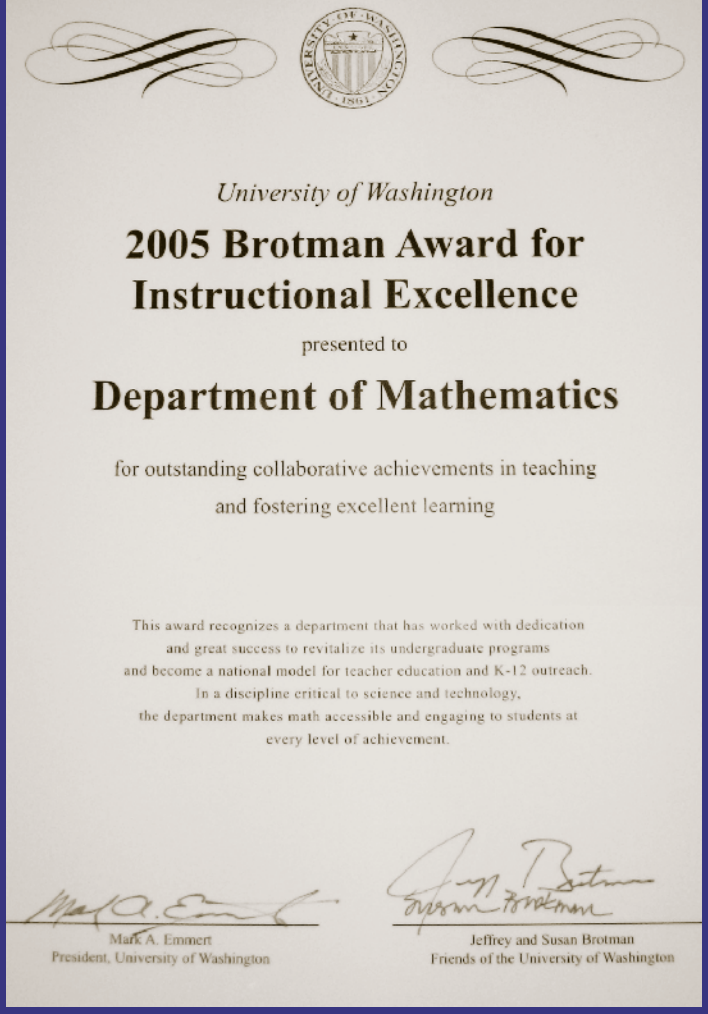
AUTUMN 2005

NEWSLETTER OF THE DEPARTMENT OF MATHEMATICS AT THE UNIVERSITY OF WASHINGTON

Mathematics NEWS



University of Washington

2005 Brotman Award for Instructional Excellence

presented to

Department of Mathematics

for outstanding collaborative achievements in teaching and fostering excellent learning

This award recognizes a department that has worked with dedication and great success to revitalize its undergraduate programs and become a national model for teacher education and K-12 outreach. In a discipline critical to science and technology, the department makes math accessible and engaging to students at every level of achievement.

Mark A. Emmert
President, University of Washington

Jeffrey and Susan Brotman
Friends of the University of Washington

DEPARTMENT OF MATHEMATICS NEWS

MESSAGE FROM THE CHAIR

The 2004–05 academic year will be remembered for the wonderful recognition and support given to the Department by the mathematical community, by our colleagues on campus, and by the Department's alumni and friends. The support we experienced on a daily basis is crystallized in the prizes received by Branko Grünbaum and Jim Morrow for work they have done over decades, the awards to our students, the Brotman Award presented to the Department for its instructional excellence, and the endowments that were established during the year. The significant increase in the involvement of our alumni, in particular, is most encouraging. And, yes, a team of our students was again selected Outstanding Winner in the Mathematical Contest in Modeling, for the fifth time in four years. Watch out, Lance Armstrong, here comes UW Math!

We have over 90 students in our graduate program this year, and they are an amazing group. The majority of them serve as teaching assistants for undergraduate courses. Having doubled the size of the Department's undergraduate degree programs during the past three years, we are working to absorb the additional students while maintaining—actually increasing—the quality of the educational experience we offer to our students. We have significantly expanded the involvement of our undergraduate majors in research projects with faculty and graduate students, for example. In addition to grants that fuel our research, we have been fortunate in attracting substantial federal funding, through our VIGRE, GK-12, and REU grants in particular, for our educational and outreach efforts. It is critical that we recruit excellent faculty members together with the strongest graduate students, and encourage and support them as they continue to create, as everything we do rests with them. It is here that private support, on top of state and federal funding, allows us to take that extra step in innovation and leads to excellence in education, research and outreach.

Every UW department is reviewed on a decennial basis. We had our turn recently. In this year-long review, as well as in many other ways, our department was commended for its achievements in education and research. The extent and effectiveness of our involvement in outreach was singled out as being remarkable for a major research department. Indeed our outreach programs, thanks to the efforts of Ginger Warfield, Jim Morrow, Jim King and many others, now cover the full K-12 span as indicated by the following (partial) list of acronyms you may be familiar with or encounter for the first time in this Newsletter: Math Fairs, GK-12, WaToToM, NWMI, SIMUW, and Math Day. Our K-12 efforts reflect our realization that the seeds of mathematical thinking and appreciation are most effectively sown early in life. In addition, through programs such as the summer Research Experience for Undergraduates and workshops for graduate students, our department is fully engaged in serving the national mathematical community. We look forward to the continuing involvement of our community in the department as we further our work at every educational level.

—SELIM TUNCEL

Pictured (cover):

Upper left: Professor Branko Grünbaum

Upper right: Professor Jim Morrow

Middle: 2005 Brotman Award for Instructional Excellence

Bottom: Photo from the 2004 Graduate Student Awards; (top row) Kris Kissel, Eric Bahuaud, Tristram Bogart, Joan Lind, Karl Schwede, David White, Troy Winfree, Catherine Williams, Joshua Kantor, Professor Barry Mazur (VIGRE Distinguished Lecturer), Keir Lockridge, Leo Tzou, (bottom row) Prof. Selim Tuncel, Prof. Doug Lind, Prof. Tom Duchamp, Prof. Monty McGovern, Ursula Whitcher, Juliet Anderson, Zsuzsanna Dancso, Travis Kopp

The Graduate Program

This year's entering class of 18 Ph.D. and 6 Master's students brings our current graduate enrollment to ninety-three, including 80 Ph.D., 11 Master's, and 2 visiting students; 18 women, and 28 international students representing 16 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 such as the University of Michigan, UC Berkeley, and UCLA, our department designed a recruitment and support plan over the past decade, and it is working very well. One of its many strengths is the 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.

