Mathematics

NEWS

$$= \sqrt{6 \sum_{n=1}^{\infty} \frac{1}{n^2}}$$

MESSAGE FROM THE CHAIR

Graduate students are the next generation of mathematical scientists and academics, whose training is the goal of our graduate program. Contributions of graduate students, like those of the faculty, underlie all of our work: They serve as teaching assistants (TAs) in undergraduate courses, participate in outreach activities and, as they make progress in our program, become active researchers. You will find in this newsletter reports on last year's activities and successes such as new VIGRE and GK-12 grants, a striking increase in the number of Math majors, our most recent win in the Mathematical Contest in Modeling, and the award of the 2004 Dean's Medal in Science to Terri Moore.

The typical Ph.D. in Mathematics takes five to six years to complete and presents unique challenges. There are relatively few graduate fellowships or research assistantships in mathematics; the student serves as a TA for most of the time. During the first year, the student has to adapt to working as a TA while learning a large amount of core graduate mathematics. Then one has to choose a research area, choose a Ph.D. advisor and make the transition into research. Finally, there is the task of becoming an independent researcher. Despite these challenges, or perhaps because of them, it is often an exciting and rewarding experience —it certainly was for me—as one goes from studying advanced mathematics to functioning as an independent researcher. The article by our Graduate Program Director, Tom Duchamp, describes how we advise and support students as they meet the challenges.

In recognition of these challenges, the Division of Mathematical Sciences at the National Science Foundation introduced the VIGRE program. The UW was among the first group to be awarded a VIGRE grant five years ago. Our application for a second grant placed at the top of this year's VIGRE competition on the basis of our achievements, particularly in graduate education and research. Our new five-year VIGRE grant will fund eight to ten graduate fellowships during each year of funding.

Recruitment of excellent students is essential for the success of our program. At the UW, we face the problem that TA salaries lag behind those of our competition. Four years ago our department introduced a "support plan" that guarantees almost every incoming Ph.D. student a supplementary stipend for five years, subject to satisfactory academic progress. The plan relies on resources made available to us on a year-to-year basis by a diverse collection of supporters such as the ARCS foundation, Microsoft and the UW Graduate School. VIGRE fellowships have been a critical component. The task facing us, as we enjoy another five years of VIGRE support, is to put in place permanent sources of funding that will enable us to continue the support plan when the grant expires.

The department has worked hard during the past seven years to build a vigorous graduate program. Our graduate students are smart and dedicated and, as they train in our program to become working mathematicians, make vital contributions to every element of the department's mission. We are very proud of them.

— SELIM TUNCEL

New Faculty

This year the department hired six faculty members, three of whom are new to the department, and three of whom were here last year in other positions.

Donna Calhoun (Acting Assistant Professor), Ph.D. University of Washington, 1999. Professor Calhoun studies numerical methods for partial differential equations, including problems in complex geometry, and problems using general quadrilateral and hexahedral grids.

Matthew Conroy (Lecturer), Ph.D. University of Colorado, Boulder, 1997. Professor Conroy was a part-time lecturer here last year.

Amer Iqbal (Assistant Professor, not pictured), Ph.D. Massachusetts Institute of Technology, 2000. Professor Iqbal works in string theory.

Alexandra Nichifor (Lecturer), Ph.D. University of Washington, 2004. Professor Nichifor works in algebraic number theory; she was a graduate student here last year.

Isabella Novik (Assistant Professor), Ph.D. Hebrew University, 1999. Professor Novik works in geometric combinatorics; she was an Acting Assistant Professor here last year.

Byung-Geun Oh (Acting Assistant Professor), Ph.D. Purdue University, 2004. Professor Oh works in geometric function theory.

Visitors

Each year, the Department welcomes many visitors. These visitors, who come for varying periods of time, teach classes and participate in our seminars and research. They make significant contributions to the life of the Department. These visitors come from all over the world, and this attests to the international nature of mathematics and to the Department's attractiveness as a center of mathematical research and teaching. Many visitors come for only a few days or a week, but some stay for a quarter or more.

Here is a list of this year's long-term visitors:

Gleb Dyatlov, Visiting Assistant Professor (Autumn, Winter), visiting from Novosibirsk State University and the Sobolev Institute of Mathematics. Professor Dyatlov studies inverse problems.

Maxim Myslivets, Visiting Assistant Professor (Autumn, Winter), visiting from Krasnoyarsk State University. Professor Myslivets does research in complex analysis.

Karoly Simon, Visiting Associate Professor (Winter, Spring), visiting from the Technical University of Budapest. Professor Simon studies dynamical systems.

Nikolaos Tziolas, Visiting Assistant Professor (Autumn, Winter), visiting from the University of Crete. Professor Tziolas does research in algebraic geometry.

Jeong-Yup Lee, NSERC Post-doc, Ph.D. University of Alberta, 2004. Professor Lee studies aperiodic order and mathematical quasicrystals.

NEW FACULTY

Donna Calhoun

Matthew Conroy

Alexandra Nichifor

Isabella Novik

Byung-Geun Oh

FACULTY EXCELLENCE AWARDS

Faculty Excellence Award selections are made by the Executive Committee of the department. While the decision is based primarily on research excellence, teaching and service contributions are also taken into account. There are always a large number of deserving colleagues; the committee often (but not always) gives preference to assistant and associate professors. You will find below brief descriptions of the work of this year's Faculty Excellence Award recipients, Sándor Kovács and Rekha Thomas.

