Van Vleck Notes 2005

From the Editor...

This year's biggest news is the awarding of the National Medal of Science to Carl de Boor, professor emeritus of mathematics and computer science. Accompanied by his family, Professor de Boor received the medal at a White House ceremony on March 14, 2005.

Carl de Boor

Carl was one of 14 new National Medal of Science Laureates, the only one in the category of mathematics. The award, administered by the National Science Foundation originated with the 1959 Congress. It honors individuals for pioneering research that has led to a better understanding of the world, as well as to innovations and technologies that give the USA a global economic edge. Carl is an authority on the theory and application of splines, which play a central role in, among others, computer-aided design and manufacturing, applications of computer graphics, and signal and image processing.

The new dean of the College of Letters and Science, Gary Sandefur, said "Carl de Boor's selection for the nation's highest scientific award reflects the significance of his work and the tradition of excellence among our mathematics and computer science faculty." We in the Department of Mathematics are extremely proud of Carl de Boor.

Carl retired from the University in 2003 as Steenbock Professor of Mathematical Sciences and now lives in Washington State, although he keeps a small condominium in Madison. Last year's newsletter contains information about Carl's distinguished career and a 65th birthday conference held in his honor in Germany.

As anticipated in last year's newsletter, the number of UW-Madison Mathematics PhDs now exceeds the "magic number" 1000. This milestone was recognized this year in a gathering in the 9th floor conference room.

RAB

From the Chair...

Hello all. This has been a terrific year for the UW-Madison Math Department. To start off, we learned in mid-August that we were one of two mathematics departments in the country awarded a multi-million dollar VI-GRE grant by the National Science Foundation (see p.19). This funding will be a tremendous boon to our program at every level, especially in the current climate of limited resources.

Despite the nation's still struggling economy, and decreasing support for higher education by our state, we have done remarkably well in attracting exceptional faculty during my time as chair. As evidence, we have hired six new tenure-track assistant professors in the past two years: Itay Ben-Yaacov, who arrived this past fall (see p.3), and Andrei Căldăraru, Serguei Denissov, and Jordan Ellenberg (see pp.3-4), who arrive next fall along with our very recent hires, James Rossmanith and Gheorghe Craciun (to be covered in next year's newsletter). We also have several new Van Vleck postdocs (see p.7), thanks in part to the VIGRE grant.

Most of all, this has been a banner year for recognition of our outstanding faculty in the form of prestigious awards, fellowship, and named chairs. Heading the list is our front page story of Carl de Boor's receiving the National Medal of Honor. Last fall, Alexander Ionescu was one of only three mathematicians to receive the prestigious Packard Fellowship for Science and Engineering for 2004 (p.6). Then Arun Ram won a Vilas Associates Award (p.10), Richard Brualdi was named Bascom Professor (p.10), and Alex Nagel was named Steenbock Professor (p.11). Finally, Paul Rabinowitz (p.9) was named Vilas Professor, the university's highest academic recognition, and most recently received the Hilldale Award for the Physical Sciences. This remarkable string of accolades is fitting testimony to the continuing excellence of our program.

Despite our many successes, the department faces a number of serious challenges over the next few years, brought about by recent budget cuts at the state, university, and college levels. Now more than ever we are dependent on generous donations from alumni and friends, so I encourage all our readers to contribute generously to our annual fund drive by using the form on the inside back of this newsletter.

Having completed a three-year term, I am about to step down as chair and pass the mantle to my friend and colleague Leslie Smith. Before leaving, let me renew our standing invitation for you to stop by Van Vleck Hall whenever you're in Madison, or to join us in January 2006 at the next Wisconsin Reunion of Alumni and Friends during the Joint Mathematics Meetings in San Antonio.

Best wishes,
David Griffeath, Chair
Department of Mathematics

New Faculty

The Department had a great recruiting outcome last year with four new Assistant Professors hired. Only one of them joined us this year; the other three will join us in the fall of 2005 after they finish their current positions.

Itay Ben-Yaacov received the PhD in Mathematical Logic in 2002 from the University of Paris 7. His thesis, prepared under the supervision of Daniel Lascar has the title *Théories simples: constructions de groupes et interprétabilité généralisée.* His PhD was given the grade "très honorable avec les félicitations du jury," the highest possible grade in France. In 2003 he was awarded the Prix Nathalie Demassieux of the Chancellerie des universités de Paris for the best doctoral thesis defended in Sciences in the Parisian region. Itay taught at the University of Lyon 1 in 2002-03, and was C.L.E. Moore Instructor at the Massachusetts Institute of Technology in 2003-04. Itay has been with us since the fall of 2004.

Dr. Ben-Yaacov's research area is pure or abstract model theory—the study of classes of structures where meta-logical notions, such as independence, exist and can be treated in a manner that need not depend on the language and/or theory with which we describe such a class. In his research, he has studied the relations between abstract independence relations and more concrete algebraic or geometric structures beneath them. He is also interested in expanding the field of applicability of model theoretic tools and, in particular, the theory of independence to certain classes of structures that cannot be described in a satisfactory manner by first-order logic. Itay has given many invited talks since receiving the PhD and has written quite a number of papers.

Andrei Căldăraru was awarded the PhD by Cornell University in 2000 with a thesis *Derived categories of twisted sheaves on Calabi-Yau manifolds* supervised by Mark Gross. In 2002 he also received a Master of Science degree in Computer Science from Cornell. Dr. Căldăraru was a Visiting Assistant Professor at the University of Massachusetts in 2000-02. With a three-year NSF Postdoctoral Fellowship, Andrei spent 2002-05 at the University of Pennsylvania where he also had the title of University Lecturer. He joins us in the fall of 2005. In his earlier student days, Andrei won a Silver Medal representing Romania in the second International Computer Science Olympiad held in Minsk, USSR. In 1993 he received the Intel Prize, awarded to outstanding students at the Hebrew University.

Andrei's research area is algebraic geometry. He is interested in questions in algebraic geometry that are related to non-commutative algebra, algebraic topology, and physics. The focus of his research is the interplay between commutative and non-commutative structures, connected by equivalences of derived categories. Andrei describes the central theme of his research is the principle that to study non-commutative geometry, one should proceed in three steps: (1) define invariants of spaces that are invariant under derived equivalence; (2) find examples of a non-commutative

space and a commutative one that are naturally derived equivalent: and (3) extract information about either the commutative or non-commutative space from know invariants of the other one, using equivalence from (2). Two recent conferences where Andrei gave invited lectures were the Workshop on Algebraic Structures and Modular Spaces in Montréal, Canada and the European Algebraic Geometry Conference in Aussois, France.

Serguei Denissov received the PhD from Moscow State University in 1999 where his advisor was V. Il'in. The title of his thesis is *One-dimensional Schrödinger operator with singular potential*. From 1999-2001 he was Research Fellow at Moscow State and then he spent one year as Bateman Research Instructor at the California Institute of Technology. From 2002 until the end of this academic year, Serguei is Olga Taussky-John Todd Instructor at the same institution. He also will join us in the fall of 2005.