Graduate Awards

The sixth annual Graduate Awards Ceremony, honoring outstanding graduate students in mathematics who received awards and fellowships during the past year, was held on November 14, 2005 in the UW Club. Mathematics students received a number of fellowships and other awards, including three Academic Excellence Awards, two Teaching Excellence Awards, three Achievement Rewards for College Scientists (ARCS) fellowships, one McKibben and Merner fellowship, two McFarlan fellowships, eleven 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 three Microsoft Scholar Awards.

Graduate students play a central role in all activities of our department: they share in the teaching of undergraduate courses, they are students in our graduate courses, and they are active participants in our research program. For the continued success of our program, it is vital that we continue to recruit from among the most talented students. Not only do the awards and fellowships provide valuable encouragement, but they are essential to our efforts to recruit talented students to our program.

The Academic Excellence Award, which recognizes outstanding performance in both core graduate mathematics courses and the Ph.D. qualifying exams, is given each fall to three students. This year's awards were presented to Jeremy Berquist, Jacob Lewis, and James Vargo. 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 Kristofer Reed and Edwin O`Shea.

Our first McKibben and Merner Fellowship was awarded to Ursula Whitcher. The fellowship is funded at the level of $5,000 annually over three years, and is awarded to a second or third year graduate student with an excellent academic record.

Matias Courdurier and Jun Zhang 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.

Three of our entering students, Michael Gaul, James Vargo, and Stephanie Vance, 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.

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Microsoft Scholar Awards were given to three entering students, Andrey Novoseltsev, Bo Tian, and Carto Wong. 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.

Stephanie Vance is also 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 PhD 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 Andrew Crites, Steven Klee, Laura Matrajt, Sweta Suryanarayan, and Travis Willse.

Eleven Mathematics graduate students are VIGRE fellows this year. VIGRE fellowships are funded by a joint grant to the UW departments of Applied Mathematics, Mathematics, and Statistics from the VIGRE program of the National Science Foundation. Each award provides fellowship support, without teaching duties, during two academic quarters and the summer. Matthew Ballard, Davis Doherty, Kelly Jabbusch, Matthew Kahle, Joshua Kantor, Keir Lockridge, Elizabeth Morris, Alex Papazoglou, David Rosoff, Zachary Treisman, and Ursula Whitcher are this year's VIGRE fellows.

We are grateful to the individuals, foundations, and UW programs who make these awards possible.

— TOM DUCHAMP

Profs. Monty McGovern (far left) and Tom Duchamp (far right) with Academic Excellence and Excellence in Teaching Awardees (beginning 2nd from left) Jeremy Berquist, James Vargo, Edwin O'Shea, Kristofer Reed, and Jacob Lewis.

Undergraduate Program

Undergraduate education in mathematics continues to thrive at UW. Our calculus curriculum revision reached two important milestones in the last year: we are now in the fifth year of our major revision of Math 124/5, and we have received ongoing funding to continue our new format of smaller class sizes on a regular basis. We have turned our attention to Math 126, making adjustments in the syllabus that will be finalized in the near future. Math 310, our introduction to mathematical reasoning and bridge to upper-division math courses, and Math 381, our introduction to mathematical modeling, are booming.

Our undergraduate degree programs in mathematics and our joint program in Applied and Computational Mathematical Sciences (ACMS, joint with Applied Math, Computer Science, and Statistics) have grown substantially over the last several years. Growth is exciting, but also includes many challenges. We are offering extra sections of some of our senior-level classes to meet the demand. After an absence of a few years, the Math Club has returned with enthusiasm, and undergraduate involvement in research in mathematics is growing. This is indeed an exciting time for undergraduate education in mathematics at UW.

—KEN BUBE

Students and faculty mingle during the Mathematics Freshman Reception.

You will find reports on the many activities of our students on the following pages...

Mathematics Department and Graduate School Colloquium

The Mathematics Department and Graduate School Colloquium invites mathematicians from around the country and the world to address our faculty and graduate students. Their talks concern their research and expertise about developments of broad interest to the mathematics community. The Colloquium is perhaps the primary way that our faculty and students become acquainted with mathematical advances outside their areas of specialization.

Last year, there was a special series of talks in the Colloquium supported by the ADVANCE Program. For that series, distinguished women mathematicians visited our department for several days to interact with our women graduate students and faculty particularly. Their colloquium talks were one of the highlights of their visits.

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

— JOHN SULLIVAN

SPECIAL PROGRAM NEWS

Our VIGRE Grant

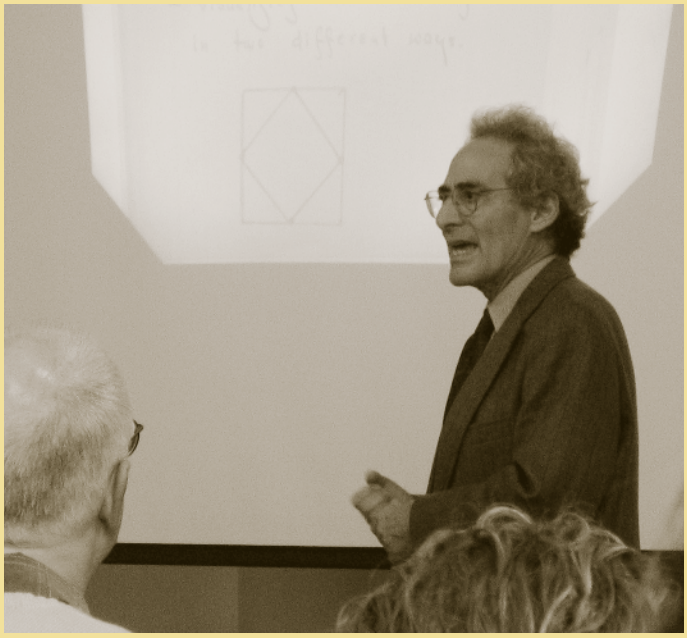
The UW Mathematics Department ranks among a handful of departments nationwide to have won back-to-back five-year VIGRE grants from the National Science Foundation. A collaborative effort with the Departments of Applied Mathematics and of Statistics, our $3.9M VIGRE grant funds undergraduate research projects, graduate student traineeships, postdoctoral fellows, and a variety of activities meant to enrich and broaden the professional development of our students at all levels.

One of the highlights the past year was a visit by our first VIGRE Distinguished Lecturer, Professor Barry Mazur of Harvard University. Mazur recently published a book called *Imagining Numbers*, in which he gives a lucid account about complex numbers for the general public. This formed the basis of his VIGRE Public Lecture to an overflow audience of 200 people (another 50 couldn't get in!), ranging from first-year undergraduates to faculty to the general public. He was also interviewed for an hour on Seattle's Public Radio KUOW about mathematics. Graduate students supported by VIGRE are responsible for organizing the VIGRE Distinguished Lecturer series, and they have already lined up four more speakers during the next two years.

