACHING TO TEACH: Shirin Malekpour

Faculty Associate Shirin Malekpour joined the department in 2006 after completing a PhD (University of Maryland) on the computational complexity of fuzzy propositional logic. Malekpour has been recognized for her own teaching (with a Housing Distinguished Instructor Award and a 2011 L&S Early Career Award) and has led department and institutional efforts to improve instruction campuswide.

Since 2009, Malekpour has served as director of the Wisconsin Emerging Scholars Program, and since fall 2013 as director of the Instructional Excellence Program. She is pre-calculus course coordinator for the Wisconsin Collaboratory for Enhanced Learning and serves on multiple departmental and campus-wide committees.

Course (re)design is an ongoing activity for Malekpour. She led the team that redesigned pre-calculus courses to improve delivery using a blended model for instruction and computer software. She also designed a new TA training program, producing videos and guideline documents for novice instructors, establishing a mentoring program, working on creating



online TA evaluations, and streamlining TA award nomination processes. In addition, Malekpour headed the departmental team that conceived and drafted the successful proposal to L&S and the provost's office to create and fund the Instructional Excellence Program. ■

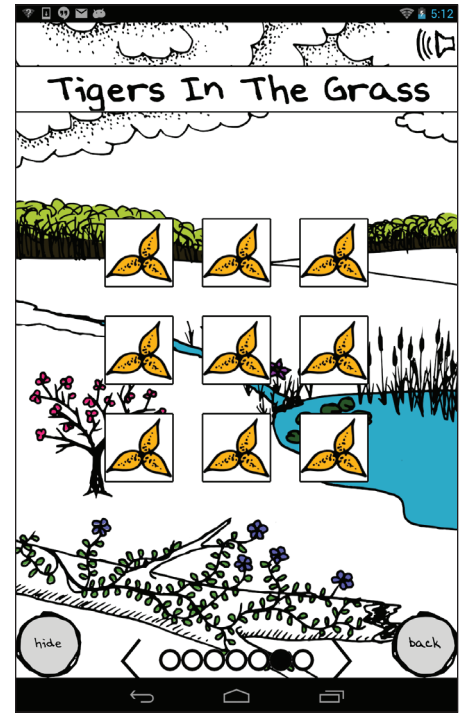
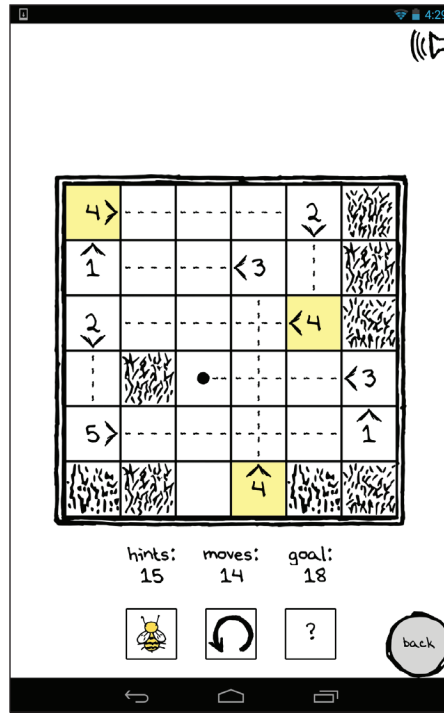
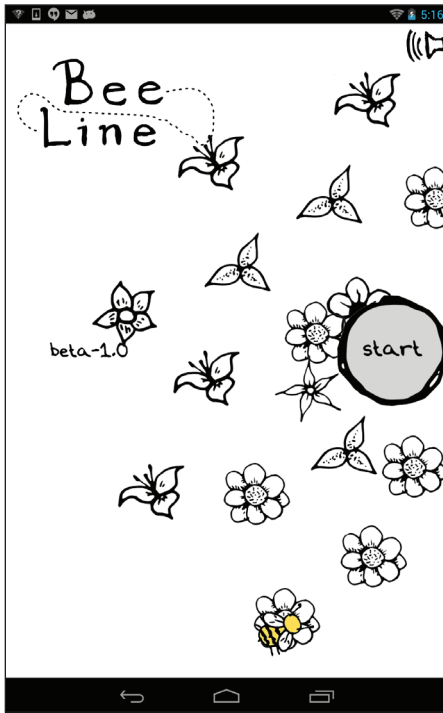
Graduate Student Impact

WHAT'S THE BUZZ: Leland Jefferies, Lalit Jain and Nathan Clement

Can you help Beatrice the bee find and visit all the flowers in the garden? BeeLine, a mobile game for the Android platform, combines elements of Sudoku, a maze, and a minesweeper. It all started with a puzzle created by graduate student Leland Jefferies.

Jefferies showed his puzzles to fellow grad student Lalit Jain who found them entertaining and suggested adapting them for the mobile platform. They partnered with Nathan Clement, another grad student, whose signature artwork gives the game a sketch-like and organic look.

Encouraged by math professor Jordan Ellenberg and computer science professor Remzi Arpacı-Dusseau, the three students also worked with UW-Madison's Law and Entrepreneurship Clinic to navigate the twists and turns involved in creating a business. The team faced other hurdles. None of them had programmed in Java, created a font, or



Android game Beeline grew out of a math puzzle and into a fully grown app.

developed a game for the Android platform. Until now.

The trio conducted user testing by asking random people at Union South and the Aldo Leopold Café at the WID to play the game and offer feedback. They used that feedback to develop a tutorial and calibrate the difficulty of the puzzles. In addition to launching a successful game, Jefferies, Jain, and Clement are completing their PhD theses.

BeeLine was just added to the Android store and is free to download.