Dr. Denissov already has a very substantial publication record. His areas of research are mathematical physics (primarily the spectral analysis of multidimensional Schrödinger and Dirac operators) and analysis (different orthogonal systems and their applications). In solving several open problems, Serguei has developed analytic tools that are likely to be useful in random matrix theory and completely integrable systems. He has taught courses from first-year to graduate courses at CalTech. Concerning his teaching, Serguei says that good teaching comes from adapting one's techniques to the students' needs and from inviting students to participate in their own learning process.

In May, 2004, Dr. Denissov was awarded the fourth Vasil Popov Prize at the International Conference in Approximation Theory held in Gatlinburg, Tennessee. This prize is awarded every third year to a young mathematician (within six years of receipt of the PhD) who has made outstanding research contributions to approximation theory and related areas.

Jordan Ellenberg received the PhD from Harvard University in 1998. His thesis, supervised by Barry Mazur, is titled *Hilbert modular forms and the Galois representations associated to Hilbert-Blumenthal abelian varieties*. Jordan was an Instructor at Princeton University from 1998-2001, spending the fall of 1999 at MSRI as a Postdoctoral Fellow. In 2001 he was given the position of Assistant Professor at Princeton University, where he currently is until he joins us in the fall.

Dr. Ellenberg's research area is arithmetic algebraic geometry and he has already published extensively in the area. His work has centered on the interface between rational points on varieties, Galois representations, modular forms, and arithmetic fundamental groups. Jordan received an NSA Young Investigator Award in 2001, and just recently was notified that he has been awarded a prestigious NSF CAREER Award and a prestigious Sloan Fellowship for 2005-07. Jordan has taught extensively at Princeton University where he received high accolades from students at all levels. At Princeton he developed a first-year undergraduate course in classical number theory called *Num-*

bers, Equations, and Proofs. In that course, students are introduced to the techniques of rigorous mathematics through the study of elementary number theory. Topics include: Euclidean algorithm, unique factorization, sums of squares, primitive roots, quadratic reciprocity, the RSA public key crypto-system, continued fractions, and rational points on curves. Jordan also wrote an expository article "The idea of a moduli space" for high school students that appeared in *Math Horizons* in 1998. In addition to all this, Jordan is an accomplished author. For example, he was a finalist in 2004 for the New York Public Library's "Young Lions" award for his novel "Grasshopper King." In his earlier student days, Jordan won Gold Medals in the 1987 and 1989 International Mathematical Olympiad and a Silver Medal in 1988. He was also a named a Putnam Fellow (top six) as an undergraduate at Harvard in 1990 and 1992. He was top ten also in 1989 and 1991.

Promotion to Professor

Eleny-Nicoleta Ionel Promoted to Professor

Eleny Ionel has been promoted to (Full) Professor. Dr. Ionel received the PhD from Michigan State University in 1996 and was a C.L.E. Moore Instructor at MIT from 1996 to 1999 until arriving in Madison in 1999 as an Assistant Professor. She became an Associate Professor in 2002. Eleny held an Alfred P. Sloan Research Fellowship in 2002-04. At the annual AMS meeting in Atlanta this past January, she gave an invited address on "Embedded curves and Gromov-Witten invariants." This year she is on leave at Stanford University.

Dr. Ionel's research is focussed on understanding the structure of the Gromov-Witten invariants of symplectic manifolds. Her groundbreaking work has appeared in many prestigious journals such as *Annals of Mathematics* and *Inventiones Mathematicae.*

Please visit our website for current events, this newsletter and other information on our programs.

http://www.math.wisc.edu

Promotion to Associate Professor

Lev Borisov Promoted to Associate Professor

Lev Borisov, who joined our department as an assistant professor in 2001, has been promoted to Associate Professor with tenure. Lev received the PhD in 1996 from the University of Michigan and then served for one year as a Postdoctoral Fellow at the Mathematical Research Institute (MSRI) in Berkeley. He was a Ritt Assistant Professor at Columbia University from 1997 to 2002, the last year of which he was on leave from UW-Madison.

Lev is well known for his problem solving ability, having won a Gold Medal in 1987 at the International Math Olympiad. He now coaches our teams for the Putnam Mathematical Competition and, in addition, is now co-organizer (with Marty Isaacs and Don Passman) of our Math Talent Search Competition.

Dr. Borisov's main research focus is algebraic geometry. His work has been centered in the area of mirror symmetry, a mathematical topic inspired by string theory. The goal of string theory is to produce a unified framework for treating both the theory of gravity and the Standard Model theory of fundamental particles. While this goal has not yet been realized, it has led to a number of interesting mathematical questions. Some of Lev's work has appeared in the prestigious journals *Annals of Mathematics* and *Inventiones Mathematicae.*

Alexander Ionescu is Awarded a Packard Fellowship

The David and Lucile Packard Foundation has named 16 new promising scientific researchers as the 2004 recipients of Packard Fellowships for Science and Engineering. Each Fellow receives an unrestricted research grant of $625,000 over five years. Among those awarded a fellowship was **Alexander Ionescu**. There was only one other award in mathematics. Nominations for Packard Fellowships come from university presidents and chancellors. There were 100 nominations this past year.

According to the website: The Fellowship Program was established in 1988 and arose out of David Packard's commitment to strengthening university-based science and engineering programs. By supporting unusually creative researchers early in their careers, the Foundation hopes to develop scientific leaders, further the work of promising young scientists and engineers, and support efforts to attract talented graduate students into university research in the United States.

Alex joined our department in 2001 as an Assistant Professor. He received the PhD from Princeton University in 1999 where his advisor was Elias Stein. His research focuses on harmonic analysis whose results and techniques find important applications in physics, chemistry, and modern biology. Dr. Ionescu was an Alfred P. Sloan Research Fellow in 2003-05. In 1991 he won a Gold Medal at the International Mathematical Olympiad.

Van Vleck Visiting Assistant Professors

Three new PhDs were appointed this past year to three-year postdoctoral appointments as Van Vleck Visiting Assistant Professors. They are Kathrin Bringmann, Sanghyuk Lee, and Jason Swanson.

Kathrin Bringmann received the PhD from the University of Heidelberg in Germany in 2004. Her thesis concerned the estimation of Fourier coefficients of Siegel modular forms and was written under the supervision of Winfried Kohnen. Kathrin's principle area of research is number theory, specifically, she is interested in Jacobi forms and Siegel modular forms and lifting maps between these vector spaces. Kathrin's early education took place in Münster and Würzburg, Germany.

Sanghyuk Lee received the PhD from Pohang University of Science and Technology (POSTECH) in 2001. His thesis $L^p - L^q$ *estimates for some averaging operators* was supervised by Jong-Guk Bak. Before coming to Madison, Sanghyuk was a Postdoctoral fellow at POSTECH. In 1994, he won a Silver Medal in the Korea University Mathematics Problem Solving Contest. At Madison, he is continuing his research in harmonic analysis.