Another innovation in our current VIGRE grant is support for summer schools for graduate students. We organized two of these this past summer. The first, a week-long "boot camp" in algebraic geometry, immediately preceded an enormous three-week conference in the same subject also held on campus. Although we originally planned on roughly 50 students attending, the boot camp turned out to be wildly popular, and we expanded the program to 130 (from 200 applicants!). The whole program came to be known as the "Woodstock of algebraic geometry." The second was a Summer School on Inverse Problems, involving 44 students, of whom 23 were from the UW. The main lecturer was William Symes of Rice University, who spoke on "The Mathematics of Seismic Imaging." In addition, minicourses consisting of three one-hour lectures covering a broad range of topics were given by five faculty, including Gunther Uhlmann of the UW.

VIGRE continues to support dozens of undergraduates working on projects with faculty. A group of four students (David Duncan, Nick Reichert, Justin Vincent, and Karl Fredrickson) worked Spring Quarter with graduate student Joan Lind and faculty member Steffen Rohde on the Stochastic Loewner Equation. This is currently a very hot topic, undergoing intense work both at the UW and at Microsoft Research, and this experience gave these undergraduates a unique understanding of developing mathematics research. Another group of four undergraduates (Eliana Hechter, Erin Tsai, Justin Vincent-Foglesong, and Jeff Eaton) worked with faculty member Tatiana Toro to organize a Math Fair at Wedgwood school, in which mathematical games and puzzles helped involve students there (and their parents!) in better understanding of concepts.

— DOUG LIND



VIGRE Distinguished Lecturer Barry Mazur during his talk on November 17, 2004.

Last summer's REU participants: (from left) Nick Reichert, TA Jennifer French, Amanda Rohde, Orion Bawdon, Owen Biesel, Joel Nishimura, Jeff Eaton, TA Ernie Esser, Peter Mannisto, Megan McCormick, Hila Hashemi, and Prof. Jim Morrow. (Other team members, not pictured, were TA Sam Coskey, Adam Chacon, Jake Danton, Eliana Hechter, Justin Robertson, and Shannon Smalley.)

REU Program at the University of Washington

The University of Washington summer REU (Research Experiences for Undergraduates) program has been running since 1988. The program has continued to grow in size (this year there were thirteen students and four TAs) and national prominence. Jim Morrow, the director of the program, was one of two math REU directors invited to a Pan-REU workshop in September in Washington, DC, and he gave a presentation to a reception for the House Science Committee held in the Rayburn Building. The program has attracted the best students in the United States, with five recent participants receiving Goldwater Scholarships and two nominees this year (2005–6) for a Rhodes Scholarship. In addition REU alumni make up the bulk of the Department's stellar Mathematical Contest in Modeling Teams. This year eleven of the twelve participants in the contest are alumni of the REU program.

The program lasts eight weeks. Students do original research on problems related to the inverse problem in electrical networks. In 2005 students found new results on directed networks and new proofs of theorems on dual graphs and embeddings of graphs in Riemann surfaces. One of the REU students will present his work on extending germs of harmonic functions on graphs at the annual meeting of the MAA in January. There were five women and eight men in the program with one of the women supported by a Phelps Fellowship. The four TAs are alumni of the program. The TAs were three graduate students (at UCLA, Rutgers, and MIT) and one advanced undergrad who is currently a TA for Math 334. A website, http://www.math.washington.edu/~reu, has detailed information about the program, including an archive of students' papers going back to 1988. The current program was awarded funding for 2005–07 by the National Science Foundation. In addition it is supported by the VIGRE grant and Department of Mathematics funds.

– JIM MORROW

Winners Again in Mathematical Contest in Modeling

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 664 participating teams, only ten, including one from the UW, were judged to be outstanding winners. In addition, one other UW team was declared Meritorious (top 13%). We have had five winning teams in the last four years.

It is natural to wonder if we are getting a name for ourselves in MCM circles. Yes, we are! However, that has no effect on the results: each team is assigned a number, and the judges do not know the names of the team members or their home institution until after the decision has been made. Each win is an independent event!

The winning team members are Ryan Bressler, Braxton Osting, and Christina Polwarth. Ryan and Cristina have graduated and are working on research projects with UW faculty. Braxton is now a graduate student at Columbia, and is coaching a team at Columbia that will enter the 2006 contest.

The contest began at 5pm on February 3, when officials posted two problems on the Web. The teams had until 5pm on February 7 (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. Here is part of the problem the winning team solved:

Lake Murray in central South Carolina is formed by a large earthen dam. Model the flooding downstream in the event there is a catastrophic earthquake that breaches the dam. In particular, could the flood be so massive downstream that water would reach up to the S.C. State Capitol Building, which is on a hill overlooking the Congaree River?

Their model was a fusion of several disparate areas of knowledge. They applied the Manning equation and the Saint-Venant Equation. They used topographical and river flow data from online databases and interpreted it using paper maps and navigation skills gained through travel in backcountry. They concluded that the flood would not reach the Capitol.

UW's winning team in the 2005 Mathematical Contest in Modeling: Ryan Bressler (back left), Braxton Osting (back right), Christina Polwarth (front left) and advisor Professor Jim Morrow (front right).

Ryan, Braxton, and Christina also won the 2005 UW Library Research award for Undergraduates for a paper based on their MCM solution.

This year's teams have now been formed and are very talented with lots of experience. As usual we have very high hopes.

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

On the experience of MCM: Stress, Depression, and Excitement

The following is a slightly edited version of an email from Jerry Pan, one of this year's MCM participants, sent to Jim Morrow the day after the contest closed. We thank Jerry Pan for the permission to include it in this newsletter.

The MCM was the single most stressful, depressing, unbelievably-exciting-when-getting-something-done thing I had done in my entire life. Needless to say, all of us worked to the best mental, physical, and psychological abilities we could summon in such a short period of time. The MCM was especially difficult for us because none of us had done MCM before, none of us was an applied math major with experience of solving PDEs, and none of us had any prior knowledge of how water behaves in an open channel. With the help of some extensive research and thinking, we came up with many different and exciting ideas, accompanied with many disappointments along the way. The most promising idea of them all, may I say, failed to give us what we wanted at 10am in the morning on the last day. We were trying to numerically approximate a hyperbolic PDE (the Saint Venant equation to be exact) using a MacCormack predictor-corrector scheme that we just learned from papers, and the results were surprisingly bad on longer time steps or a longer overall time span. We had to drop the idea because it would not give us the data we wanted on the flooding over the entire length of the Saluda river. This fact completely crushed us. At that moment, we had a quarter of a paper done, and, no model to finish it. We were all about to give up altogether because it was too close to the deadline to come up with any other ideas and to write a paper based on them. We had to get out of the office and take a break. We went out for breakfast. The entire process was silent. We all fell into our own traps of self-loathing because we had no idea what to say to you when we would hand our paper to you with no results in it. Over the past months, you have put so much work and hope into us. We knew we must be able to at least get some results in this contest. Nonetheless, the situation seemed hopeless for us to do that. I had never felt so bad in my life.