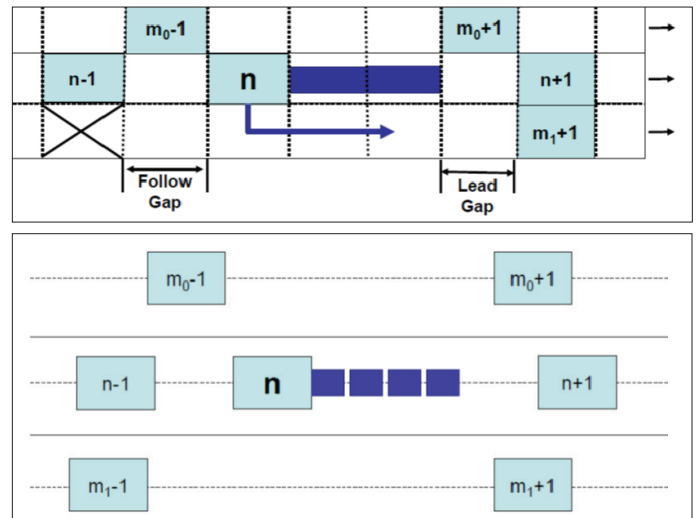
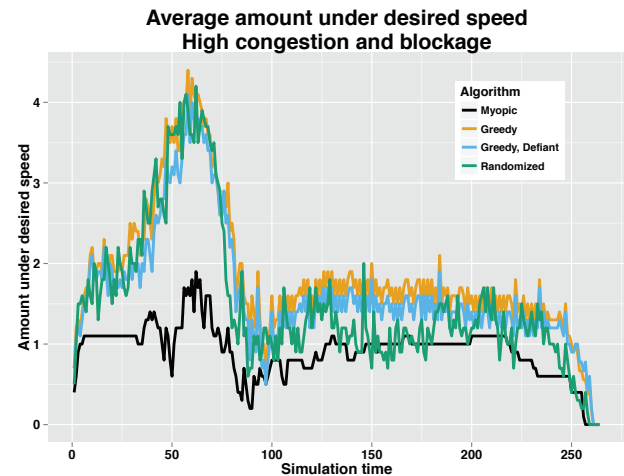
The game is also available at Google Play at <http://www.seventhharmonic.com>. ■

Undergraduate Student Impact

FIXING REAL PROBLEMS WITH MATH : Ian Campbell, Kristian Chavira and Michael Reilly

This year the department fielded three teams to compete in the Mathematical Contest in Modeling. In this contest, two open-ended, real-world problems are released worldwide at the same moment in late January. Teams of three undergraduates choose one of these problems and have only 96 hours to develop a mathematical model, derive and/or compute solutions, and present the results in a formal paper. This time out, the team of Ian Campbell, Kristian Chavira, and Michael Reilly were awarded the ‘Meritorious’ designation for their paper on lane changes and traffic jams (in which they invented the Individualistic Greedy and Defiant Algorithm, the Lazy Algorithm and others), placing them in the top 10 percent out of more than 6700 teams. ■

These illustrations show the detail required of our students involved in the Mathematical Modeling Competition.



Departmental Updates

New Arrivals to the Faculty and Staff

Tenure-Track Hires in 2013



Uri Andrews received his PhD in mathematics from the University of California-Berkeley in 2010 with a primary interest in recursive model theory. While at Berkeley, he studied under the direction of Thomas Scanlon. After completing his research there, Andrews accepted a position at UW-Madison as a Van Vleck Visiting Assistant Professor, teaching

four courses per year. During this three-year appointment, Andrews collaborated with the logic group, strengthening connections between it and other groups in the department, as well as serving as a model theorist. At the end of the three-year appointment, he accepted the mathematics department's offer of an assistant professorship. He continues to have close ties with the research group in Berkeley and is currently on leave to work on a research project at the Mathematical Sciences Research Institute.



Daniel Erman joined the Department of Mathematics in 2013 as an assistant professor. He was a Simons Postdoctoral Research Fellow at the University of Michigan before he came to Madison, where he established his research program in the area of algebraic geometry. Prior to that appointment, he held a position as an NSF postdoctoral fellow at Stanford, working with Ravi Vakil. He received his PhD from the University of California-Berkeley in 2010 under the supervision of David Eisenbud. Erman published 16 papers within two years of receiving his PhD, and he is also actively engaged in improving K-12 education.

Van Vleck Hires in 2013

Jennifer Beichman has a three-year appointment through 2015-16 as a 50 percent Van Vleck Visiting Assistant Professor and a 50 percent Postdoctoral Fellow Research Associate. Beichman is performing research under the direction of Professor Denisov.

- PhD, mathematics, University of Michigan, August 2013
- Research: Partial differential equations, specifically the water wave problem and dispersive-type equations, harmonic analysis, and fluid mechanics
- Dissertation: "Nonstandard Dispersive Estimates and Linearized Water Waves"



Marko Budišić has a three-year appointment through 2015-16 as a 25 percent Van Vleck Visiting Assistant Professor and a 75 percent Postdoctoral Fellow Research Associate. Budišić is performing research under the direction of Professor Jean-Luc Thiffeault.

- PhD, mechanical engineering, University of California-Santa Barbara
- Research: Emphasis in dynamics, control, and robotics
- Dissertation: "Ergodic Quotients in Analysis of Dynamical Systems"



Brian Cook has a three-year appointment through 2015-16 as a 50 percent Van Vleck Visiting Assistant Professor and a 50 percent Postdoctoral Fellow Research Associate. Cook is performing research under the direction of Professor Andreas Seeger.