Jason Swanson is also a VIGRE Fellow. He received the PhD in 2004 from the University of Washington with a thesis on probability theory and stochastic process, inspired by a question in mathematical finance—how to hedge an option given by the median of n independent stocks whose price follows geometric motion as $n \to \infty$. Jason's work at Washington was jointly supervised by Krzysztof Burdzy and Zhen-Qing Chen.

Continuing as Van Vleck Visiting Assistant Professors are: **Marton Balazs**, **John Vano**, **Jesenko Vukadinovic**, **Li Jing Wang**, and **Andrej Zlatos**.

Visiting Faculty

Again we have a number of faculty from around the world who have come to Madison for an extended period in order to collaborate in research with our faculty. Along with their period of stay in Madison and sponsoring faculty member, they are:

Mohammad H. Ahmadi	1/31/05-8/31/05	Prof. Assadi (UW Whitewater)
Harvey J. Blau	8/23/04 - 1/6/05	Prof. Isaacs (Dekalb, Illinois)
Bohui Chen	1/10/05 - 5/31/05	Prof. Ruan (China)
Han-Hyuk Cho	1/1/05 - 6/30/05	Prof. Brualdi (Rep of Korea)
Alessandro Cincotti	5/24/04 - 12/31/04	Prof. Propp (Italy)
Joan Hart	7/1/04 - 8/31/.04	Prof. Kunen (UW Oshkosh)
Christine Heitsch	1/1/05 - 12/31/05	Prof. Griffeath (UW Madison)
Morris W. Hirsch	9/15/03 - 9/14/05	Prof. Robbin (Chicago, Ill.)
Yaozhong Hu	12/1/04 - 4/30/05	Prof. Kurtz (China)
Thomas M. Keller	10/1/04 - 10/31/04	Prof. Isaacs (Texas State U.)
Yingming Liu	1/15/05 - 2/15/05	Prof. Ruan (China)
Roummel Marcia	1/1/05 - 12/31/05	Prof. Mitchell (UW Madison)
Alexander Moreto	9/13/04 - 10/26/04	Prof. Isaacs (Spain)
Jianzhong Pan	11/1/04 - 11/30/04	Prof. Ruan (China)
Shanzhong Sun	1/1/05 - 12/31/05	Prof. Ruan (China)
Krishnanand Verma	4/2/04 - 4/30/05	Prof. Griffeath (UW Whitewater)
Wen Xin	9/1/04 - 12/15/04	Prof. Jin (China)
Ilia Zharkov	9/15/04 - 1/15/05	Prof. Griffeath (Madison, WI)

Fengshan Bai from Tsinghua University in Beijing China is a Visiting Professor for the spring semester of 2005. He received his PhD from the same university in 1989. His research area is numerical and scientific computation. Professor Bai is teaching a graduate course on Methods of Computational Mathematics II with an emphasis on numerical algebra, finite element methods for elliptic PDE, and Monte Carlo methods and molecular dyanmics.

Sabbaticals and Leaves

2005-06 Academic Year

Five faculty members have been awarded sabbaticals for the 2005-06 academic year.

Mikhail Feldman will be on sabbatical leave in the fall of 2005. One of the goals of his sabbatical will be to visit and work on existing research projects with mathematicians at several universities who are part of an NSF Focused Research Group Grant of which he is co-principal investigator. He also will participate in a program on PDE at MSRI in Berkeley.

David Griffeath will be on sabbatical leave in the spring of 2006. After three years as Chair of the Mathematics Department, this sabbatical will give him an opportunity to renew research projects on computer visualization and probabilistic cellular automata. One project in the works is an introductory graduate level text on threshold growth dynamics.

Donald Passman will take his sabbatical leave in the fall of 2005. In addition to continuing research collaborations with several co-authors in England, he plans to continue working on his teaching manuscript "A Projects-Oriented Approach to Abstract Algebra."

Arun Ram will be on sabbatical leave during the full 2005-06 academic year. He will be mostly in Rome collaborating in research on representation theory with other experts there. He also plans to complete a book on combinatorial representation theory that he is coauthoring.

Jean-Pierre Rosay will also be on sabbatical leave during the full 2005-06 academic year.

Honors and Awards

Paul Rabinowitz Named Vilas Professor

Paul Rabinowitz has been awarded a Vilas Professorship, the highest recognition UW-Madison can bestow on a faculty member. Paul has played a fundamental role in the development of Nonlinear Analysis and is one of the main architects of the theory of topological methods in the calculus of variations. His work has provided fundamental tools in science and engineering, with applications to astronomy, statistical mechanics, fluid dynamics, and phase transitions. Paul's celebrated "mountain pass theorem" (jointly with A. Ambrosetti) has become a central part of any graduate course on nonlinear partial differential equations. Indeed, in 2004 the book "The Mountain Pass Theorem: Variants, Generalizations and Some Applications" by Y. Jabri was published by Cambridge University Press.

Paul has been a member of our Department since 1969, and has been Edward Burr Van Vleck Professor of Mathematics since 1986. In 1998, he was awarded the Birkhoff Prize in Applied Mathematics of the American Mathematical Society and the Society of Industrial and Applied Mathematics. That same year he was elected to the National Academy of Sciences. Professor Rabinowitz holds an Honorary Doctorate from the Université de Paris VI in 1992.

Arun Ram receives Vilas Associates Award

Arun Ram has been named a Vilas Associate for the years 2004-06 by the UW-Madison Graduate School. This prestigious award provides summer research support for two years and a flexible research fund for scholarly activities.

Arun received the PhD from the University of California - San Diego in 1991. After one year as a Postdoctoral Fellow at MIT, he was a Van Vleck Visiting Assistant Professor in Madison from 1992 to 1995. He spent four years as an Assistant Professor at Princeton University before returning to Madison in 1998. Arun was promoted to Professor in 2003.

Professor Ram's research areas are representation theory and algebraic combinatorics, and he is considered one of the leading world's experts. He is one of four editors-in-chief of the *Journal of Algebraic Combinatorics* and one of five Advisory Editors of the *Journal of Combinatorial Theory, Series A*. In addition to working with graduate student's, Arun has been very active supervising undergraduate research projects. Some of the titles of research projects he has supervised are: *Harmonics for complex reflection groups*, *Algebraic varieties and algebraic groups*, and *Combinatorics of Kostka-Foules polynomials*.

Richard Brualdi Awarded Bascom Professorship

Richard Brualdi has been named UWF Chair Beckwith Bascom Professor by UW-Madison. This is a five-year professorship, with the possibility of renewal. The Bascom professorships were created with funds from the UW Foundation to recognize former chairs of the board of the University of Wisconsin Foundation. They were established to recognize faculty for their balanced contributions to the University's teaching, research, and service.

Richard's research area is combinatorics, graph theory, matrix theory, and related topics. He has been on the UW-Madison faculty since 1965. In 2000 he was awarded an Euler Medal for lifetime contributions by the Institute of Combinatorics and its Applications. In 1986 he received a Distinguished Teaching Award from the University. His textbook *Introductory Combinatorics*, first published 28 years ago, is now in its fourth edition. From 1993 to 1999, Richard was Chair of the Department of Mathematics. He was on the College of Letters and Science (L&S) Curriculum Committee for five years, three of which were as Chair. Currently he serves on the L& S Academic Planning Council, the Faculty Commission on Compensation and Economic Benefits, the General Education Committee, and the Freshman Interest Group Committee. He serves as an editor-in-chief of the journals *Linear Algebra and its Applications* and the *Electronic Journal of Combinatorics*.