Sándor Kovács is an algebraic geometer. When he was an undergraduate at Eötvös University, the cradle for Hungarian mathematicians, Sándor discovered his fascination with the interaction between algebra and geometry while studying Fulton's book "Algebraic Curves". At around that time he met János Kollár, another Hungarian, then teaching at the University of Utah, and told him of his interest in algebraic geometry. When Kollár returned to Utah, he sent Sándor a letter suggesting some exercises he might tackle. So began a long-distance, pre-email, correspondence, with Sándor sending solutions and Kollár sending corrections, feedback, and a new list of problems after a delay of several weeks. After he completed his undergraduate degree in Budapest, Sándor followed Kollár to Utah, and under Kollár's guidance received his Ph.D. in 1995. After graduating, Sándor held positions at MIT and the University of Chicago. Algebraic geometry has been a central part of mathematics since the time of the Greeks, and although several members of our department are consumers of algebraic geometry, we were without a genuine practitioner. We had recognized this gap, and had wanted to fill it for some time. We had the good fortune to hire Sándor in 2000, and his impact on our department has been considerable. He has attracted half a dozen good graduate students, and has taught several well-attended courses and run a number of lively seminars on a wide range of algebraic geometric topics. Sándor has also started up the Pacific Northwest Algebraic Geometry Seminar in collaboration with other mathematicians at the Universities of British Columbia and Oregon. He has been deeply involved in the Summer Institute in Mathematics at the University of Washington (SIMUW) for talented high school students. Sándor's research concerns higher dimensional algebraic varieties of general type, especially moduli spaces that arise as spaces parametrizing families of surfaces, and singularities. The impact and quality of his work has been widely recognized. He received a Centennial Research Fellowship from the American Mathematical Society in 1998, a National Science Foundation Career Award in 2001, and a Sloan Fellowship in 2002. When not doing mathematics, Sándor plays basketball and rows. He has recently taken up yoga, and in that context one is reminded of one of the most famous recent results in algebraic geometry, Mori's Bend and Break Theorem. Let's hope that is not an omen. Sándor is married to Tímea Tihanyi, an artist and sculptress working in ceramics and other media, whom he met in Budapest.

— PAUL SMITH

Rekha Thomas has broad ranging interests in mathematics. After getting her Ph.D. in operations research under the direction of Bernd Sturmfels, she spent time as a postdoctoral fellow working with the well-known economist Herbert Scarf. Currently, Thomas is interested in combinatorial problems related to algebra and geometry. In particular, Thomas researches problems that lie at the intersection of discrete optimization, computational algebra and polytopal geometry. Her recent works focus on the combinatorics of toric Hilbert schemes (with Maclagan), algebraic shifting (with Babson and Novik) and the complexity of Groebner bases (with Babson and Onn and with O'Shea). She has been involved in developing software for problems in computational algebra with Anders Jensen; these packages are available on her web site for other researchers in the field. Thomas is actively advising three Ph.D. candidates: Edwin O'Shea, Tristram Bogart and Anders Jensen.

— SARA BILLEY

Undergraduate Awards

The luncheon honoring the Math Department's undergraduate award winners for 2003-4 was held on May 25 in the University of Washington Club (formerly known as the Faculty Club). As usual, awards were given to both continuing students and graduating seniors.

The winners of the Dumas Awards for excellence in honors calculus were Jeffrey Eaton and Nicholas Reichert. Jeffrey Eaton, the winner of the award for outstanding student in first year honors calculus, was a UW Academy student; he is now a regular student and is currently in the second year honors calculus sequence. Nicholas Reichert was the winner of the award for outstanding student in second year honors calculus; he was also an early entrance student. Nick participated in Professor Morrow's REU program this past summer and plans on competing in the Mathematical Modeling Contest this year.

The winners of the Gullicksen Awards for outstanding juniors in mathematics were Sheng-Fong (Simon) Pai and Michael Gaul. Simon also won the award—for the third consecutive time—given to the UW student scoring highest on the Putnam Exam, a nationwide undergraduate math competition. This year, he is writing a senior thesis in computer science and is planning to participate once more in the Mathematical Modeling Contest (and presumably the Putnam). Michael Gaul is currently taking graduate courses in both algebra and complex analysis. The winners of the awards for outstanding graduating seniors in mathematics were Ian Walls, Joel Adriance, Adam Wilson, Caleb White,

Aleksandr (Sasha) Aravkin, and Tracy Lovejoy. Ian Walls won the award for outstanding B.A. Liberal Arts major; he completed the Mathematics-Philosophy Option and is planning a trip to Europe followed by a return to school to study computing. The winner of the award for outstanding B.A. in the Teacher Preparation Option was Joel Adriance, who is now in the Teacher Education Program at the UW seeking Certification and a Master's Degree. Caleb White was named the outstanding ACMS major, and he is now studying for a Ph.D. in Economics at the University of Wisconsin. Also studying for doctorates are Sasha Aravkin and Tracy Lovejoy, the outstanding graduates in the B.S. Comprehensive Option. They are both at the UW: Sasha in Mathematics and Tracy in Physics. They also each served as a TA in summer programs here—Sasha for SIMUW and Tracy in Professor Morrow's REU. Finally, Adam Wilson was named the outstanding graduating senior in the B.S. Standard Option; he also earned a degree in Technical Writing and is now working for Microsoft.

Jennifer French was awarded a Phelps Fellowship, which allowed her to participate in the REU here. She is now taking graduate courses in differential geometry and real analysis in addition to being the TA for first year honors calculus. She too plans to participate in the Mathematical Modeling Competition.