- PhD, mathematics, University of British Columbia, Vancouver, Canada, 2012
- Research: Harmonic analysis, additive/extremal combinatorics, and additive number theory
- Dissertation: "Equations in the Primes"





Administrative Staff of the Math Department (clockwise from left top) Chris Uhler, Mark Castillo, Sharon Paulson, Joan Wendt, Vicki Richards, Xuefeng Fu, Lynn West, Leslie Smith (Chair), Kathie Keyes.

Parker Lowrey has a one-year appointment through 2013–14 as a 50 percent Van Vleck Visiting Assistant Professor and a 50 percent Postdoctoral Fellow Research Associate. Lowrey is performing research under the direction of Professor Jordan Ellenberg.

- PhD, mathematics, University of Texas at Austin, 2010
- Research: Algebraic geometry, homotopy theory and topology, applications of homotopy theory to algebraic geometry and other sciences (e.g., bioinformatics, computational sciences), derived categories, and moduli problems
- Dissertation: “Autoequivalences, Stability Conditions, and N-gons”

David Sondak has a two-year appointment through 2014–15 as a 50 percent Van Vleck Visiting Assistant Professor and a 50 percent



Postdoctoral Fellow Research Associate. Sondak is performing research under the direction of professors Leslie Smith and Fabian Waleffe.

- PhD, aerospace engineering, Rensselaer Polytechnic Institute, August 2013
- Research: Fluid turbulence, magnetohydrodynamics, applications to geophysics, nuclear fusion and astrophysics, numerical simulation of turbulence in fluids, turbulence modeling, multiscale modeling, kinetic theory, and Vlasov equation
- Dissertation: “Large Eddy Simulation Turbulence Models for Incompressible Magnetohydrodynamics Using the Variational Multiscale Formulation.” ■

Staff Hires in 2013

Kathie Keyes is the new graduate coordinator in the math department. She transferred to the department from the College of Engineering and has a strong background in university systems and processes, as well as the basics of graduate coordinating. An Edgewood College graduate, Keyes has an undergraduate degree in mathematics.

Lynn West joined the department in August of 2013 as the administrative department manager. She transferred to the department from the Wisconsin State Laboratory of Hygiene, where she was the supervisor of the Radiochemistry Unit. She holds a master’s degree in water chemistry from UW-Madison. ■



Programmatic Updates

Caucuses

The department has strength in many subfields in mathematics, as well as in interdisciplinary domains. Many faculty participate in research in multiple subfields, referred to as caucuses.

Algebra

- **Faculty:** Dima Arinkin (Harvard, 2002); Eric Bach (Berkeley, 1984); Nigel Boston (Harvard, 1987); Andrei Caldararu (Cornell, 2000); Tullia Dymarz (Chicago, 2007); Jordan Ellenberg (Harvard, 1998); Daniel Erman (Berkeley, 2010); Shamgar Gurevich (Tel Aviv, 2006); Paul Terwilliger (Illinois, 1982); Melanie Matchett Wood (Princeton, 2009); Tonghai Yang (Maryland, 1995)
- **Postdoctoral fellows:** Robert Harron (Princeton, 2009); Parker Lowrey (University of Texas at Austin, 2010); Sean Rostami (University of Maryland, 2012); Owen Sizemore (UCLA, 2012)
- **Seminars:** Algebraic Geometry Seminar (Fridays, 2:30 p.m.); Applied Algebra Seminar (Thursdays, 11:00 a.m.); Combinatorics Seminar (Mondays, 2:25 p.m.); Lie Theory Seminar (Mondays, 1:20 p.m.); Number Theory Seminar (outside speakers, Thursdays, 2:30 p.m.); Number Theory Seminar (grad-student speakers, Tuesdays, 2:30 p.m.); SILO (Systems, Information, Learning, and Optimization) (Wednesdays, 12:30 p.m.)

Analysis

- **Faculty:** Serguei Denisov (Moscow State University, 1999); Xianghong Gong (University of Chicago, 1994); Alexander Kiselev (Cal Tech, 1995); Amos Ron (Tel-Aviv University, 1987); Andreas Seeger (Technische Hochschule Darmstadt, 1985); Betsy Stovall (University of California-Berkeley, 2009); Brian Street (Princeton, 2007); Andrej Zlatoš (Cal Tech, 2003)
- **Postdoctoral fellows:** Jennifer Beichman (University of Michigan, 2013), Kyudong Choi (University of Texas at Austin, 2012), Brian Cook (University of British Columbia, 2011), Yao Yao (UCLA, 2012)
- **Seminars:** Analysis Seminar, Graduate Student Analysis Seminar, PDE and Geometric Analysis Seminar

Applied Math

- **Faculty:** David Anderson (Duke, 2005); Sigurd Angenent (Leiden, 1986); Amir Assadi (Princeton, 1978); Nigel Boston (Harvard, 1987); Gheorghe Craciun (Ohio State, 2002); Shamgar Gurevich (Tel Aviv, 2006); Shi Jin (Arizona, 1991); Alex (Sasha) Kiselev (Cal Tech, 1997); Gloria Mari-Beffa (Minnesota, 1991); Julie Mitchell (UC-Berkeley, 1998); Sébastien Roch (UC-Berkeley, 2007); Leslie Smith (MIT, 1988); Saverio Spagnolie (Courant, 2008); Sam Stechmann (Courant, 2008);

Jean-Luc Thiffeault (Texas, 1998); Fabian Waleffe (MIT, 1989); Andrej Zlatoš (Cal Tech, 2003)