Alexander Nagel Awarded the Steenbock Professorship of Mathematical Sciences

Alex Nagel, Lipman Bers Professor of Mathematics, has been selected by the UW-Madison Graduate School to be the Steenbock Professor of Mathematical Sciences. This professorship "is intended to be among the most prestigious and important professorships for the support of research on campus." Previous holder of this Steenbock professorship was Carl de Boor.

Alex has made fundamental and pioneering contributions to two important fields, namely Harmonic Analysis and Several Complex variables. His work has been described as striking and of central importance, as opening up new basic directions of research, and as transforming and enriching active fields of analysis. Some of the areas where Alex's achievements have been recognized are singular Radon transforms; an associated geometry (resulting from the "Carnot metric") for certain problems in harmonic analysis, singular integrals, and several complex variables; and singular integrals and their application to harmonic analysis. So far, fourteen students have received PhDs under Alex's supervision.

Alex has been on our faculty since 1970, and served as Department Chair from 1991 to 1993, and as Associate Dean for Natural Sciences in the College of Letters and Sciences from 1993 to 1998. He was a member of the Council of the American Mathematical Society from 2001 to 2004. In 1982 he was given a Distinguished Teaching Award. In 2004 Alex was selected by the Wisconsin Section of the MAA to receive the Wisconsin Section Distinguished Teaching Award. The award was presented to him at the 2004 Spring Section Meeting held at UW-Platteville (see the photo).

Nigel Boston Part of a Team Building a New Face Recognition System

Nigel Boston, who has joint appointments in Mathematics and Electrical and Computer Engineering (ECE) is part of a team (other members are Professors Yu Hen Hu of ECE and Chuck Dyer of Computer Science, Biostatistics and Medical Informatics) that has been awarded a grant of $500,000 by the National Science Foundation to build a face recognition system (FRS) and to investigate a common foundation between face recognition and cryptanalysis. The team is developing a new robust theory of integral invariants. Invariants are features of the face that do not change when the face moves. Whereas overt biometric authentication is accomplished by iris recognition, covert authentication is much less successful. Psychophysicists have demonstrated that people use invariant-based recognition, such as curvatures of the face, to recognize other people. A mathematical theory of such differential invariants can be used in FRS but in practice are too sensitive to noise. The team's new theory of integral invariants permits almost 100-percent recognition of fish in two dimensions, even with appreciable noise. The mathematics for three dimensions is complete and soon will be tested on face databases. Analogies with cryptanalysis are being pursued with the entropy of the human face estimated with the help of a professional cartoonist.

Special Lectures

9th Wolfgang Wasow Memorial Lecture

Michael Christ of the University of California - Berkeley gave the 9th Wolfgang Wasow Memorial Lecture in September, 2004. The title of his lecture was *The d-bar Neumann problem, magnetic Schrödinger operators, and the Aharonov-Bohm phenomenon.*
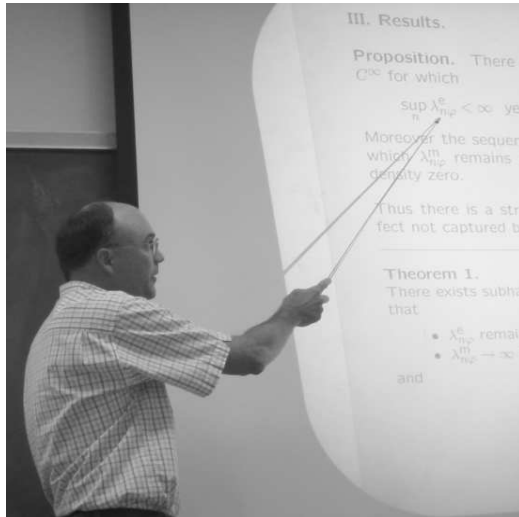
Michael Christ received the PhD in 1982 from the University of Chicago where his thesis advisor was Alberto Calderon. He spent the years 1982-86 at Princeton University and 1986-97 at UCLA. Currently he is Professor of Mathematics at UC-Berkeley. In 1997 Professor Christ was a recipient of the Bergman Prize for his "major contributions to a number of fields, mainly harmonic analysis, partial differential equations, and several complex variables."

The abstract of Professor Christ's wide-ranging lecture, discussing joint work with Siqi Fu, is:

The d-bar Neumann problem is a boundary value problem for Laplace's equation on domains in several complex dimensions. The boundary condition, and thereby the regularity of solutions, depend on the complex geometry of the boundary, in a manner which has been extensively studied but is still only partially understood.

One fundamental problem is to characterize compactness of the solution operator in complex geometric terms, that is, to decide when solutions are necessarily slightly smoother than data, as solutions of a differential equation ought to be. We discuss this problem for the special class of domains possessing a one-dimensional symmetry group.

There is a well-known but not entirely sufficient condition, known as (P). For domains with one-dimensional symmetry, both (P) and compactness are equivalent to certain properties of quantum particles in electric and magnetic fields, asymptotically as Planck's constant tends to zero, related to diamagnetism and paramagnetism.

We describe a class of nonsmooth domains for which compactness arises through an effect not captured by condition (P). This is based on an extreme form of the Aharonov-Bohm effect, in which a quantum particle experiences a magnetic field even though it is confined to a region in which the field vanishes identically.

However, our main result paradoxically asserts that for smooth domains, (P) is equivalent to compactness. This equivalence comes about in a surprising way, via an exceptional sequence of Fourier modes which must exist but can be quite sparse.

Announcing

2005 Wasow Memorial Lecture

Stan Osher

UCLA

October 21, 2005

9th LAA Lecture

In April of 2004, the 9th annual LAA Lecture was given by **Craig Tracy** of the University of California at Davis on *Distribution functions for largest eigenvalues and their applications.*

Craig Tracy is Distinguished Professor of Mathematics at the University of California at Davis. His field of research is Mathematical Physics. With H. Widom, he was the 2002 winner of the George Pólya Prize of the Society for Industrial and Applied Mathematics (SIAM) for a series of three papers published in *Commun. Math. Physics* in the 1990's. To quote from SIAM News, the award was given "for their remarkable work on random matrix theory, a subject with multiple connections to complex analysis, orthogonal polynomials, probability theory, and integral systems." Professor Tracy was an invited speaker at the ICM held in Beijing in 2002.

In his lecture, Professor Tracy said that it is now believed that the limiting distribution function of the largest eigenvalue in each of the three classic random matrix models GOE, GUE and GSE describe new universal limit laws for a wide variety of processes arising in probability and mathematical physics. An overview of these developments was given.