Other math students were recognized for winning awards from outside the department. Aravkin, Lovejoy, and Casey Schneider-Mizell were the members of the championship Math Modeling team (see separate article), Noah Giansiracusa won a Goldwater Scholarship, and Terri Moore won a Dean's Medal. Noah participated in the REU here and is now a TA for second year honors calculus, and Terri is a math graduate student at the University of Nebraska.

— ETHAN DEVINATZ

Fifth Annual Graduate Awards Ceremony

The fifth annual Graduate Awards Ceremony, honoring outstanding graduate students in mathematics who received awards and fellowships during the past year, was held on November 17, 2004 in the UW Club. Mathematics students received a number of fellowships and other awards, including six Academic Excellence Awards, two Teaching Excellence Awards, two Achievement Rewards for College Scientists (ARCS) fellowships, two McFarlan fellowships, ten Vertical Integration Grants for Research and Education (VIGRE) fellowships, a Graduate Opportunity Research Assistantship (GO-MAP award), five Top Scholar Awards sponsored by the Graduate School, and two Microsoft Scholar Awards.

The Academic Excellence Award recognizes outstanding performance in core graduate mathematics courses and the Ph.D. qualifying exams. Academic Excellence Awards were presented to Zsuzsanna Dancso, Joshua Kantor, Travis Kopp, Leo Tzou, Ursula Whitcher, and Troy Winfree. The Excellence in Teaching Award is given each fall to two of our Teaching Assistants for outstanding teaching performance in undergraduate mathematics courses. This year's Excellence in Teaching awardees are Juliet Anderson and Keir Lockridge. In addition to a certificate, each Excellence Award includes a supplementary academic stipend, funded by endowments created by Carl B. Allendoerfer, Z. William Birnbaum, and Edwin Hewitt, all of whom were distinguished mathematicians and members of the Department.

Sunil Chebolu and Pablo Shmerkin are this year's McFarlan Fellows. The McFarlan Fellowship program, which began in 1992, provides support for graduate students through the income on a bequest given for this purpose by the late Professor Lee McFarlan of the Mathematics Department.

Two of our entering students, Robert Bradshaw and Michael Cecil, were awarded Achievement Rewards for College Scientists (ARCS) Foundation Fellowships this year, bringing to six the total number of ARCS fellowships currently held by mathematics students. The ARCS Foundation is a national organization of women who raise funds for fellowships in science, medicine and engineering. ARCS Fellowships are $15,000 awards, funded over three years at the level of $5,000 annually.

Microsoft Scholar Awards were given to two entering students, Julia Eaton and Jacob Lewis. These $20,000 awards, in the form of yearly supplementary stipends of $5,000 for four years, are funded by a gift from Microsoft Corporation.

Ariana Dundon is the recipient of a Graduate Opportunity Research Assistantship, sponsored by the Graduate Opportunity and Minority Achievement Program (GO-MAP), for the purpose of bringing outstanding women and minority candidates to our Ph.D. program. The award provides support, without teaching duties, during three academic quarters. Top Scholar Awards are recruitment awards made available by the Graduate School to help with the recruitment of outstanding applicants. This year's Top Scholar awardees are Aleksandr Aravkin, Jonathan Cross, Emily Fragerstrom, Ian Langmore, Kurt Luoto, and Dustin Moody.

Ten Mathematics graduate students are VIGRE fellows this year. VIGRE fellowships are funded by a grant from the VIGRE program of the National Science Foundation. Each award provides fellowship support, without teaching duties, during two academic quarters and the summer. Eric Bahuaud, Tristram Bogart, Christopher Hanusa, Dylan Helliwell, Brant Jones, Kris Kissel, Joan Lind, Karl Schwede, David White, and Catherine Williams are this year's VIGRE fellows.

— TOM DUCHAMP

UW Wins $3.9M VIGRE Award from the National Science Foundation

"It is now cool to major in mathematics!" says one UW undergraduate. A major reason is the multitude of activities funded by a grant from the National Science Foundation under their program called VIGRE (Vertical Integration Grants for Research and Education).

In 1999 the UW Mathematics Department, in collaboration with the Departments of Applied Mathematics and Statistics, was awarded one of the first six VIGRE awards. The results of this $2.5M grant have been impressive: the number of mathematical sciences majors has increased by nearly 100%, 24 undergraduate research projects were funded last year alone, and the departments sponsored five VIGRE postdoctoral fellows. Graduate students organized VIGRE forums to learn about job search strategies, how to get a paper published, and how to establish a successful career in their first job.

Undergraduates, graduate students, postdocs and faculty cooperated in VIGRE projects ranging from statistical aspects of weather forecasting to writing scheduling software for the Mathematics Study Center, doing in seconds what used to take days. Many students helped local middle and high school classes with mathematics tutoring. Intense student involvement in these VIGRE projects is transforming lives across all three departments.

As our first VIGRE grant drew to a close this past year, we worked together to develop ideas for a new VIGRE proposal. The competition was intense: 29 major research universities submitted proposals this year; nine of these universities were selected for comprehensive site visits by the NSF, including the UW. At our site visit, groups of undergraduates, graduate students, postdocs, and faculty all described the accomplishments of our first grant, and what exciting new things we wanted to do with continued funding. One new direction was to integrate our VIGRE activities with the Canadian universities making up the Pacific Institute of Mathematical Sciences. When the results came in, the UW was rated the top proposal! This resulted in a second five-year VIGRE award, this time for $3.9M, which will support even more undergraduate projects and graduate fellowships. The UW and the other UW (University of Wisconsin) are the only mathematics departments with consecutive VIGRE awards.