- **Postdoctoral Fellows:** Majid Arabgol (HPC & Visualization Research Scholar); Anakewit (Tete) Boonkasame (UW-Madison, 2012); Marko Budišić (UC-Santa Barbara, 2012); Yongyong Cai (National University of Singapore, 2012); Shengqian “Chessy” Chen (UNC-Chapel Hill, 2013); Gerardo Hernandez-Duenas (Michigan, 2011); Scott Hottovy (Arizona, 2013); Matthew Johnston (University of Waterloo, 2011); Reed Ogrosky (UNC-Chapel Hill, 2013)
- **Seminars:** Applied and Computational Math Seminar (Fridays, 2:25 p.m., VV 901); Graduate Applied Math Seminar (Mondays, 3:40 p.m., VV 901); Physical Applied Math Group (Thursdays, 4:00 p.m., VV 901)

Geometry and Topology

- **Faculty:** Richard Peabody Kent IV (UT at Austin, 2006); Gloria Mari-Beffa (Minnesota, 1991); Laurentiu Maxim (U Penn, 2005); Yong-Geun Oh (UC-Berkeley, 1988); Sean T. Paul (Princeton, 2000); Jeff Viaclovsky (Princeton, 1999); Bing Wang (UW-Madison, 2008)
- **Postdoctoral Fellow:** Ruifang Song (Harvard, 2011)
- **Seminars:** PDE Geometric Analysis Seminar, Symplectic Geometry Seminar

Logic

- **Faculty:** Uri Andrews (UC-Berkeley, 2010); Stefan Lempp (Chicago, 1986); Terry Millar (Cornell, 1976); Arnie Miller (UC-Berkeley, 1977); Joe Miller (Cornell, 2002)
- **Postdoctoral Fellow:** Mingzhong Cai (Cornell, 2011)
- **Seminars:** Southern Wisconsin Logic Seminar (Tuesdays, 3:30 p.m.); Logic Reading Seminar (Wednesdays, 3:30 p.m.); Midwest Computability Seminar and Midwest Model Theory Day (twice a semester in Chicago)

Probability

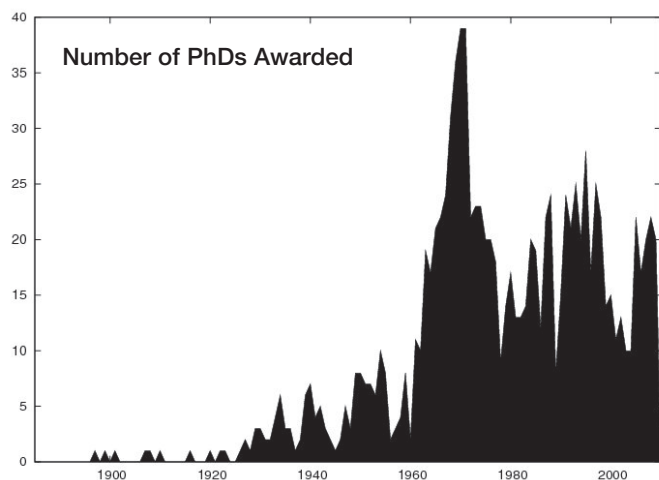
- **Faculty:** David Anderson (Duke, 2005); Sébastien Roch (UC-Berkeley, 2007); Timo Seppäläinen (Minnesota, 1991); Benedek Valkó (Budapest, 2004); Philip Matchett Wood (Rutgers, 2009); Jun Yin (Princeton, 2008)
- **Postdoctoral Fellow:** Gregory Shinault (UC-Davis, 2012)
- **Seminar:** Probability Seminar (Thursdays, 2:25 p.m.)

Graduate Program

The lifeblood of any Research I university department is its graduate students. The typical size of the graduate student body in mathematics is approximately 120. Both in training these students and in working with them on their dissertation research, mathematics faculty have the opportunity to explain their own research, collaborate with junior colleagues, and establish lasting collegial relations with future research mathematicians.

The first PhD in mathematics at Wisconsin was awarded to Henry Freeman Stecker in 1897 with a thesis titled "On the Roots of Equations, Particularly the Imaginary Roots of Numerical Equations." Stecker, a native of Sheboygan, Wisconsin, went on to have a successful career at Penn State University. Thirty-nine people received their PhDs in 1970 and 1971, the peak years of PhD production. It is interesting to note that two of the first five PhDs from this department were granted to women.

The following is a histogram with the number of PhDs awarded by the department as a function as time:



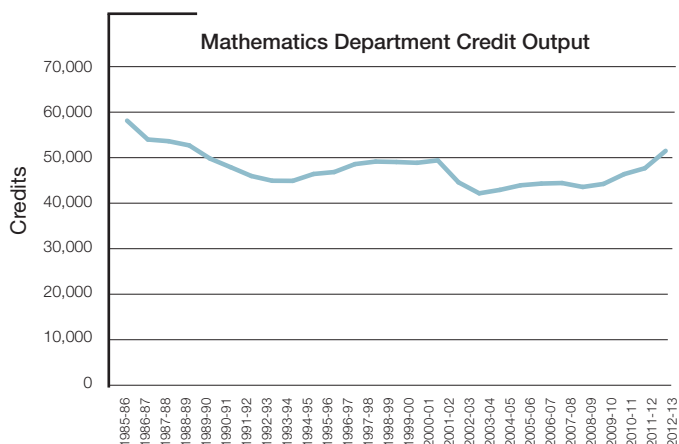
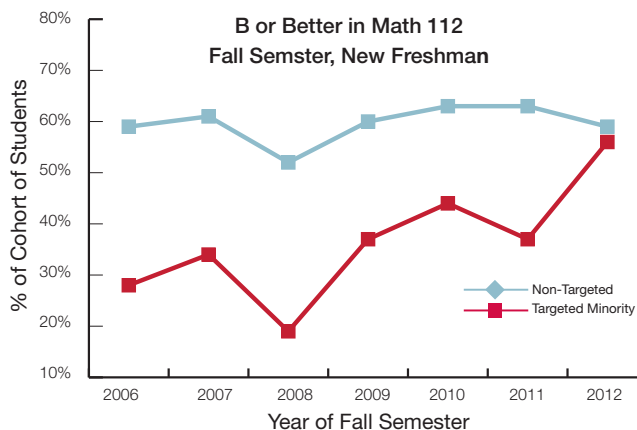
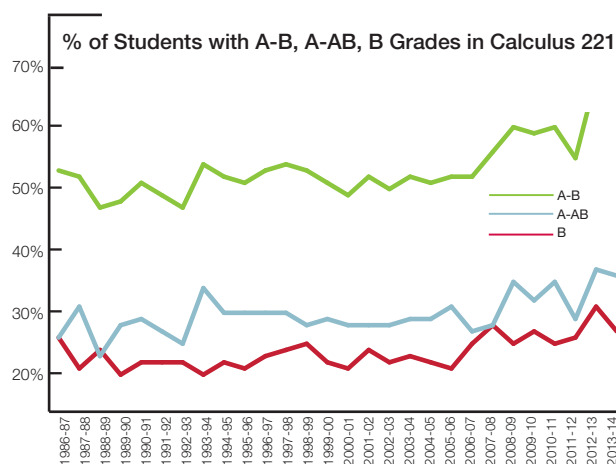
PhDs in mathematics leads to a broad spectrum of productive careers, as evidenced by the graduates of our program.

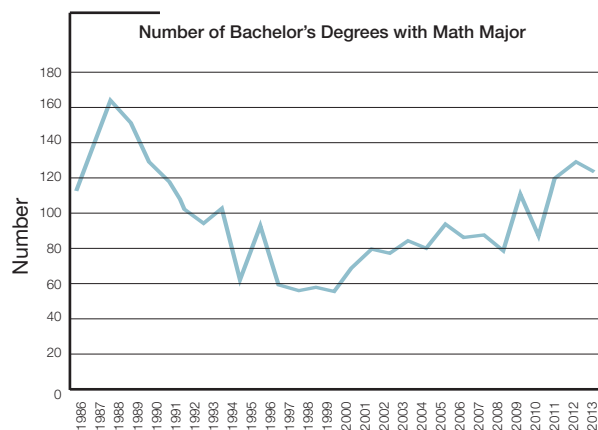
Undergraduate Program

With increased entrance requirements and improved pedagogy, mathematics performance among undergraduates continues to improve. The chart at the top right tracks approximately 35,000 students taking calculus 221 from 1985–86 through 2013–14.

Although the department is still experimenting to determine how to perpetuate the phenomenon, the WisCEL math program that was reformatted to use more online software for the college algebra courses eliminated the (minority) grade gap in the fall of 2012, — a remarkable result, independent of what caused it.

The department is committed to providing both quality and quantity. For example, there are 48 academic departments in the College of Letters & Science, and the mathematics department delivers 10% of the total credit hours for the college. The number of credit hours delivered is almost equal to the number delivered by the College of Agricultural and Life Sciences, as well as the School of Education, and is about 75 percent of the number of credit hours delivered by the College of Engineering. The graph below shows credit hours delivered over the last 30 years. (Note that the department faculty FTE count was higher 30 years ago than it is currently.)





Instructional Excellence Program

The department inaugurated the Instructional Excellence Program (IEP) in 2013–14. IEP strives to serve the department's mission in teaching excellence by preparing novice teaching assistants and providing resources to all the department's instructors. More than 20 first-year math graduate students and 50 teaching assistants hired from outside the department (LT-TAs) participated in teaching workshops and sessions of practice teaching in August 2013, the week before classes started. IEP staff and teaching mentors visited classrooms and provided feedback. IEP also offered monthly workshops focused on grading and preparing material for discussion sections and end-of-semester issues, as well as on the administrative aspects of running a course, and held meetings throughout the fall semester.

The mentoring program continued for the first-year math graduate students and LTTAs during the spring semester. Graduate students who did not perform well in fall-semester teaching duties as assessed by the TA evaluation committee were also added to the group. Members of the IEP group — including Shirin Malekpour, Oh Hoon Kwon, Diane Rivard, and graduate students Carolyn Abbott, Alison Gordon Lynch, Chris Janjigian, and Sara Jensen, — created instructional videos and material for IEP participants. These include a video about a typical first day of class and how (not) to run a discussion with group work. IEP provides material about grading, creating quizzes and exams, typical expectations of teaching assistants, and teaching during office hours.

We are grateful for the funding provided by the provost's office and L&S for IEP. More than 80 percent of our cohort of new graduate students earned a rating of satisfactory or better from the TA evaluation committee, based on students' and supervisors' evaluations and comments. We aim to increase that percentage to close to 100 percent.

Tutorial Program

The department's Mathematics Tutorial Program offers free, small-group tutoring to students enrolled in pre-calculus and calculus courses who might otherwise drop, fail, or receive a very low final grade if they received only regularly scheduled

instruction. Faculty Associate David Camacho is Director of the Tutorial Program.

The tutorial staff identifies skill deficiencies, misconceptions, improper study methods, and other problems relating to the course material and provides the added contact, advice, enrichment, and practice for overcoming these difficulties. Students are recommended to the Math Tutorial Program by their instructor, teaching assistant, or adviser, or they may request admission to the program without a formal recommendation during the first three weeks of the semester.