Announcing

2005 LAA Lecture
David Donoho
Department of Statistics, Stanford University
March 14, 2005

Barry Mazur Gives Hilldale Lecture
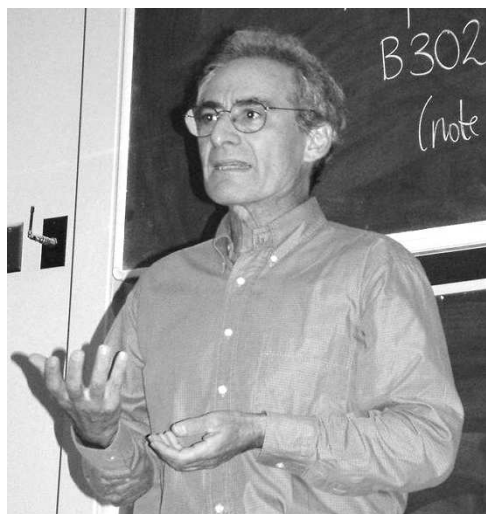
Barry Mazur, Gerhard Gade University Professor at Harvard University, gave the Hilldale Lecture in the Physical Sciences on September 22, 2004. The title of his lecture was "Bernoulli Numbers and the Unity of Mathematics." The Bernoulli numbers, as later they were referred to, were first introduced by Jacob Bernoulli in his treatise *Ars Conjectandi* published posthumously in 1713. In his lecture, Professor Mazur showed how Bernoulli numbers are connected with much of the rest of mathematics, pure and applied, and how they unify branches of mathematics as disparate as differential topology and modular forms. He also explained briefly *why* it is that they play that role. A reception in Van Vleck Hall followed the lecture. Professor Mazur also talked in the number theory seminar on "Organizing the arithmetic of elliptic curves."

Barry Mazur received the PhD from Princeton University in 1959 at the age of 21 after having proved the Schoenflies Conjecture in geometric topology. He has won the Veblen Prize in geometry, the Cole Prize in number theory, the Chauvenet Prize for exposition, and the Steele Prize for seminal contributions to research. In 1982 he was elected to the National Academy of Sciences. In his recent book *Imagining Numbers (particularly the square root of minus fifteen)* he compares mathematics with poetry.

Distinguished Lecturers

There were two distinguished lecturers in the spring of 2004.

Stefan Hildebrandt of the University of Bonn. He visited the Department of Mathematics in April of 2004. Professor Hildebrandt's major interests are in problems that border on geometry and PDE. Due to German retirement laws, he is now professor emeritus, although he remains very research active. He has been a visitor at universities all over the world, most recently in Stockholm, Pisa, and Santa Cruz. In 1994, he was the second mathematician to be awarded the Karl-Georg Christian von Staudt Prize for outstanding achievement. In 1996 he was the Landau Lecturer at the Hebrew University in Jerusalem. Dr. Hildebrandt holds honorary degrees from Leipzig University and Dusseldorf University. He is the author of several books, including two for general audiences.

The title of his distinguished lecture was *The Plateau problem for parametric variational integrals, and Lichtenstein's theorem*. In his lecture Professor Hildebrandt discussed the existence of mappings $X : B \to R^n$, bounded by a prescribed rectifiable and closed Jordan curve in R^n, which minimize a parametric variational integral $F(X) = \int_B F(X, X_u \wedge X_v) du dv$, where the Lagrangian $F(x,z)$ is convex in z (i.e. $f(x,p) = F(x, p_1 \wedge p_2)$ is polyconvex in p) and satisfies $F(x, tz) = t F(x,z)$ for $t > 0$ and $m_1|z| \leq F(x,z) \leq m_2|z|$ with constants $m_2 \geq m_1 > 0$. A byproduct of this analysis was a new proof of the global version of Lichtenstein's theorem that one can introduce conformal parameters on a smooth surface.

Rajesh Gopakumar of the Harish-Chandra Research Institute, Allahabad gave the String Theory Distinguished Lectures in May of 2004 on *Gauge Theory and Geometry: Lessons from Duality*. In these lectures Dr. Gopakumar conveyed how physicists are uncovering some remarkable theoretical connections between gauge field theories and gravitation (as encoded in the geometry of spacetime). In the first lecture he introduced the idea that strings naturally arise as excitations of gauge field theories. These strings then give rise to a geometric or gravitational description of the gauge theories. In the next two lectures, he went deeper into this phenomenon focusing on a particular example where it is possible to understand this connection between gauge theory and geometry fairly explicitly. This example relates a simple gauge theory, the Chern-Simons theory, with a topological string theory. Physically, this duality helps the understanding of the open-closed string duality that underlies the general gauge theory/geometry correspondence.

[The String Theory Distinguished Visiting Lectureship program is aimed at presenting the work of scholars, who have made contributions with lasting impact, to lecture on that subject at a pedagogical level so that they may be appreciated by wide spectrum of scholars and students at UW-Madison. Unlike the weekly seminars which aim to concisely communicate the recent developments, these lectures are arranged in a series format to provide sufficient time to cover the subject at greater depth and completeness.]

Julie Mitchell leads new BACTER Institute
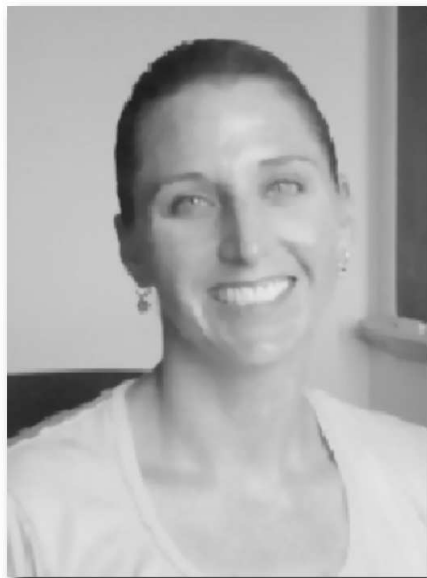
The BACTER Institute, funded by a 3-year, $3.67 million grant from the Department of Energy's Office of Science has been created at UW-Madison as part of the Genomics:GTL program. Lead by Professor **Julie Mitchell** of the Departments of Mathematics and Biochemistry, BACTER: Bringing Advanced Computational Resources to Environmental Research will bring a new paradigm of computational biology research and education to bear on the DOE goals of bioremediation and energy production.

The Offices of Advanced Scientific Computing Research (ASCR) and of Biological and Environmental Research (BER) in the Office of Science (SC), U.S. Department of Energy (DOE), are leveraging the success of the Human Genome Project and related sequencing efforts into an integrated, systemic approach to understanding the complexity of life. The goals of the DOE's Genomics:GTL (formerly Genomes to Life) initiative are identifying and characterizing the entire pathway from sequenced genomes through molecular machines to whole-cell communities. Recent advances in genomics and proteomics highlight the potential of using microbial organisms to solve some of our most intractable environmental problems. The research of the DOE-funded BACTER Institute will focus on two model microbial organisms, Rhodobacter sphaeroides and Shewanella oneidensis. Understanding the remarkable ability of these microbes to thrive under extreme environmental conditions will lead directly to new avenues for addressing the DOE missions of clean energy production and bioremediation.