Our new VIGRE grant will help us attract top students to our graduate program, get more undergraduates actively involved in team-based projects, and provide travel funds for both undergraduates and graduate students to participate in workshops and conferences. Combined with other innovative educational directions, the Mathematics Department has become a national model for high quality student programs.

— DOUG LIND

Terri Moore Wins Dean's Medal

For the third year in a row, a math major has been named the Dean's Medalist in the Sciences: Terri Moore is the medalist for 2004. (Jeff Giansiracusa was the medalist in 2003, and Thomas Carlson in 2002.) Terri graduated magna cum laude with a double major in mathematics and computer science. While she was a student here, she did research in both fields. She spent some time abroad, as part of the Budapest Semesters in Mathematics program. She participated in REU (Research Experiences for Undergraduates) programs at Trinity University in San Antonio during the summers of 2002 and 2003, and wrote several papers as a result. She continued this research in a VIGRE-funded project at the UW in the Winter and Spring of 2004. She is now attending graduate school in mathematics at the University of Nebraska.

— JOHN PALMIERI
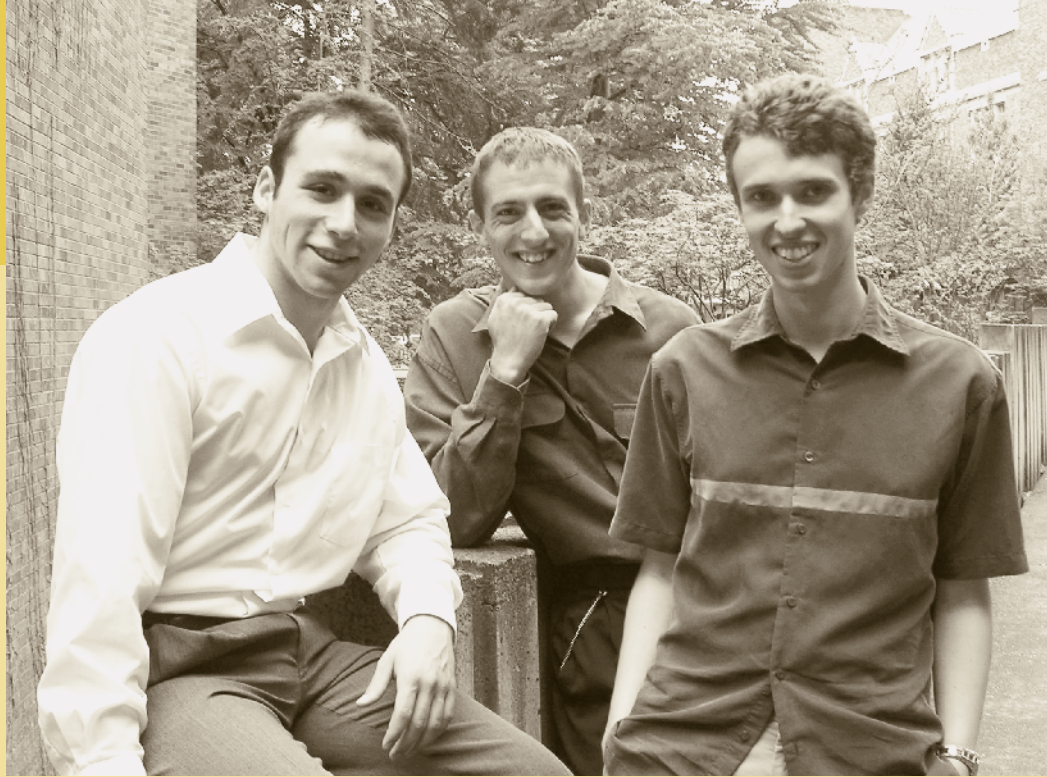
Math Modeling Contest

A three-member team of University of Washington students has again been declared Outstanding Winners in the Mathematical Contest in Modeling. Of this year's 599 participating teams, only seven, including one from the UW, were judged to be outstanding winners. In addition, two other UW teams were declared Meritorious (top 10%). We have had four winning teams in the last three years.

The winning team members are Tracy Lovejoy of Kenmore, Sasha Aravkin of Bothell and Casey Schneider-Mizell of Olympia. All were seniors and double majors: Tracy and Casey in Math and Physics; Sasha, who is now a first year math grad student at the UW, in Math and Computer Science. Casey is now a graduate student in Physics at the University of Michigan, and Tracy is a graduate student in Physics at the UW. Last year the UW had two Outstanding Winners, and the year before, one team won. In a way, the UW had a second win this year, since the winning team from Oxford University was advised by Jeff Giansiracusa, who was twice on winning teams as an undergrad at the UW.

The contest began at 5 p.m. on February 5, when officials posted two problems on the Web. The teams had until 5 p.m. on February 9 (96 hours) to select one problem and devise a solution. Competitors could access sources on the Web or in the library, but could not consult with anyone outside their team. One problem involved mathematically assessing how unique fingerprints are, and the other dealt with lines at amusement parks, the problem being to find a way to issue "quick-passes" in a fair way to allow customers to avoid long waits in line.

Casey, Sasha, and Tracy chose the quick-pass problem. Their solution was an application of the idea of a Kalman filter, a concept that Sasha learned about in computer science. They gathered some of their data by observing the waiting times at Subway in the HUB. It is important for students to draw on non-standard and original ideas in the solution of the MCM problems. The team that chose to work on fingerprints used the idea of Voronoi tessellations, surely not something that would occur to most undergrads. Another UW team that worked on the quick-pass problem used ideas from economics.