Promotions and Awards

In 2013 the following promotions were awarded by the department and approved by the university:

- **To associate professor:** Dima Arinkin, Laurentiu Maxim, Sébastien Roch, Benedek Valkó
- **To full professor:** Jean-Luc Thiffeault

A number of distinguished awards and appointments are mentioned elsewhere in the newsletter. Additional honors include:

Mikhail Feldman received a Simons Fellowship from the Simons Foundation for 2013–14 that allowed him to take a full-year sabbatical at the Newton Institute in Cambridge and other institutions.

Shi Jin was selected to be one of the 33 fellows of the Society for Industrial and Applied Mathematics in 2013. He also served on the scientific committee and as the chair of the organizing committee of the Second Pacific Rim Mathematical Association Congress, held in Shanghai, China, June 24–28, 2013.

Timo Seppäläinen was invited to become chief editor of the *Annals of Applied Probability* for the period 2013–15. This past year, he was an invited speaker in the Probability Section of the International Congress of Mathematicians in Seoul and a Medallion Lecturer of the Institute of Mathematical Statistics.

This year the department held a conference honoring **Marshall Slemrod's** 70th birthday.

To emphasize the importance of excellence in mathematics, the department has an award ceremony honoring some of the most notable performances by undergraduates.

The three winners this spring were chosen for their excellent coursework, both in quantity and quality.

- **Tejas Bhoraj** is the winner of the V.H. Frank Award. After getting a bachelor's in biological-medical sciences in India, he came to the U.S., first through Pittsburgh, and then to Madison. At this time, he is the math major with the highest grades and the highest number of advanced undergraduate math courses. Several of his instructors have nominated him for an award.
- **Derek Francour** is the winner of the Buck Award. He has done undergraduate research with Zev Klagsbrun and Melanie Wood, both of whom were impressed with his work.
- **McKinley Meyer** is the winner of the Ingraham Award. The quality of his work over an impressive array of courses puts him in the same league as Bhoraj and Francour.

Department Administration

A large department central to the university's mission requires administrative work by everyone. There are nearly as many committees as there are faculty within the department, and all faculty and staff serve not only on internal committees, but also on many university committees, not to mention national organizations serving the discipline.

With the arrival of two new key staff members, — Lynn West as the new academic department manager (Vicky Whelan has retired), and Kathie Keyes as the new graduate program assistant director (Mary Rice has taken a new position in a different department), — the department is taking the opportunity to reorganize how it manages many of its administrative responsibilities. With the chair's authorization, West is leading a team comprising the entire administrative staff, as well as a few faculty, to design, test, and implement these changes.

Wisconsin Emerging Scholars (WES) Program

The Wisconsin Emerging Scholars program provides motivated students with an opportunity to study calculus in a challenging, friendly, multicultural environment. Under the leadership of faculty associate Shirin Malekpour, the number of WES sections and students has increased in the last few years. We have coordinated with the College of Engineering and the Center for Academic Excellence in L&S to recruit highly qualified and motivated freshmen to participate in WES. Additionally, WES has partnered with the chemistry department to reserve seats in the general chemistry courses for WES students, which allows WES students to form a more official cohort and study group that spans both mathematics and chemistry.

Increasing the number of underrepresented students in STEM fields is a campus priority, and WES is a critical component of that effort. Students in WES have excellent learning outcomes and report that they are happy with their WES experience. This is reflected in the sections' GPAs and the superior ratings garnered by WES teaching assistants in teaching evaluations.

Wisconsin Collaboratory for Enhanced Learning (WisCEL)

In August 2013, Dan Drake succeeded Shirin Malekpour and Diane Rivard as director for WisCEL math courses. Moving Math 95, 101, and 112 to a new format is a major undertaking and has attracted notice across campus. This program was featured in last year's newsletter.

13x

The Department of Mathematics is committed to improving math-content education for future elementary and middle school teachers and is putting tremendous efforts into innovative teaching and learning approaches to mathematics at the university level. The Math 13x Teacher Preparation Program connects these efforts to K–8 school mathematics instruction and teacher preparation. Math 130, 131, 132 are

math-content courses required for all elementary-education and special-education majors from the School of Education. Math 135, 136, 138 are for the mathematics/science dual-minor students who plan to teach in middle schools and wish to enhance their content preparation. Faculty Associate Ho Hoon Kwon is the Director of the 13x Program.

Recently, with support from the department and a campus-wide Educational Innovation Mini-Grant, the department developed a video archive of Math 13x instructors' classroom teaching. Classroom videos are used for video-based reflections in training new and current Math 13x instructors. Weekly Math 13x instructor meetings also help to innovate Math 13x classrooms more effectively.

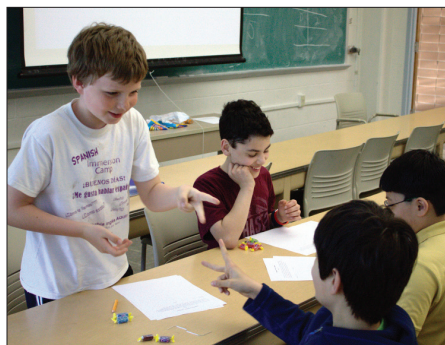
Math Circles

The national Math Circle program, which began in Berkeley, California in 1998, aims to bring together professional mathematicians and middle school and high school students. The UW-Madison Math Circle began in 2004, and it meets weekly, 10 to 12 times per semester. Past presentations have included weather in outer space, the way images are shaded in video games, and how credit card numbers are securely transmitted over the Internet. Each presentation is created by a mathematician who introduces the week's topic and provides problems for the students to explore. Around 20 to 25 participants attended each week in spring 2014, thanks to the enthusiastic support of several people: Jennifer Koziar, a teacher at Queen of Peace Middle School who has been encouraging her students to attend; Steve Entine, a UW math alumnus whose generous donations have supported the program's growth; and math graduate students Carolyn Abbott, Lalit Jain, and Ryan Julian, who volunteer to attend the weekly meetings and assist the speaker and the students.