Starting with the fully sequenced genomes of the two model organisms, the goal of research in the BACTER Institute is to find the genes, transcribe the proteins, predict the folds, perform pairwise docking of the model structures, deduce pathways, and ultimately construct whole cell models. BACTER will engage students in project oriented computational biology research through three interdependent research tracks: Genomics and Biological Pathway Analysis; Protein Dynamics, Folding, and Docking; and Macrobiological Modeling. The BACTER Institute will train students to uncover biological mechanisms and pathways within these microbial organisms through the use of computational biology and synergistic collaborations with experimental groups. Beginning with existing software tools, the BACTER research team will actively explore the relationship between genome sequence, protein structure, and macromolecular function. In future years, BACTER researchers will develop their own computational tools for the analysis of microbial genomes, molecular interactions, and signaling pathways.

To achieve these ambitious goals, the BACTER Institute is building an interdisciplinary team of faculty, postdocs, and graduate students. UW Madison is one of America's premier universities with one of the largest biological research communities in the world. BACTER-affiliated faculty hold appointments in departments which rank among the top few in the country, including Biochemistry, Chemistry, Computer Sciences, Microbiology, and Mathematics.

The BACTER Institute is one of three new DOE institutes for the advancement of computational biology research and education; the others are at Johns Hopkins University in Baltimore and the University of California at Merced. The goal of all three institutes is to translate computational power into improved biological understanding to further the goals of the DOE Genomics: GTL program. [Taken from a DOE release.]

New Staff

Concetta Gómez has been appointed as the Coordinator of the Wisconsin Emerging Scholars (WES) Program. Concha received the PhD from the University of California at Berkeley in 2000 with a thesis *Definability in p-adic Power Series rings* under the supervision of Leo Harrington. Dr. Gómez was an Assistant Professor of Mathematics at Middlebury College in Vermont until coming to Madison in the fall of 2004. In 2001-02, she was an MAA Project NExT (New Experiences in Teaching) Fellow.

Concha taught in the original Emerging Scholar's Program (ESP) designed by Uri Treisman at Berkeley. There mathematics graduate students with superlative teaching records worked intensively with ethnically mixed groups of first-year calculus students. The goals were to help participating students to excel in calculus and to encourage them to pursue careers that required advanced degrees in mathematics or mathematics-dependent fields of study. Our own WES Program is modeled on the ESP Program developed by Treisman. Dr. Gómez also worked for three years with the Berkeley Summer Mathematics Institute, an outgrowth of ESP. This purpose of this institute was to develop doctoral students from among promising minority undergraduates. She also worked as a consultant in a national initiative to increase the capacity of American high schools to offer advanced mathematics and statistics courses to a broad range of their students. At Middlebury, Concha worked with the Office of Institutional Diversity on identifying and mentoring underrepresented minority students in Middlebury's Science Division. The future of our WES program is in good and experienced hands.

Oumar Kaba has joined the Mathematics Tutorial Program (MTP) as an Assistant Faculty Associate. Mr. Kaba has a Master of Arts degree in Mathematics from UW-Madison. He had previously worked in the MTP as a tutor. Oumar has also provided calculus instruction to students in the College of Engineering Summer Program and has taught algebra, statistics, and finite mathematics at Edgewood College. In his new position, Oumar will continue to do tutoring and work on expanding teaching strategies.

Conference News

International Conference Honoring Marshall Slemrod

Marshall and Sonia Slemrod

An *International Conference on Mechanics and PDEs* was held in Madison from April 30 to May 2 of 2004 in honor of **Marshall Slemrod** in celebration of his 60th birthday. The goal of the conference was to bring in top applied mathematicians and promising young researchers in the area of mechanics and nonlinear PDEs to discuss the most recent advances in this area, and to foster interactions between senior researchers and young participants. Former students and colleagues of Marshall were especially invited to join in on this happy occasion, and many did.

The organizers of the conference were Shi Jin and Athanasios E. Tzavaras. There were 19 invited speakers from Israel, England, Korea, France and, of course, the USA. Sponsors of the conference were the Institute for Mathematics and its Applications in Minnesota, the Office of Naval Research, the Office of Naval Research International Field Office, and the UW-Madison Mathematics Department. A conference banquet featured several people such as Jim Infante and Costas Dafermos who recalled their long friendships with Marshall and his wife Sonia.

Noteworthy Article

Fabian Waleffe is coauthor of the article "Experimental Observation of Nonlinear Traveling Waves in Turbulent Pipe Flow" in the September 10, 2004 issue of *SCIENCE* that has received a lot of attention.

Since the seminal studies of pipe flow by Osborne Reynolds in 1883, the onset of turbulence in the flow of simple fluids such as water is a fundamental problem that has remained a mystery in spite of 120 years of active research. Last year, two groups, one German and one British, independently discovered traveling wave solutions of the Navier-Stokes equations for pipe flow. Both groups followed the physics-based computational method that Fabian developed and used to discover similar nonlinear waves in plane Couette and plane Poiseuille flows, the other two canonical shear flows. Then, late last year an experimental group in the Netherlands set out to look for those three-dimensional nonlinear traveling waves in pipe flow and to their amazement, they found that the turbulent "puffs" observed since Reynolds' time are closely related to the traveling waves, as reported in the Science article. These observations confirm that the unstable traveling waves are key stepping stones toward further understanding of turbulence. Waleffe's research was also mentioned in another article in the February 2004 issue of *PHYSICS TODAY* in relation with experiments by a UK group that observed a scaling inversely proportional to the Reynolds number for the amplitude of the smallest perturbation that can trigger turbulence. Waleffe had predicted that scaling and he and graduate student Joy Wang have recently shown that the traveling waves obey that scaling exactly. The *SCIENCE* article was accompanied by news stories in: PhysicsWeb (Sept 2004), Scientific American (Nov 2004) and Physics World (Dec 2004), together with a "perspective" article in the same sept 10 issue of Science magazine.

Annual Wisconsin Reunion and Reception

The annual Wisconsin Reunion was held at the joint AMS Meeting in Atlanta, January 7, 2005. A large group of former Wisconsin PhDs (now numbering more than 1000) gathered to renew friendships and catch up on goings-on. As usual refreshments and drinks were enjoyed by all. Some photos from the reunion, thanks to Berit Nilsen, are included here.

Nancy Neudauer and Richard Brualdi

T. S. Michael, Georgia Benkart & Michael Tangredi

Joni Baker and Andy Raich

Josh Rushton and Jorge Garcia

Mark MacLean and Gwen Fisher

Math Department Receives
Second VIGRE GRANT from NSF

In late Spring 2004, the National Science Foundation awarded our department a 2.5 million dollar VIGRE grant. This grant provides funding for many activities involving the integration of research and education. UW-Madison was one of just three departments awarded a VIGRE site grant during the current funding cycle. In fact, ours was the only proposal from a single mathematics department that was funded.