All of the teams were a bit nervous since there was a tradition of winning the contest and they didn't want to fall short of that standard. This year's contestants might also feel the pressure, but there are many good candidates and we hope to do quite well. Information on the local teams, including copies of the winning papers, is available at http://www.math.washington.edu/~morrow/mcm/mcm.html

— JIM MORROW

Recent Degree Recipients

The following students completed their doctorates in math during the academic year 2003-2004:

Jason Chen. His advisor was Paul Tseng, and his thesis title was "Merit functions and nonsmooth functions for the second-order cone complementarity problem." He is now an Assistant Professor at National Taiwan Normal University.

Rebekah Hahn. Her advisor was Steve Mitchell, and her thesis title was "K(1)-local Iwasawa theory." She teaches at the Lynnwood campus of Central Washington University.

Rob Hladky. His advisor was Jack Lee, and his thesis title was "Boundary regularity of the Neumann problem for the Kohn Laplacian on the Heisenberg group." He holds a John Wesley Young Research Instructorship at Dartmouth.

Panki Kim. His advisor was Zhen-Qing Chen, and his thesis title was "Potential theory for stable processes." He holds a Doob Research Assistant Professorship at the University of Illinois, Urbana-Champaign.

David Maxwell. His advisor was Dan Pollack, and his thesis title was "Initial data for black holes and rough spacetimes." He is an Assistant Professor at the University of Alaska, Fairbanks.

Daniel Meyer. His advisor was Steffen Rohde, and his thesis title was "Melting snowballs." He holds a T. H. Hildebrandt Assistant Professorship at the University of Michigan.

Alexandra Nichifor. Her advisor was Ralph Greenberg, and her thesis title was "Iwasawa theory for elliptic curves with cyclic isogenies." She is now a Lecturer at the University of Washington.

Michal Skokan. His advisor was Gunther Uhlmann, and his thesis title was "Regularity of ghosts of geodesic x-ray transform."

Jason Swanson. His advisor was Chris Burdzy, and his thesis title was "Variations of stochastic processes: Alternative approaches." He is now an Assistant Professor at the University of Wisconsin.

Michael van Opstall. His advisor was Sándor Kovács, and his thesis title was "Some stable degenerations and applications to moduli." He is an Assistant Professor at the University of Utah.

Below is a list of those who finished their work at the UW with a Master's degree in Mathematics, with each student's advisor listed in parentheses:

Michael Bakkemo (Eric Babson)

Catherine Darrow (Branko Grünbaum)

Anne Garrison (Judith Arms)

Jim Kelly (John Sylvester)

Jacob Mannix (Steve Mitchell)

Tracey Marsh (Jack Lee)

Younggu Moon (Paul Tseng)

Swati Sircar (Chris Burdzy)

Rosalie Tepper (Sara Billey)

The State of the Graduate Program

This year's entering class of 16 Ph.D. and 6 Master's students brings our current graduate enrollment to 82, including 73 Ph.D. and 9 Master's students, 17 women, and 23 international students representing 13 nationalities. Our graduate students are as talented and enthusiastic as any that I have seen since I arrived at the UW twenty-five years ago.

To successfully compete for these top students with other leading universities, we need a well-designed recruitment and support plan, and careful mentoring and advising to facilitate the difficult transitions from college to graduate school, from course-work to reading current research papers, and finally from reading papers to doing research in mathematics.

We began to formulate our current recruitment and retention plan in 1997 when it became apparent that our old strategy was not working. Since then, we have instituted a number of changes to our program, which, together with other factors, are responsible for our success. For example, we revised our evaluation procedure for applicants. The Graduate Admissions Committee reads each application and scores it on a four-point scale, with a score of 3.5 or above for applicants whom the Committee judges to be exceptionally strong. Students rated in this top group are routinely recruited by leading universities such as the University of Michigan and UC Berkeley. We use funds from the Graduate School together with internal departmental funds to bring our top candidates here for visits. Our own students are the best publicity for our program, so each visiting applicant is hosted by an advanced graduate student.

Another major change is the development of a support plan guaranteeing adequate financial support to our top students; this is a critical component of our recruitment efforts. These efforts are working: this year for the first time, everyone in our entering Ph.D. class was rated 3.5 or above by the Admissions Committee.

Our advising and mentoring program is also the result of a multi-year effort. We have designed a three-day orientation program for new students and teaching assistants. Each new student meets individually with the Graduate Program Coordinator, is given an introduction to our graduate pro-gram, and participates in a TA training program. In addition, each student is mentored by an experienced TA during her/his first quarter of teaching.

Mentoring and advising continues throughout our program. Each student is assigned a preliminary advisor who helps to map out the student's course of study. To ensure that students get sound advice, we have compiled a "Handbook for Advisors and Instructors of First Year Students." The Graduate Program Coordinator meets annually with every student during each of the first three years of study.

Our system of three preliminary examinations is designed to encourage a smooth and timely transition from course-work to research. Students can enroll in summer tutorial sessions designed to prepare them for the prelims, which are given in mid-September of each year. Strong performance in any one of our five "core courses" can be used in lieu of one exam, and those students who have passed two exams and established a research focus can choose an "Oral Prelim Option" in place of their third exam. Although we expect our doctoral students to complete prelims by the beginning of their third year, this year the majority of our second year students have already completed them.

The department sponsors numerous activities designed to acquaint students with current research in mathematics as well as with current topics related to the profession. In addition to regular colloquia, formal and informal seminars, and reading groups, graduate students organize the Current Problems Seminar where faculty and advanced graduate students discuss their own research. This year the department received funds from the University's ADVANCE program to sponsor a series of visits by well known women mathematicians. In addition to formal talks, the department sponsors lunches with colloquium and ADVANCE speakers, and "brown-bag lunches" to discuss issues related to the teaching of mathematics. Approximately twice each quarter the department sponsors an informal dinner where a small group of students and faculty meet to explore ways to improve our graduate program.