Talent Search Celebrates 50 Years!

Mathematics Professor Laurence Chisholm Young (1905–2000) began the Wisconsin Mathematics, Engineering, and Science Talent Search in 1963. Early Talent Search directors included Professors Michael Bleicher, Lawrence Levy, and Rod Smart, with contributions from many other members of the University of Wisconsin-Madison mathematics department. Professor I. Martin Isaacs was director for 32 years, from 1980 to 2012.

Each school year, the Talent Search creates five sets of five problems each and distributes them to high school and middle school students in the state of Wisconsin and throughout the world. These problems are unusual, challenging, and enjoyable. They are not easy, but their solutions do not require advanced mathematical knowledge — just hard work and creativity. Students can work on the problems at their own pace and send in their solutions to be graded. Top participants are invited to Madison for an Honors Day in the spring and to participate in an exam for the Van Vleck Scholarship to UW-Madison.



Math Circles are free, open to the public, math-oriented fun for students of any level.

Wisconsin Mentorship Program for Women in Mathematics and Science

The mentorship program provides an opportunity for high school girls with an interest in math and science to interact with students and professors in the UW-Madison math department. This project-based, noncompetitive program allows students to work on interesting and challenging projects relating to math and its applications to the real world. Past projects have been on math and epidemiology, chaos and the weather, and number theory and computer encryption. All students who have taken algebra or above are welcome, and our projects are designed for students with backgrounds ranging from algebra to BC calculus.

Research Experience for Undergraduates

In the summer of 2013, the department organized a Research Experience for Undergraduates (REU) in Analysis and Differential Equations. Professors Denisov, Kiselev, Spagnolie, and Zlatoš directed research by 12 students from UW-Madison and eight from MIT, Princeton, UC-Berkeley, and other universities. The program was a great success, and the students continued their efforts even after leaving Madison. The results are four research papers submitted to both undergraduate and regular research journals, plus two others in final phases of preparation.

The REU was supported by Professor Zlatoš's National Science Foundation (NSF) CAREER grant and by the department's prestigious NSF Research and Training Group (RTG) grant in analysis and applications. The latter grant, which was rated by the NSF as the best RTG grant proposal in analysis in 2012, will in the near future sponsor a number of research and teaching activities at the UW, such as REUs, research and training of graduate students and postdocs, and organizing workshops and conferences.

Funded Research and Activities

Despite the lean times over more than a decade, faculty members in the department have been successful in securing federal funding. Over the past 12 years, faculty members have

been awarded approximately 150 separate grants, totaling about \$35 million in support of research and graduate-student professional development. Most of this support comes from the National Science Foundation (NSF), but there have been awards from other federal agencies such as the National Institutes of Health and the Department of Defense.

Mathematics faculty are frequent recipients of national and campus awards recognizing and supporting research and teaching. Some of these have been mentioned in the stories included in this newsletter, but there are many more. For example, two of the four Sloan Fellowships awarded this year to faculty on campus were given to members of the math faculty Sam Stechmann and Jun Yin.

Faculty in the department play leadership roles in awards made to the campus. For example, two faculty members in mathematics were the principal investigators (PIs) and project directors for three NSF mathematics and science-education awards to the campus for approximately \$40 million over 16 years. The K-Through-Infinity project placed teams of graduate students from across mathematics, computer science, the natural sciences and engineering in K–12 classrooms. There were also faculty/staff/teacher/graduate-student teams that designed science and math materials and pedagogical approaches for those classrooms.

Another one of these large NSF projects headed by a PI and project director from math was System-wide Change for All Learners and Educators (SCALE). UW-Madison was the lead SCALE institution in a partnership of several universities and four large, urban public-school districts from across the country with about 1,000,000 K–12 students and 40,000 K–12 teachers combined (Madison Metropolitan School District, Providence [Rhode Island] Public Schools, Denver Public Schools, and Los Angeles Unified Public Schools). This project had teams of faculty, staff, and teachers (from math, science, and engineering departments) designing curriculum supplements, as well as designing and delivering content-based professional development to in-service teachers. Many faculty, staff, and graduate students from the department and from other departments across campus participated in the work of both KTI and SCALE.

Alumni News

It is impressive how UW-Madison prepares its graduate students for success. We feature two such stories associated with the mathematics department: one is about **Steven Entine**, former vice president of software development for Persoft, Incorporated, as well as principal architect/messaging solutions for Quest Software, who received a master's degree from the mathematics department. The other is **Peter Cholak**, a professor of mathematics at Notre Dame, who earned a PhD from the mathematics department. The department is very proud to have such distinguished alumni.

Steven Entine



Steve Entine takes a no-nonsense approach to all aspects of his education. For each of the three postsecondary degrees he earned, he had specific goals and criteria that guided each decision. For example, since he had completed a number of undergraduate courses while attending high school in

Pennsylvania, he chose Michigan State as his undergraduate institution because it provided him with the most flexibility to define his own major and incorporate what he already learned in high school. It also allowed his adviser to define his honors program. His choice for graduate school in mathematics came down to money: UW-Madison offered him the best financial deal, including a teaching assistantship.