After going back to the office, because I really hated giving up, I made a seemingly hopeless move. I changed the program that implements the MacCormack scheme to a simple one-step finite difference method. To my surprise, it gave us very workable results. It was six hours away from the deadline, and we finally had a new model to work with and write a paper on. Time was of the essence. After a short argument about whether there was still hope for us, we decided to just do it and see what happens. We all became busy and nervous and started doing things as fast as we could to meet the deadline. What you will be reading is what we came up with in that period of time.

> "I got to work with such brilliant minds on a problem that I would have never done otherwise."

I certainly know that our paper has many imperfections and may not even explain very well what we actually accomplished. However, I just wanted to let you know that we tried very hard and we hope that it deserves what you have done for us. I also wanted to share the experience with someone, and since you are the first person that came to my mind, I am writing to you. On a final note, I am glad (after 15 hours of sleep, that is) that I did this contest. I got to work with such brilliant minds on a problem that I would have never done otherwise. We learned so much in the process and got pushed so hard. Now every time there is a stressful situation, I'll always think back to the MCM and realize that there could be worse situations. It was an unparalleled experience altogether. Thank you so much for getting us into this and coaching us and letting us know, during the contest, that we still had hope yet. Thank you.

– JERRY PAN

STUDENT NEWS

Undergraduate Awards

The annual Mathematics Department luncheon to honor its outstanding undergraduates was held this year on May 31 at the University of Washington Club on campus. A gift from the firm of Towers Perrin helped pay for the luncheon and was also used for a new award, the Towers Perrin Award, given to the outstanding graduating mathematics major with an interest in actuarial science. The first winner of this award was Michelle Seim, who is currently working in Capital Markets–Foreign Exchange at Microsoft. The other awards were given in the usual categories, to both graduating seniors and continuing students.

Zhili Wu and Owen Biesel were named the outstanding students in first and second year honors calculus, respectively. Zhili is continuing with second year honors calculus, and Owen is studying real analysis at the graduate level.

The winners of the Gullicksen Awards for outstanding juniors in mathematics were Nicholas Reichert and Noah Giansiracusa. Nick also scored the highest among UW students in the Putnam Exam, a nationwide undergraduate math competition. Currently, Nick is taking several advanced graduate courses in mathematics and is a TA for second year honors calculus, while Noah is participating in the Math in Moscow program this fall. He intends to be back at the UW come winter.

Eliana Hechter, another outstanding junior, was awarded a Phelps Fellowship, to be used for participation in Professor Morrow's REU program. Eliana is now studying algebra and real analysis at the graduate level and is a TA for first year honors calculus.

Eliana Hechter receives the Phelps Fellowship certificate at the Mathematics Honors Luncheon.

In addition to the yearly Departmental honors given at the luncheon, several Mathematics undergraduates earned awards from outside the Department. They include the following:

Joel Nishimura	UW Freshman Medalist
Jeffrey Eaton	UW Sophomore Medalist
Anna Schneider	2005 Goldwater Scholarship Award
Noah Giansiracusa	Fall 2005 AMS Math in Moscow Scholarship Award

The winners of the other awards for outstanding graduating seniors in Mathematics were Karl Fredrickson, Ann Dao, Michelle Goldstein, Braxton Osting, and Jennifer French. Karl Fredrickson won the award for outstanding B.A. (Standard Option) major; he is now a graduate student in Mathematics at the University of California, San Diego. Ann Dao won the award for outstanding B.A. major in the Teacher Preparation Option and is continuing at the UW as a graduate student in the Teacher Education Program. She hopes to eventually teach sixth grade mathematics. The outstanding B.S. Standard Option graduate was Michelle Goodstein, who is now a graduate student in Computer Science at Carnegie Mellon, where she is the holder of a Clare Booth Luce Graduate Fellowship. Braxton Osting won the award for outstanding ACMS major and is now a graduate student in Applied Mathematics at Columbia. He plans to use his experience as a member of the UW's championship mathematical modeling team to coach a team at Columbia for this competition. Joining Braxton and Michelle back East is Jennifer French, the winner of the award for the outstanding B.S. Comprehensive Option graduate: after spending the summer as a TA for the REU program here, she entered MIT as a graduate student in Mathematics.

– ETHAN DEVINATZ

Mathematics Undergraduate Endowed Scholarship Awarded to Zachary Sanford

Zachary Sanford has been selected to receive the Mathematics Undergraduate Endowed Scholarship. Zachary, a graduate of Woodinville High School, earned exceptional grades not only in honors mathematics courses such as AP Calculus, but in AP Physics, AP History, and AP Government/Political Science as well. His high marks are accompanied by stellar SAT scores. Zachary is now in his freshman year here at the UW.

The Mathematics Undergraduate Endowed Scholarship is made possible by an endowment established by Byron and Shiela Bishop (see "New Endowments" on page 14).

Recent Degree Recipients

The following students completed their doctorates in Mathematics during the academic year 2004–2005:

Matt Blair. His advisor was Hart Smith, and his thesis title was "Strichartz Estimates for wave equations with coefficients of Sobolev regularity." He holds a postdoctoral position at Johns Hopkins University.

Sunil Chebolu. His advisor was John Palmieri, and his thesis title was "Refinements of chromatic towers and Krull-Schmidt decompositions in stable homotopy categories." He has a postdoctoral position at the University of Western Ontario.

Pete Couperus. His advisor was Eric Babson, and his thesis title was "Combinatorial Problems on Abelian Cayley Graphs." He is a Software Engineer at ESI in Portland, Oregon.

Chris Hanusa. His advisor was Henry Cohn, and his thesis title was "A Gessel-Viennot-type method for cycle systems with applications to Aztec pillows." He holds a Riley Assistant Professorship at SUNY Binghamton.

Dylan Helliwell. His advisor was Robin Graham, and his thesis title was "Boundary regularity for conformally compact Einstein metrics in even dimension." He is now an Assistant Professor at Seattle University.

Joan Lind. Her advisor was Steffen Rohde, and her thesis title was "Geometry of Loewner Evolution." She has a postdoctoral position at Cornell University.

Pete Littig. His advisor was Steve Mitchell, and his thesis title was "Schubert Varieties and the Homology Ring of the Loop Space of a Compact Lie Group." He teaches at UW Bothell.

David White. His advisor was Chris Burdzy, and his thesis title was "Processes with Inert Drift." He has a postdoctoral position at Cornell University.