— TOM DUCHAMP

STUDENT AND ALUMNI NEWS

REU Program at the UW

The National Science Foundation supports Research Experiences for Undergraduates in various disciplines at selected universities. Readers of this newsletter are familiar with the fact that the University of Washington Mathematics Department has had an REU site since 1988, directed by Jim Morrow. The students in the program are talented undergraduates selected in a competitive process from universities throughout the United States; in Summer 2004, students came from the University of Washington, Brandeis University, University of Indiana, CalTech, LSU, Illinois Institute of Technology, University of Chicago, and Western Illinois University. The program is nationally recognized; an article about the program appeared in the September 2004 issue of *Math Horizons*.

In 2004, the NSF VIGRE grant supported two TAs and four additional UW undergraduate student participants, and for the first time the Bob and Elaine Phelps Scholarship was awarded to support one more UW student, bringing the total number of undergraduates in the program to thirteen, the largest number ever to participate in our REU.

The students work on projects in the general area of "inverse problems for electrical networks." After a week of lectures and reading, students start their own research. Students make interim oral reports and eventually write a research paper with their problem solution. Sometimes the work is of the quality to appear in journals and be reported at national meetings.

Please visit our REU web site, http://www.math.washington. edu/~reu/. This website contains an archive of past papers written by REU students, plus photos of the participants and other information.

— JIM MORROW

ACMS Program

The Applied and Computational Mathematical Sciences program continuesto be a focal point of interdisciplinary activity across the mathematical sciences and across the physical and social sciences, as well as across many of the colleges within the university. With degree specializations in the Biological and Life Sciences, Discrete Mathematics and Algorithms, Engineering and Physical Sciences, Mathematical Economics, Operations Research, Scientific Computing, Social and Behavioral Sciences, and Statistics, ACMS students can be found throughout campus creating the kind of synergy between the mathematical sciences and applications that will be required to face the challenges of the 21st Century. Our students are involved in undergraduate research projects in Engineering, Biology, Education, and Computer Science. The program continues to attract some of the top students on campus with many students pursuing a double major in their area of application.

Last year the ACMS program graduated 76 of its 180 majors. The success of the program is a testament to the vision and creativity of our students as well as to the spirit of cooperation between the four participating mathematical sciences departments: Mathematics, Applied Mathematics, Computer Science and Engineering, and Statistics. Indeed, this spirit of cooperation extends across the UW campus. A hallmark of the ACMS program is its success in working together with a great variety of programs and individuals throughout campus to provide balanced interdisciplinary programs for our students. We go forward into 2005 with the goals of opening up more upper-level courses to ourstudents and continuing the development of streamlined double majors with client departments.

— JIM BURKE

Number of Mathematics Majors Continues to Increase

The number of Mathematics majors reached 300 at the end of the 2003-04 academic year. This is a striking increase from 205 majors at the end of 2002-03, and 153 at the end of 2001-02.

The number of ACMS majors has been stable for several years at a little below the program cap of 200. There were 180 ACMS majors at the end of 2003-04. The combined figure of 480 for the Mathematics and ACMS undergraduate degree programs represents a near-doubling of the combined number of 245 at the end of the 1998-99 academic year.

95 degrees in Mathematics and 75 degrees in ACMS were awarded in June 2004, up from 72 and 67 the year before. The combined figure of 170 is also a near-doubling of the 90 degrees awarded in the two programs in 1998-99. The graph below gives annual totals for the last ten academic years.

YEAR

- ■ Math & ACMS degrees
- ■ Math & ACMS majors
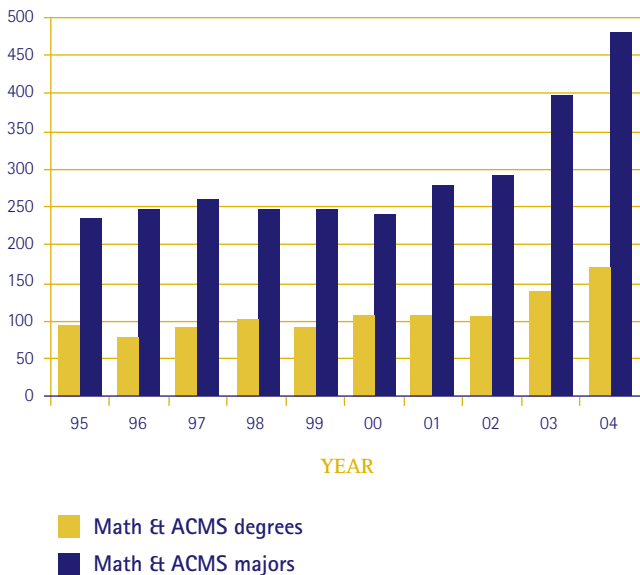
Alumni News

Starting this year, we are including items about our alumni in the newsletter. Please send us any interesting information, and we will try to include it next year.

Shizu Lee (B.A., 1997) is in the Ph.D. program in Economics at UCLA. "What I particularly liked about math was that once in a while there were problems that I just could not solve, and after spending hours and hours thinking about them, I was able to solve them. I really liked the feeling of being lost in my thoughts and the immense satisfaction I would get when I was finally able to solve the problems."

Kathy Temple (B.S. and UW President's Medalist, 1999) is working on a Ph.D. thesis in Mathematics at the University of Wisconsin; her field of specialty is probability. About her experience with UW Mathematics, Kathy says that she "really appreciated that I felt a part of the department, which gave me a home within the university."