The benefits of this grant are numerous, but here is a brief list of some of our planned VIGRE-funded activities:

- Academic year Collaborative Undergraduate Research Labs, or "CURLs"

- Summer REU programs for the next five years

- Fellowships for promising graduate students

- Summer enhancement programs for training beginning US graduate students

- VIGRE Van Vleck Assistant Professorships, combining our regular post-doc positions with VIGRE support, with substantial mentoring

- Internships at Motorola, Microsoft, Epic Systems, NCAR and Woods Hole

- An expanded Wisconsin Talent Search, building on past success, to attract talented high school students into mathematics and science

- Development of interdisciplinary courses involving mathematics and disciplines such as biology, physics, engineering and earth sciences

- A variety of integrated activities, including an expanded Brown Bag Seminar, Math Club, Graduate Participation Seminars, Major Trends in Mathematics lecture series, etc.

The VIGRE Management Team that spearheaded the proposal consisted of **Alejandro Adem** (PI), **Paul Milewski**, and **Ken Ono**. Milewski will replace Adem as PI in Spring 2005. The VIGRE Steering Committee that shaped the proposal through many drafts, and arranged the details of the pre-award full-day site visit by NSF, consisted of **Gloria Mari Beffa**, **David Griffeath**, **Sigurd Angenent**, **Nigel Boston**, **Alex Kiselev**, **Steffen Lempp**, **James Propp**, **Timo Seppalainen**, and **Leslie Smith**.

For more information about the department's VIGRE activities, see:

http://www.math.wisc.edu/VIGRE/ .

Collaborative Undergraduate Research Lab (CURL)
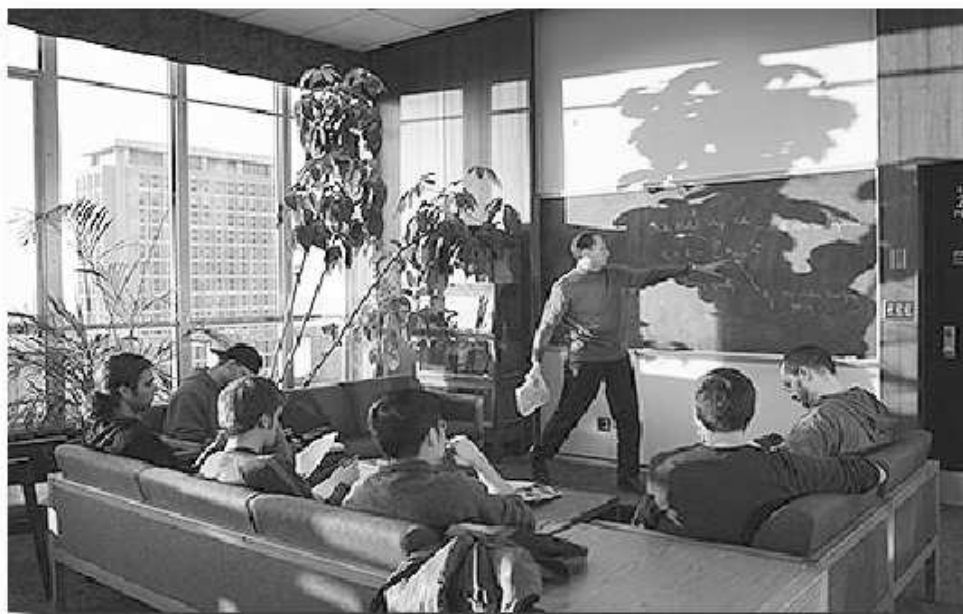
A CURL is an undergraduate research lab which is usually linked to a concurrent special topics class. The course is taken for credit, and those who work in the lab are paid for their efforts. The lab is a gathering of undergraduate students, graduate students, and faculty engaged in exploring mathematical phenomena of all kinds. Whatever the topic of a particular CURL, the focus is on genuine research questions that are of interest and accessible to undergraduates. This year's topic has been mathematical biology, and it has been led by **Alexander Kiselev**, **Paul Milewski**, **Julie Mitchell**, and **Jim Propp**, with the assistance of postdoc **John Vano**. Nine undergraduates are participating in this CURL.

The focus of the course and CURL next year will be on problems in number theory and algebraic geometry amenable to investigation by undergraduates. The plan is to concentrate on questions of counting: for instance, given an equation, how many integer solutions? How many number fields are there with certain properties? These counting problems lend themselves to both theoretical investigation and computer experimentation; methods to develop new conjectures and accumulate evidence concerning existing conjectures will be used, and perhaps some theorems will be proved.

Testing the Limits of Math

That was the headline in the Daily Cardinal on February 9, 2005 in which it described the second annual UW-Madison Integration Bee that took place on the preceding day. There were 14 competitors hoping to be proclaimed the 2005 *Grand Integrator of Madison*. Just like a sporting event, there were fans and signs. The participants competed in a double-elimination style competition by computing integrals until only two remained. One was math graduate student **Stephen Griffith**; the other was engineering graduate student **Aarti Singh**. The winner in the final round was Singh, who became an "instant celebrity" with requests for her autograph. Last year's winner, math graduate student **Boian Popunkiov**, was eliminated early this year.

Student and Instructional News

Mathematics Talent Search Honors Day

Top: Andrew Bolanowski, Anthony Marcuccio, Danielle Chen, Chihiro Ara, Ziyi Wang
Nikita Mayorov, David Kasper, Andy Lei, Kirk Wienkes, Daniel Jang, Jeff Stenczyk, Ben Holzer.
Bottom: Alec Li, David Yu, Richard Qian, Po-Ling Loh, Nick Wage.

Twenty-two students were invited to our annual Talent Search Honors Day last year where Andrew Bolanowski of Rufus King High School was announced as the winner of the four-year Van Vleck scholarship. The program for the Honors Day included talks by Professor John Vano on "Strategies and techniques in combinatorial game theory" and Professor Eric Bach on "The science of algorithms." A tour of the Planetarium in the Astronomy Department concluded the program .

Two problems from this year's problem sets are:

(1) A set of three or more prime numbers is *amazing* is the sum of every three of them is also a prime number. For example, the set $\{5, 7, 11, 181\}$ is an amazing set of primes. Prove that no amazing set of four primes can contain 3 and that no amazing set of five primes exists.

(2) Let $N = 100\ldots001$ be the integer having $n \geq 0$ zero digits sandwiched between the two ones. If N is a prime number, prove that $n + 1$ is a power of 2.

Madison Student Wins Second Place in National Competition

Martin Isaacs and Po-Ling Loh

Po-Ling Loh, a senior at Madison Memorial High School and a student in many mathematics courses at UW-Madison, took second place in the 2004-05 Siemens Westinghouse Competition in Math, Science and Technology held in Washington, D.C. For this she was awarded a $50,000 scholarship to the university of her choice. Po-Ling became a finalist in this year's competition by taking first place in the midwest regional competition held at the University of Notre Dame. She competed against the other five finalist. Po-Ling also won l0th place at the 2005 Intel Science Talent Search at the National Academy of Sciences in Washington, D.C. As the 10th place winner she received a $20,000 scholarship.