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:

Juliet Anderson (Anne Greenbaum)

Jonathan Landis (Anne Greenbaum)

Dymitr Mozdyniewicz (Dan Pollack)

Chris Quarles (James Zhang)

Bachelor's Degrees

177 Bachelor's degrees were awarded during the 2004-2005 academic year: 100 in Mathematics and 77 in ACMS.

MATHEMATICS DEPARTMENT HONORED

Grünbaum Wins Steele Prize

The American Mathematical Society has awarded Branko Grünbaum the 2005 AMS Leroy P. Steele Prize for Mathematical Exposition, for his book *Convex Polytopes*. According to the AMS,

> [This book] has served both as a standard reference and as an inspiration for three and a half decades of research in the theory of polytopes. That theory is currently very active and enjoys connections with many other areas of mathematics, including optimization, computational algebra, algebraic geometry, and representation theory. Much of the development that led to the present, thriving state of polytope theory owes its existence to this book, which served as a source of information for workers in the field and as a source of inspiration for them to enter the field. Despite the passage of time, *Convex Polytopes* retains its value both as an exposition of the theory and as a reference work. Springer-Verlag's decision to issue a second edition in 2003, consisting of Grünbaum's original text plus notes by Volker Kaibel, Victor Klee, and Guenter Ziegler to describe newer developments, will extend the book's influence to future generations of mathematicians.

Branko received his Ph.D. from Hebrew University in 1957, and joined the UW in 1966. He has supervised at least 17 Ph.D. students, has written seven books, and has published well over 200 papers.

Jim Morrow Wins Two Awards

This spring, Jim Morrow won two awards in recognition of his remarkable teaching and service to the university: he was awarded the first UW College of Arts and Sciences Alumni Professorship, and he was also one of two winners of the PIMS Education Prize.

The citation for the Alumni Professorship says, "For having a profound effect on students, both inside and outside the classroom, for exemplary teaching and mentoring, Professor James A. Morrow, Ph.D., Professor of Mathematics is hereby awarded the College of Arts & Sciences Alumni Distinguished Professorship."

The Pacific Institute for the Mathematical Sciences (PIMS) is a consortium of universities in the Pacific Northwest, which aims to support mathematics research, education, and ties with industry. Its Education Prize recognizes those who have "played a major role in encouraging activities which enhance public awareness and appreciation of mathematics, as well as fostering communication amongst the various groups and organizations concerned with mathematical training at all levels."

Jim received his Ph.D. from Stanford in 1967, and arrived at the UW in 1969. He has written a number of books and papers, he has had 5 Ph.D. students, and has mentored countless undergraduate math majors. Readers of this newsletter know many of his other activities and accomplishments: for example, he organizes Mathday each spring, he runs an REU program each summer, and he coaches the department's teams for the Mathematical Contest in Modeling; the last four years have seen five winning teams in this contest. He regularly teaches the second year of our honors advanced calculus course (Math 334/5/6). He won a University of Washington Distinguished Teaching Award in 2003.

University Week: Brotman Award for Department of Mathematics

The following article was published in *University Week*, the faculty and staff newspaper, in recognition of the selection of the Department for a Brotman Award for Instructional Excellence. The award is given by the University to academic units or groups "who have achieved excellence in teaching and fostered excellent learning throughout a program of study." We thank *University Week* and Rob Harrill for permission to include the article.

Department Chair Selim Tuncel receives the 2005 Brotman Award from UW President Mark Emmert on behalf of the Department of Mathematics.

In some ways, the Department of Mathematics at the University of Washington is like an octopus.

The main body is firmly grounded in the department's headquarters, where math majors pursue the intricate dance of mental gymnastics that advanced mathematics provides. But its arms reach into and support numerous other disciplines on campus—physics, computer science, electrical engineering and statistics, to name a few—where math plays a foundational role.

"Math provides a basis for most of what we do in the sciences," according to Selim Tuncel, department chair. "As such, our faculty interact with students from across campus, helping prepare them to pursue their individual paths."

A number of strategies implemented over the years have helped the department do an increasingly better job of supporting students as they pursue math-intensive degrees university-wide. As a result, the department has won a 2005 Brotman Award for Instructional Excellence.

One of the key changes has been a revamping of the department's calculus courses, which provide an instructional backbone for the university's science and engineering students. Class size has been greatly reduced, training for teaching assistants beefed up and communication among instructors enhanced. As a result, failure rates are down while retention rates and enrollment are up. To implement the changes, faculty members agreed to shoulder a 10-percent increase in their teaching load.

That, according to Werner Stuetzle, is one of the most powerful indications of the mindset in the department.

"(They) accepted an increase in teaching load to support the reform," said Stuetzle, acting chair of the statistics department. "It is hard to imagine a more concrete and convincing demonstration of commitment to undergraduate education."

An undergraduate research program exposes students, both in and outside the department, to important issues in the field, said David Notkin, chair of the Department of Computer Science & Engineering. And the math department's K-12 programs are unique for a major research university.

"They help instill a love of mathematics in our pre-college youth that will serve them well no matter what field they enter," Notkin said.

The department also pays close attention to those who wish to make mathematics their chosen field of study. The honors sequence of courses focuses on building close mentoring relationships. Perhaps one of the most vivid evidences of success is student participation in the annual international Mathematic Contest in Modeling.

Under the guidance of Professor Jim Morrow, the department has placed five teams in the contest's top bracket in the past four years, holding its own with math powerhouses like Harvard, Yale, the Massachusetts Institute of Technology and the University of California at Berkeley. After each win, Morrow has received calls from colleagues at institutions around the world who want to know his secret, Tuncel said.

The student outreach undertaken by Morrow, Virginia Warfield and other faculty members is gaining outside notice, he said.

(continued on next page)

NEW ENDOWMENTS

Multiple Endowments Established in Mathematics

The earning of an undergraduate scholarship helped propel future Expedia.com co-founder Byron Bishop to graduate from the UW in 1986 with a bachelor of science in both computer science and mathematics. Never able to thank the establisher of the scholarship directly (he had passed on by the time it was awarded to Bishop), he was always looking for another way to say thank you. Last autumn he and his wife Sheila, another UW scholarship beneficiary, generously established the **Mathematics Undergraduate Endowed Scholarship.**

> "We hope to keep the Department strong..." —Maggie Walker

Bishop believes that coming to the UW was by far the best decision of his life, and he and his wife hope to allow future students in mathematics to focus less on tuition and more on their studies, just as their scholarships allowed them to do. Says Bishop, "(We're) trying to make it easier for someone to concentrate on getting the most from their education."

The Bishops' generous endowment is just one of several that the Department has received in the past year.

Over the summer, John and Kathy Connors joined the Bishops in aiding future Mathematics undergraduates with the establishment of the **John and Kathy Connors Foundation Endowed Scholarship.** Designed to provide assistance to Mathematics majors in the Educational Opportunity Program, the Connors' gift will grant educational opportunities to deserving, high achieving students who would not otherwise be able to afford a UW education.