Thomas Carlson (B.S. and Dean's Medalist, 2002) is now enrolled in the Master of Divinity program at Trinity Evangelical Divinity School (TEDS), and is almost halfway through his degree program. Thomas says, "Even though I'm not involved in a math-driven profession at present, I appreciate my math major for teaching me careful reasoning and analytical skills, which are extremely important when one is exploring theology and its implications for life."

Ernie Esser (B.S., 2003) was a member in our model contest winning teams in 2002 and 2003, and is now a math graduate student at UCLA. He came back last summer to give a lecture at SIMUW.

Lauren Sandven (M.A., 2003) just started in a tenure-track faculty position at Shoreline Community College.

Mike Story (M.S., 2004) now has a temporary associate faculty position at Shoreline.

The Milliman Lectures

Our 2004-2005 Milliman Lecturer, Professor Luis Caffarelli, is scheduled to visit our department and deliver three lectures during the week of February 7-11, 2005.

Professor Caffarelli holds one of the four Sid W. Richardson Foundation Regents Chairs in the Department of Mathematics at the University of Texas in Austin. He is also affiliated with the Texas Institute for Computational Engineering and Sciences. Professor Caffarelli is a leader in the field of partial differential equations and their applications. He is one of the most original mathematicians working in this area; his deep insights and absolutely unique intuition have transformed the field. His ideas have become the foundation upon which the fields of fully non-linear partial differential equations and free boundary problems are based.

Luis Caffarelli received his Ph.D. from the University of Buenos Aires in 1972. He came to the States as a Postdoctoral fellow at the University of Minnesota in 1973, where he became a Full Professor in 1979. Over the last 25 years, he has been a Professor at the Courant Institute at NYU, at the University of Chicago, and at the University of Texas in Austin. From 1986 to 1996 he was a permanent faculty at the Institute for Advanced Study in Princeton.

Over the last 30 years his mathematical activity has been centered around two very broad questions: existence and regularity (i.e. the degree of smoothness) of solutions for non-linear partial differential equations, and free boundary regularity for elliptic and parabolic problems. Among his major contributions to the first question are deep results concerning fluid flows and the introduction and successful implementation of convexity methods, as well as the more recent use of homogenization techniques to study fully nonlinear differential equations. Caffarelli's work in free boundary problems constitutes the foundation upon which

the field was built. Free boundary problems arise naturally in physics and engineering: the free boundary may appear as the interface between a fluid and the air, or water and ice. For example, in the filtration problem, which studies how water filtrates from a dam made of a porous medium (say earth), the free boundary separates the wet part from the dry part. Caffarelli often proceeds by modeling physical problems to show that mathematically sound solutions exist, then proving the regularity of such solutions.

As a recognition for his leading role in the field, Caffarelli was elected to the American Academy of Arts and Sciences in 1986 and to the National Academy of Sciences in 1991. Among the many honors and awards he has received are Doctorate Honoris Causa from École Normale Superieure in Paris, from Universidad Autónoma de Madrid and from Universidad de la Plata, Argentina. He received the Stampacchia Prize in 1982, the Bocher Prize in 1984, and the Gold XI Plus Medal in 1988. He was a plenary lecturer at the International Congress of Mathematicians in Beijing, China in 2002. He delivered the Fermi Lectures at the Scuola Normale de Pisa in 1998, and the Morse Lectures at the Institute for Advanced Study. He was also an invited lecturer to the American Mathematical Society Centennial Celebration.

The main characteristics that make Caffarelli such a unique member of the mathematical community are his intuition, his originality, and his generosity both with his time and his ideas. By sharing his ideas in a one-on-one basis with the younger generations, he has planted the seeds of a booming field.

— TATIANA TORO

Math Department Colloquium

This year, there will be two special series of math talks within the usual departmental colloquium.

The ADVANCE Colloquium Series: This series of talks by distinguished women mathematicians is supported by UW's ADVANCE grant from the NSF. The main purpose of these talks is to showcase high quality research by a diverse set of female mathematicians. The visits include a strong mentoring component for students and faculty. Each speaker will visit for several days and give an introductory talk for graduate students on Monday and the colloquium talk on Tuesday. The speakers scheduled thus far are Angela Gibney (University of Pennsylvania, November 9), Sun-Yung Alice Chang (Princeton University, November 23), Yvonne Choquet-Bruhat (Faculté des Sciences de Paris and l'Université Pierre et Marie Curie, February 15) and Ulrike Tillman (Oxford University, April 5).

Great Ideas Series: Continuing from last year, this series features expository talks by UW faculty that explain an important idea or open problem in mathematics to a wide audience. There were six talks in this series last year: Jerry Folland, Steffen Rohde, Anne Greenbaum, Dan Pollack, Sándor Kovács and Steve Mitchell. This year we will have four talks in this series: Boris Solomyak (November 30), Eric Babson (March 8), Gunther Uhlmann (April 26), and Krzysztof Burdzy (May 31).