After completing his master's degree, Entine pursued a programming career in the medical school with an academic staff appointment in biostatistics, sometimes working for six or seven departments. He participated in many grant applications, as well as in the research that those grants funded. Eventually, his supervisor, impressed by his work, encouraged Entine to secure a PhD so that he could eventually be the principal investigator on grants. For that reason, he returned to graduate school at the UW in computer sciences a decade after earning his master's degree in mathematics. He stopped short of a PhD, however, feeling that the research he could do wasn't relevant to his career goals, and he left the program with his second master's degree.

Entine believes that the mathematics department served his intellectual needs and helped to prepare him for his successful career. He also believes that universities — at least in his experience — do not engage enough with the business sectors in their communities, and he finds that surprising. He's attended many publicized business forums where he felt university professors and academic staff from different disciplines could have both contributed and benefited from participating.

As a successful business owner, Entine is results oriented. He and his wife have been generous donors to the department's Math Circles program (for which we are very thankful), but they have based their contributions on an analysis of the impact and success of the program, and have made it clear that future contributions will be similarly calibrated. Not surprisingly, Entine's advice to individuals planning for advanced degrees is to analyze what you hope to do in life and make sure that your educational trajectory is likely to serve those hopes. ■

Peter Cholak



Peter Cholak's first graduate school assignments were unreadable. "Peter was one of about 15 graduate students taking a model-theory course for which I was the instructor. When I tried to evaluate Peter's first homework assignment, I could not make much sense of most of what he had written on any of the five problems, even though each solution occupied one to two pages," recalls Terry Millar, Cholak's eventual

thesis adviser.

"Clearly, he thought he was communicating something. Therefore, I asked Peter to stay behind after the next class, explained my confusion, and Peter cleared it up immediately: he was severely dyslexic, and in fact he was working with the campus McBurney Disability Resource Center.

"When he explained his ideas, it was clear he had solved all of the problems, and very cleverly," says Millar. Though Cholak was very bright, his dyslexia interfered with his ability to translate his ideas into written symbols. "Just on a hunch, I gave Peter a very hard problem — one that had been the main result in the PhD thesis of a fellow student of mine at Cornell several years before," says Millar. "Peter solved it completely in just a few days."

Millar eventually became Cholak's adviser. In Cholak's fifth year in the program, Millar secured a research assistant appointment that allowed Cholak to attend a yearlong workshop in logic at the Mathematical Sciences Research Institute (MSRI) at Berkeley under the guidance of new faculty member, Steffen Lempp, who had agreed to join his thesis committee. Cholak prospered with this opportunity and the additional guidance that Lempp provided. After a year at MSRI, Cholak went on to complete an impressive thesis that was published in an issue of the *Memoirs of the AMS*. He continued his career with a number of postdocs, including one from NSF, and a year each at Cornell and Michigan. Cholak joined Notre Dame's math department in 1994 but maintains close ties with the mathematics department at Madison in general and with the logicians here in particular. ■

Emeriti Service



Emeritus professor Mike Bleicher has been active since retiring from the department in 1996. Following his retirement, he served as chair of the math department at Clark Atlantic University, a historically black institution of higher education.

In the spring semester of 2011, he was a visiting professor and head of the mathematics department at Eternal University, a

newly established Sikh university in the village of Baru Sahib, in the foothills of the Himalayas. His wife, Jeanne, was an associate professor of English and taught spoken American English to prospective school teachers there. The challenge that Bleicher accepted was to teach graduate students and to develop both undergraduate and graduate curricula.

The university and the village were built under the auspices of the Kalgidhar Trust (a Sikh charity) and include a charity hospital and free boarding schools, kindergarten through high school, for rural and tribal students of all faiths whose parents cannot afford to send them to school. Due to serious internal problems beyond their control, Bleicher and many other faculty left at the end of the semester. He went on to give guest lectures at several universities, including Panjab University in Chandigarh and the Indian Institute of Technology in Madras.

When word spread that the Bleichers were willing to teach in India, he was invited to teach at a new IIT campus in Hyderabad in the fall of 2011. Starting in the fall of 2013 Bleicher taught a post-graduate course, Convex Sets and Inequalities, at the IIT campus in Indore, a new branch for IIT. He was awarded the title of Distinguished Visiting Professor by his IIT colleagues in recognition of his experience and perspective as an educator.

The Bleichers have now returned to the States but they continue to be an inspiring and wonderful example of lifelong devotion to education and its role in our multicultural world. ■

Donor Update

In 2013, the department received approximately \$27,000 in new, unspecified gifts by individuals — a 79 percent increase over the previous year — and approximately \$8,000 in unspecified pledges — almost the same as the previous year. The department has not received a corporate or foundation gift for the past two years. There was a total of approximately \$35,000 in gift contributions for specific department annual funds, a 64 percent increase over last year.

Thanks to all of you for your continued interest in the university and the Department of Mathematics, and for your continued contributions. You can make a gift online at supportuw.org with a note that it is for the Mathematics Annual Fund. Or, if you prefer, make a check payable to *UW Foundation* and note “Mathematics Annual Fund” in the memo line. Please mail checks to UW Foundation, US Bank Lockbox, Box 78807, Milwaukee, WI 53278-0807.

If you have any questions or feedback, memories or offerings, contact Rebekah Sherman at (608) 265-9793 or rebekah.sherman@supportuw.org. Please visit our website at math.wisc.edu for updates, events, newsletters and links to our Facebook page and our donation page. We want to recognize the generous donors to the mathematics department and say thank you. It is through your private gifts that these outreach programs have been able to continue challenging minds and impacting lives. ■





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Read about alumni
Steven Entine and
Peter Cholak on
page 14.

View from Van Vleck towards the Capitol after a rainstorm.

— PHOTO BY ASSISTANT PROFESSOR RICHARD KENT