The endowments received in the past year have been further enhanced by the UW's Matching Initiative, which provides donors with even more incentive to give by multiplying the power of their gifts. "It makes the endowments so much more productive," says UW graduate and UW Foundation Member Maggie Walker. In addition to gifts distributed across other UW departments, this year she and her husband Doug created the **Walker Family Endowed Professorship in Mathematics**, which will help the Department continue to compete with other mathematics departments across the nation.

As a graduate of the Department and co-founder of software company WRQ, Inc., Doug Walker believes that not only is mathematics still an important part of his intellectual life, but an important discipline to keep strong. It is the Walkers' hope that their endowment

(**Brotman Award**, continued from page 13)

"We had our 10-year review this year, and the group that made the site visit stressed how unusual it is for a large university to have the level of closeness and involvement that we have here," he said.

Growing interest indicates that students are noticing the effort. The number of math majors reached 300 at the end of the 2003–04 academic year, up from 205 the year before and 153 the year before that. And majors in the Applied and Computational Mathematical Science program, an interdisciplinary degree created in 1997 and jointly sponsored by math, applied math, statistics, and computer science and engineering, currently number 180.

Students both in and out of the department say solid math instruction plays a critical role in their academic success.

Scott Moon, a major in aeronautical and astronautical engineering, said he knew his chosen path would require intensive mathematics and he was apprehensive. Several courses offered by the department put his fears to rest.

"Applying the mathematical concepts I had learned from the math department, I was easily able to transfer my calculus skills to my various aerospace engineering prerequisite

will aid the Mathematics Department in doing so. "We hope to keep the Department strong and continually attract faculty that will enliven the place," explains Ms. Walker.

In addition to their professorship, the Walkers have also created the **Walker Family ARCS Fellowship**, which will benefit graduate students in both Mathematics and CSE.

Craig McKibben began his involvement with the Mathematics Department by earning a Master of Science degree in 1972. Explains McKibben, "I've always been interested in science, and math seemed the best way to understand the language of science." His intent was to combine mathematics and computers, and as the computing era was still in its infancy, as McKibben puts it, "Computer science *was* math." He is quick to point out that the study of mathematics fosters the ability to think logically and sequentially, a valuable skill in programming.

McKibben went on to become another co-founder of WRQ, Inc., and this year he and his wife Sarah Merner have made incredible contributions of their own to the Department. Together they created both the **Craig McKibben and Sarah Merner Endowed Fellowship in Mathematics** and the **Craig McKibben and Sarah Merner Endowed Professorship in Mathematics**, bolstering the Department in two key areas.

> **"The Department is on an upward trajectory, and when you're on an upward trajectory, you can always use more resources to do things."**
> **—Craig McKibben**

"The Department is on an upward trajectory," says McKibben, "and when you're on an upward trajectory, you can always use more resources to do things." Both he and his wife want to help Mathematics continue the progress it has made in recent years. With the support of all of those who have been so generous, it will continue to do just that, growing and thriving far into the future.

– MICHAEL MUNZ

courses," he said. "These classes allow non-math major students to easily transfer mathematics skills to their respective fields of study."

Ravi Shroff, a senior in mathematics and economics, talks of how the curriculum and instructors' presentation of it captivated him and eventually led him to consider graduate work in the field.

"I don't think I had ever thought of math as 'beautiful' or 'amazing,'" he said of his experience in an upper division math course. "I actually remember saying, 'Wow, that's crazy' when I found out that in a non-Hausdorff topological space a sequence could have two distinct limits."

Notkin sums it up: "The math department is a jewel in the crown of the University of Washington."

– ROB HARRILL

OUTREACH

Outreach Programs

A couple of decades ago the Math Department became conscious that its focus on mathematics and on building mathematicians was causing it to turn its back on the community outside its doors. This was not a healthy state of affairs, so we got to work on it. One result was Math Day, begun in 1991 and still very much alive today. It annually brings some 1,200 high school students and their teachers from around the state to our campus for a day of mathematical activities and topics ranging from boomerangs to astronomy. With Jim Morrow at the helm and the Extension Office assisting, it looks (but isn't!) nearly effortless. Since then we have been reaching out in an ever-increasing set of ways and directions. In the mid-nineties we joined the College of Education for a pair of NSF projects (Creating a Community of Mathematics Learners and Expanding the Community of Mathematics Learners) that worked intensively with teachers at all levels in six school districts around Lake Washington. Meanwhile, under the guidance of Jim King, a group of teachers from around the state began attending the Park City Mathematics Institute, another NSF project. That group got a month of very exciting mathematics at an institute attended also by researchers and graduate students. They came back and put together another annual event, the Northwest Mathematics Interaction. That one runs for two weeks on the UW campus and brings in yet another group of teachers to work and learn together. The PCMI connection has recently produced yet another sub-project, TM 3, about which you can expect to hear a lot next year.

Another joint venture, this one with Applied Mathematics and an independent school, University Child Development School, is the GK-12 Project. Also supported by the NSF, this project takes graduate students and UCDS teachers into several elementary schools to be a resource for teachers who are in the process of learning to teach mathematics as a set of concepts rather than a set of procedures (generally those who are adopting one of the new curricula).

On the home front, and quite without NSF funding, we have been running a series of quarter-long special topics courses designed to be of interest to in-service teachers, and accessible to them both in content and in scheduling.

And most spectacularly, thanks to an anonymous donor, we run an annual summer event called SIMUW (Summer Institute of Mathematics at the University of Washington) that brings 24 bright, lively high school students to live on campus for six weeks and immerse themselves in mathematics. They have six two-week mini-courses run by different mathematicians, mostly from the UW faculty, and a bunch of special lectures and events. It's hard to tell for whom it is more exciting—the kids or the mathematicians working with them!

— GINGER WARFIELD

Math Fairs

What do you get when you mix elementary school children and their teachers and families with University of Washington math faculty and students? A lot of mathematical fun, and in specific, a Math Fair.

Math Fairs first turned up around here in spring of 2004. Inspired by an article in the PIMS newsletter, Ginger Warfield took students from her Math 170 course (Mathematics for Elementary School Teachers) to Leschi Elementary School. After three successive weeks of preparation sessions, the experience culminated in an evening where the gym and lunchroom were filled with tables of puzzles and games manned (mostly!) by kids, with support of the Math 170 students. Kids learned each other's games and, best of all, taught the games to their parents and challenged them with the puzzles. It was an exciting evening.

Last year saw three more Math Fairs along the same lines, at Leschi and Thurgood Marshall Elementary Schools and the African American Academy, all in the Central Area. It also saw a Math Fair on a slightly different model at Wedgwood Elementary School. That one was run by Tatiana Toro, with the assistance of four math majors. Wedgwood is well supplied with games and mathematical construction supplies from the Math 'n' Stuff store, so their Math Fair was shaped around those. Almost all of the preparation time was spent with the fourth graders, who then were in charge of a daytime Math Fair for their schoolmates as well as an evening Math Fair for their parents.