The full colloquium schedule can be seen at
http://www.math.washington.edu/Seminars/coll.php

— REKHA THOMAS

Mathday

The fifteenth annual Mathday will be held on the campus of the University of Washington on March 21, 2005. On that day 1,200 high school students and teachers from around the state will attend lectures and panel discussions, participate in hands-on activities, and go on field trips to labs on the campus. Students come from all over the state of Washington, and in recent years we have always had representatives from the state of Idaho. The first Mathday was held in 1991. This year the plenary speaker will be our own Sándor Kovács, and he will speak on "The Mathematics of Internet Security." Guest lecturers will include Zelda Zabinsky (Industrial Engineering); Millie Johnson (Mathematics, WWU); Cliff Mass (Astronomy, UW); Carl Bergstrom (Biology, UW); Peter Hoff (Statistics, UW); Sara Billey, Matt Kahle, and Zack Treisman (Mathematics, UW); and others not yet confirmed. In 2004 there were more than twenty activities and field trips. There is a website, http://www.math. washington.edu/~morrow/mathday.html, which will be updated with current information. Undergraduate students, graduate students, staff, and faculty contribute to the success of this exciting, educational day in which students learn about the uses of mathematics in academic research and industrial research and development. Mathday is partially supported by donations from two anonymous donors and Wells Fargo. The Wells Fargo donation supports students from underrepresented public schools in the Seattle and Tacoma area.

— JIM MORROW

GK-12: UW Grad Students Working with Local Schools

As many of you are aware, these are stirring times in K-12 mathematics education. The pressures are great and so is some of the progress. One notable characteristic is that the richer the mathematics that is being tried, the heavier the demands are on the teachers who are doing the trying. With that in mind, the NSF instituted GK-12 Projects, which take graduate students into elementary school classrooms to support teachers who are working with strong new curricula. Here at the University of Washington we are in the fourth year of such a GK-12 Project, run by Professor Loyce Adams of the Department of Applied Mathematics and Dr. Ginger Warfield of the Mathematics Department. Our first GK-12 grant was funded for three years, from 2001 to 2004, and we recently received a second grant, $2M for the five year period 2004-2009. This year fourteen UW graduate students, including two from the Mathematics Department, are going to three central area schools. The Project supports the graduate students with a seminar, a peer community and some mentor-time. It supports the teachers with the classroom presence and planning time of a person on whose mathematical expertise they can rely, and with some workshops. And it supports the students of Leschi, Thurgood Marshall, and Emerson Schools by giving them their own private mathematician whom by and large they adore!

— GINGER WARFIELD

Math Fairs!

How many people do you meet who would describe mathematics as dreary and/or terrifying? For most of us the answer is "Far too many!" The department is launching a project to offset this a bit: Math Fairs. A Math Fair is a family evening at which groups of students in an elementary school take charge of presenting mathematical games and puzzles, and their families and fellow students come play the games and work on the puzzles and have a lot of fun. The first of the Fairs was at Leschi Elementary School last spring (a description is at http://www.math.washington.edu/~warfield/news/news117.html). This year, with help from the GK-12 Project, we are working to involve more mathematicians, and to establish a template that can be offered to other schools. One thing is for sure — it's not only the kids who have fun with the Fairs!

— GINGER WARFIELD

SIMUW 2004

The Summer Institute for Mathematics at the University of Washington (SIMUW) has completed its second year, and this was as successful as the first one. SIMUW is an exciting program for students who have not yet completed their final year of high school. It is funded entirely by a generous gift from an anonymous couple.

The second class of twenty-four enthusiastic, talented students arrived at the campus of the University of Washington on June 20, 2004 for a six-week program of classroom activities, special lectures, field trips, social activities, and intense interaction with faculty, TAs, and fellow students.

The two dozen students from Washington, Oregon, and British Columbia studied topics ranging from mathematical ideas in scientific computing to higher dimensional geometry in two-week segments, interspersed with special half-day sessions on topics like mathematical reasoning, knot theory, and the mathematics of movement. They spent four days each week on the two-week topics, and one day on the special sessions. Most of this time they worked together and with the staff, grappling with mathematical problems. On weekends, there were planned excursions to museums, science labs, and the beach.

Students in the program deepened their understanding and appreciation of many active areas of mathematics. They also established friendships and contacts that will last long after the final session.

The SIMUW program is directed by UW faculty members Ron Irving, Sándor Kovács, Paul LePore, and Jim Morrow. In 2004 there were six faculty members from the UW, the University of Chicago, and Microsoft; seven special lecturers from the UW and the University of California at Los Angeles; and six teaching assistants from around the country who also served as counselors.

The original funding for SIMUW was for two years, which ended with this year's program; however, our generous donors have agreed to continue funding for another two years. As a result, we are now starting preparations for SIMUW 2005. Students from Washington, British Columbia, Oregon, Alaska, and Idaho are encouraged to apply.

Information about the 2005 program will soon appear on the SIMUW website, http://www.math.washington.edu/~simuw/.

— SÁNDOR KOVÁCS

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The following is a list of our friends who have contributed to the Department between July 1, 2002, and October 25, 2004. Should you notice an error or omission in this list, please draw it to our attention by a telephone call or e-mail message to Mike Munz (206-543-1150 or munz@math.washington.edu).

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Each year the Department receives gifts from its alumni and friends. These gifts are of immense value to us. They permit us to carry on important activities for our students and our scholarly work; for instance, they provide money for scholar-ships, fellowships, and prizes for our students. They help to support events like Mathday and the REU program. They support visits to our Department by distinguished mathematicians from around the country and the world. They give the Department a much-needed element of flexibility to meet special needs as they arise. For these contributions we are truly thankful, and we hope to continue enjoying the support of our many alumni and friends. If you are thinking of making a gift to the Department, or remembering the Department in your will, we invite you to discuss the matter with Professor Selim Tuncel, the chair of the Department (206-543-1151 or chair@math.washington.edu) or with Dondi Cupp of the Development Office in the College of Arts and Sciences (206-685-6736 or dcupp@u.washington.edu). You can also visit our web site http://www.math.washington.edu/ and click on "Giving to Math."

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Mathematics NEWS

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