This year we are carrying the plan forward one more notch. The Warfield-style Math Fairs were all assisted by support from the GK-12 grant, and the Toro-style Math Fair was assisted by support from the VIGRE grant. Now we are coming up with an amalgamated style, and are being further assisted by the Mathematics Department. Aided by Math 'n' Stuff, the department has come up with funding to enable us to provide three Central Area schools with a lot of the same games and puzzles that were at the heart of the Wedgwood Math Fair. VIGRE will continue to support undergraduates, and in addition will make it possible to involve a graduate student in the organizational side of the project. Our hope is to finish the year not only having produced four more of these exciting math events, but with a template that will make it possible to turn them into an ongoing offering to the community around us. And that is an exciting thought indeed!

— GINGER WARFIELD

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, Chuck Doran and Isabella Novik.

Chuck Doran is a geometer and string theorist. He went to Harvard for graduate school, studying several subjects with several advisers. He studied differential geometry and theoretical physics with Shing-Tung Yau, and number theory and algebraic geometry with Barry Mazur. It turns out that each of these subjects, even number theory, has become an important ingredient in Chuck's current field, string theory, and his knowledge of these fields helps him stay in the leading pack. After graduating from Harvard, Chuck spent a year at the Pennsylvania State University and then landed a prestigious VIGRE Postdoctoral Fellowship at Columbia University, where he started a fruitful collaboration with John Morgan, a well-known topologist. They are studying the topology and geometry of Calabi-Yau threefolds, a topic central to the mathematical side of string dualities.

In the short time Chuck has spent here he has developed close relations with the string theorists in the physics department and co-organized two international math/string workshops here in Seattle. One of these, "K-Theory and Supersymmetry," quickly led to a grand collaboration that now involves three west-coast mathematicians and three east-coast physicists at various institutions. Besides this, Chuck is collaborating with several mathematicians from across the country.

Chuck has also taken this collaborative attitude to teaching: he is now team-teaching a class on "Exceptional Structures in Mathematics" with Henry Cohn, a researcher in the Theory Group of Microsoft Research.

One of Chuck's favorite pastimes, other than working, is riding his bicycle on the Burke-Gilman Trail. Chuck's brother, Brent, is also a mathematician, with a position at Oxford University. While Brent was in town for the decennial AMS algebraic geometry conference this summer, the two brothers took part in another classic Seattle activity: attending the full Ring Cycle in the new opera house.

– SÁNDOR KOVÁCS

Isabella Novik joined the UW Math department in 2001 as an Acting Assistant Professor after having been a Morrey Assistant Professor at the University of California in Berkeley. Since 2004 she has been an Assistant Professor in the Math department at UW.

Novik received her award-winning Ph.D. in 1999 from Hebrew University in Israel under the supervision of Gil Kalai. Her research is centered around the study of face (f)-vectors of simplicial complexes, a major theme in algebraic and geometric combinatorics with deep connections to commutative algebra and algebraic topology. Her contributions to this field extend fundamental results by some of the best combinatorialists in the world: Richard Stanley (MIT), Lou Billera (Cornell), Anders Björner (KTH, Sweden), Peter McMullen (University College, London), Victor Klee (UW) and Gil Kalai (Hebrew University, Israel).

Novik's first paper, "Upper bound theorems for homology manifolds," proved the *Upper Bound Conjecture* for a large class of triangulated manifolds. This conjecture, put forward by Motzkin in 1957, states that the maximal f-vector of a d-dimensional simplicial polytope with n facets is achieved by *cyclic polytopes*. It was proved for polytopes by Klee and McMullen in 1964 and 1970 and extended to simplicial spheres by Stanley in 1975. In her 2005 paper, "On face numbers of manifolds with symmetry," she further extended these results to non-oriented manifolds and manifolds with group actions. Her most recent work ventures into analytic techniques for proving results in discrete geometry. She recently became one of four chief editors of the *Journal of Algebraic Combinatorics*, a central journal in combinatorics.

Isabella Novik regularly teaches both graduate and undergraduate classes and is currently supervising Andy Frohmader's Ph.D. work.

– REKHA THOMAS

FACULTY NEWS

Transitions

This year the department made four new faculty appointments.

Aravind Asok (Acting Assistant Professor/VIGRE Postdoctoral Fellow, not pictured), Ph.D. Princeton University, 2004. Professor Asok studies algebraic geometry, representation theory, and mathematical physics.

Xiaosheng Li (Acting Assistant Professor), Ph.D. UCLA, 2005. Professor Li studies partial differential equations, inverse problems, and non-linear functional analysis.

Andrew Loveless (Lecturer), Ph.D. Washington State University, 2005. Dr. Loveless studies number theory, cryptography, combinatorics and algebra.

Julia Pevtsova (Acting Assistant Professor), Ph.D. Northwestern University, 2002. Professor Pevtsova studies algebraic geometry, algebraic topology, and representation theory.

Last year the department appointed **Amer Iqbal** (Assistant Professor), Ph.D. Massachusetts Institute of Technology, 2000. He was on leave last year and joins the department this year. Professor Iqbal studies string theory.

Yu Yuan was promoted from Assistant Professor to Associate Professor, with tenure. Professor Yuan studies partial differential equations and differential geometry.

Professors **David Ragozin**, **Lee Stout**, and **John Westwater** retired, each after over 30 years with the Department.

Visitors

Each year, the UW Department of Mathematics 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:

Federico Ardila, Visiting Assistant Professor (Autumn), visiting from Microsoft Research. Professor Ardila studies combinatorics and geometry.

Rami Atar, Visiting Associate Professor, visiting from Technion – Israel Institute of Technology. Professor Atar studies stochastic processes, control and partial differential equations.

Carsten Lange, Visiting Assistant Professor (Autumn, Winter), visiting from TU Berlin. Professor Lange studies geometric combinatorics.

Valerey Serov, Visiting Associate Professor (Winter, Spring), visiting from the University of Oulu, Finland. Professor Serov studies inverse problems, spectral theory, and nonlinear equations with applications in optics.

Vladimir Sharafutdinov, Visiting Professor (Autumn), visiting from the Sobolev Institute of Mathematics. Professor Sharafutdinov studies differential geometry and topology.

Amer Iqbal

Xiaosheng Li

Andrew Loveless

Julia Pevtsova

STRING THEORY AND MATHEMATICS

Why are mathematicians so excited about string theory?

To answer this question, consider the history of interaction between physics and mathematics. For 3000 years the two subjects evolved in tandem. Once their separate identities emerged, there were long periods when mathematicians and physicists worked largely apart on seemingly unrelated problems. But no matter how physical laws came to be generalized (e.g., in the theory of general relativity, quantum mechanics, or gauge theory), the still more abstract mathematical language needed to express them had usually already been developed for non-physical reasons (e.g., differential geometry, functional analysis, or bundle theory, respectively).

To physicists, this "Unreasonable Effectiveness of Mathematics in the Natural Sciences" (summarized in Eugene Wigner's 1960 essay) required explanation; Wigner viewed it as an inevitable consequence of the laws of invariance (i.e., the notion that physical laws are valid at every point of space-time), and the empirical law of epistemology (i.e., the accrued evidence that mathematics has worked well so far). He contrasts this with the "nightmare of the theorist," illustrated by the problem of quantum gravity—the quest to unify quantum mechanics and general relativity—wherein "The two theories operate with different mathematical concepts ... [and] no mathematical formulation exists to which both of these theories are approximations."

To mathematicians, physics is a rich source of both examples and conjectures, each a powerful motivation for mathematical research.

On the one hand, with its wealth of "coherent structures," physics can be viewed as the ur-example: Classical mechanics has motivated the qualitative theory of differential equations and symplectic geometry; quantum mechanics has inspired "q-analogues" throughout algebra and geometry; general relativity has led to much research in partial differential equations and differential geometry.

On the other hand, to a mathematician the very best conjectures are those whose statements or proofs relate very different types of mathematics. Wigner's illustration of the theorist's nightmare now becomes a great opportunity!

Since any candidate for a consistent theory of quantum gravity must relate in a fundamentally new way the different branches of mathematics used to describe each component theory, such a physical theory should suggest important mathematical conjectures.

String theory is the leading candidate theory of quantum gravity. In fact, there are several consistent variants (Types I, IIA, IIB, and two Heterotic string theories), and they all have certain common features. The most obvious are the replacement of point particles by strings and the six extra "curled-up" space-time dimensions. The shape of these compactified dimensions is what mathematicians call a Calabi-Yau manifold, and the particle spectrum of the physical theory is determined by the topology and geometry of this manifold. Due to their "extra mathematical" origin, these distinct string theories can admit very different mathematical descriptions.

Physically, the five string theories may be viewed as limits of a single as yet unknown "M-theory," and hence are related one to another by "string dualities." Identifying these via a string duality sometimes results in an equivalence between an easy problem (computation is feasible) and a hard problem (undeveloped mathematics). This has lead to some very precise mathematical predictions from physics, and proven quite useful for mathematicians seeking to refine the conjectures they inspire. The very non-uniqueness of string theory has become a boon to mathematics, yielding new and deep mathematical conjectures.

String theory has produced "derivations" of mathematical theories like toric geometry and K-theory, and a host of string-motivated conjectures in virtually every field of mathematics. Whatever its eventual status as a physical theory of quantum gravity, the inevitability of string theory as a mathematical theory of the highest order is hard to dispute. In light of this, perhaps we should turn Wigner's remark around and marvel instead at the unreasonable effectiveness of string theory in mathematics!

— CHUCK DORAN

This article was inspired by Professor Doran's lecture in the Science Forum Colloquium last May. Powerpoint slides are available for download online at: http://www.math.washington.edu/~doran/StringTheoryandMathematics.ppt.

SPECIAL LECTURES

MUMFORD AND GOWERS TO GIVE PUBLIC LECTURES

This coming year, two Fields Medalists will be visiting the University of Washington: David Mumford (in February 2006) and Timothy Gowers (in April 2006). The Fields Medal is the most prestigious award given to mathematicians; it is awarded every four years at the International Congress of Mathematicians.

Timothy Gowers Is This Year's Milliman Lecturer

Our 2005-2006 Milliman Lecturer, Professor Timothy Gowers, is scheduled to visit the department and deliver three lectures during the week of April 3–7, 2006.

Timothy Gowers is the Rouse Ball Professor of Mathematics at Cambridge University. He works in combinatorics, combinatorial number theory, and the theory of Banach spaces, and has made fundamental contributions to each of these fields. Before Gowers' work, most mathematicians would have viewed these as being unrelated, but Gowers has shown otherwise, to great success: in 1998 he was awarded a Fields Medal. In 1996 he received the Prize of the European Mathematical Society, and in 1999 he was elected Fellow of the Royal Society.

Banach spaces are important in quantum physics, as well as in mathematics, and mathematicians and physicists study their inner structure and their symmetries. When Gowers began working on Banach spaces, many of the most important problems were rather old, dating from the work of the eponymous Polish mathematician Stefan Banach (1892–1945). Solving one fifty-year old problem is significant, but Gowers has in fact settled a number of these.

In combinatorics Gowers has worked on problems involving arithmetic progressions and randomness in graph theory. One notable result was a beautiful new proof of a famous theorem of Emre Szemeredi about random graphs. He has also studied Ramsey numbers and related topics. (The Ramsey number R(3,3) can be defined as the number of people one must invite to a party in order to guarantee that at least three people all know each other or at least three people have never met. It turns out that R(3,3)=6. The Ramsey numbers R(m,n) can be defined analogously, and they are hard to compute; for example, the exact value of R(5,5) is not known.)

Gowers also wrote the wonderful book, *Mathematics: A Very Short Introduction.*

David Mumford to Give Walker-Ames Lecture

On February 21, 2006, Professor David Mumford of Brown University will give a Walker-Ames Lecture on "The Lure of the Abstract: Case Studies in Math and Art."

Mumford is one of the most renowned and honored mathematicians in the world: he received the Fields Medal in 1974; he was elected to the National Academy of Sciences in 1975 at the age of 38; and he was a MacArthur Fellow from 1987 to 1992.

He was trained in the field of algebraic geometry, and it was for his contributions in this area that he was awarded the Fields Medal. In the early eighties, he switched fields and focused on problems concerning vision and pattern recognition. As he puts it in his biography in Encyclopedia Britannica, "I turned from algebraic geometry to an old love — is there a mathematical approach to understanding thought and the brain?" For the past 20 years he has been in a quest to understand and formulate the vision process as a mathematical model.

David Mumford is a unique ambassador for mathematics. Not only is his research at the forefront of science, but some of his writings have made mathematics accessible to a wide audience. His book *Indra's Pearls*, joint with Caroline Series and Dave Wright, is an account of their exploration of a family of symmetrical but infinitely convoluted sets, part of the modern investigation of how chaos evolves from very simple rules, producing intricate complexity on every scale from the very large to the very small. In the authors' words: "Our dream is that this book will reveal to a larger audience that mathematics is not alien, cold and remote but just a very human exploration of the patterns of the world, one which thrives on play and surprise and beauty."

— JOHN PALMIERI (WITH HELP FROM TATIANA TORO)

See http://www.math.washington.edu/Seminars for more information on lecture rooms and times.

OUR DONORS

The following is a list of our friends who have contributed to the Department between September 1, 2003, and October 25, 2005. 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 (206-543-1151 or munz@math.washington.edu).

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Dr. and Mrs. Loren N. Argabright
Prof. Judith M. Arms & Mr. Stan Sorscher
Prof. Michael Artin
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