The title of Po-Ling Loh's project was "Closure Properties of D_{2p} in Finite Groups." She studied the generalized version of a question posed by the topologist Emmanuel Farjoun about closed embeddings of finite groups, where the subgroup H is closed in G if every homomorphism from H to G extends to a unique homomorphism from G to G. In particular, she looked at the case when H is D_{2p}, where p is an odd prime, and proved that if H is closed in G and G is solvable, then $H = G$.

Po-Ling's brother, Po-Shen Loh, well-known to recent newsletter readers, received *Honorable Mention* for the 2004 Morgan Prize for Outstanding Research in Mathematics by an Undergraduate. The presentation took place at the annual Prizes and Awards Ceremony at the AMS/MAA Meeting in Atlanta in January 2005. Po-Shen graduated from Caltech in 2004 and is now a Winston Churchill Foundation Scholar at the University of Cambridge in England. In the fall, he will study for the PhD at Princeton University.

Madisonians fared very well in last year's Putnam Exam. Daniel Kane, now a student at MIT, was named a Putnam Fellow by virtue of his Top 5 finish. Po-Ru Loh and Po Shen Loh were part of the Caltech Putnam team that came in fourth place.

Sidewalk Math

Sidewalk Math 2004 at Van Vleck Hall
helping students prepare for finals

Some Photos of Undergraduate Scholarship Winners

Shane Squires, Manuela Mazzocco and Undergraduate Advisor, Gloria Mari-Beffa

Issaac Schwabacher   **James Patek**   **Sam Lachterman**

Lyubov Chumakova, Jeremy Hanson, Andrew Huening and Paul Milewski

Chad Koch,   **Benjamin Cain**   **Wil Brady**

Paul Heideman, Fredrick Moore and Adam Feldman

Undergraduate Scholarship Awards

At our annual Student Awards Ceremony held on May 5, 2004, a number of under-graduates were recognized with scholarship awards.

The Applied Mathematics Engineering and Physics (AMEP) leadership prize is awarded to students who excel in this rigorous major and who have also participated in out-reach activities. It carries a $500 prize and was generously endowed by Dan Koellen, an AMEP graduate.

Leadership Prize in AMEP went to:

    Lyubov Chumakova: Lyubov is now attending graduate school at the Courant Institute and Columbia.

    Jeremy Hanson: Jeremy is now attending graduate school at the Courant Institute and Columbia.

    Andrew Huening: Andrew is currently a senior in the program.

Frank Cady Scholarships ($2000 for needy and deserving students) went to:

Manuela Mazzocco: Manuela was a straight A junior and is currently doing research with Professor Ram.

Shane Squires: Shane was a sophomore Honors student who had taken already many 500-level courses for honors with top grades; he entered at the 234 level (3rd semester calculus) as a freshman. He supports himself economically by working many hours a week. He is now doing research with Dr. Mari-Beffa and has a double major in Math and Physics.

Becky Shapiro: Becky is a hard working student who is also paying her way through the University. She was a junior doing a double major in Math and Physics.

David Lawrence Young Memorial Scholarship ($500) went to:

Isaac Schwabacher: Isaac was only a freshman when he received this award. He began by taking only 500-level courses and was a star student in Dr. Mari-Beffa's 521 class (Advanced Calculus) course.

Prof. Linnaeus Wayland Dowling Scholarships ($500) went to:

Adam Feldman: Adam had a double major in Math and Computer Science.

Fredrick Moore: Fred had a strong record and was a double major in Math and Computer Science.

Paul Heideman: Paul worked in Professor Propp's lab last year and in the Math-Biology lab during the summer. He is a double Biology/Math major.

Irma L. Newman Scholarship ($800) went to:

Benjamin Cain: Ben was a senior with a triple major in Math with Honors, Physics, and Astronomy and won an Ingraham Scholarship the year before. He is now in graduate school at MIT in theoretical physics. With straight As in Math, Ben wrote a senior thesis in physics.

R. Creighton Buck Scholarship for creativity ($800) went to:

Jim Patek: With a double major in Math and Physics (Honors in Math) Jim wrote a senior thesis with Professor Ram. Last year Jim was awarded the Kirkbride Scholarship.

Higgitt Scholarships ($800) went to:

Liana Prescott: Liana is a Math Honors students with a second major in History. She received the Dowling Scholarship last year when she was a sophomore.

Sam Lachterman: Sam entered at the 234 level (3rd semester calculus) as a freshman. At the end of last year, he had taken already three 500-level courses for Honors, had participated in Professor Propp's research lab during the year, and got the prize for the best talk by an undergraduate in the MathClub. Sam worked with Professor Ono last summer and that work is continuing this year.

Mark H. Ingraham Scholarships ($900) went to:

Chad Koch: Chad received the Higgitt prize as a sophomore. He completed an Honors in Math degree last year with a second major in CS.

Daniel Wueller: Daniel is a straight A senior math major.

David and Janet Kirkbride Scholarship ($1000) went to:

Wil Brady: Wil was a senior and is now in graduate school at the University of Pennsylvania studying Math. Wil received the Higgitt award last year. He did a triple major in Computer Science, Economics (math emphasis) and Honors Math. He was the only undergraduate TA last year and only one of three we have had.

Ten PhDs Awarded in 2004

Ten mathematics PhDs were awarded by UW-Madison in calendar 2004. Their names, thesis advisors, current positions, and thesis title are listed below.

El-Guindy, Ahmad (Advisor, Ken Ono) Research Assistant Professor, Texas A & M University, *W*eierstrass Points on Modular Curves

Laghi, Norberto (Advisor, Andreas Seeger) Post-Doc at University of Edinburgh, *T*opics in the Regularity Theory of Fourier Integral Operators

Lau, Michael K. (Advisor, Georgia Benkart) NSERC Postdoctoral Fellow, University of Ottawa, *F*ock Representations and Central Extensions

Lyall, Neil (Advisor, Steve Wainger) Post-Doc at University of Georgia, *S*trongly singular integral operators on the Heisenberg group – L^2 estimates.

Mukherjee, Shantala (Advisor, Georgia Benkart) Visiting Assistant Professor, DePaul University, *R*epresentations of Nilpotent Lie Algebras and Superalgebras

Ondrus, Matthew (Advisor, Georgia Benkart) Post-Doc at University of Arizona, *W*hittaker Modules, Central Characters and Tensor Products for Quantum Enveloping Algebras

Sutherland, Jamie R. (Advisor, Bob Wilson) Visiting Asst. Prof., Texas A & M University, *V*alues in University Mathematics Placement Practice

Taylor, Paul T. (Advisor, Andreas Seeger) Post-Doc at McMaster University, *B*ochner-Riesz Means With Respect to a Rough Distance Function

Thiem, F. Nathaniel (Advisor, Arun Ram) Szego Assistant Professor at Stanford, *U*nipotent Hecke Algebras

Unlu, Ozgun (Advisor, Alejandro Adem) Britton Postdoctoral Fellow at McMaster University, *C*onstructions of Free Group Actions on Products of Spheres

Continuing graduate students were also active in many things outside Van Vleck. Thomas Hangelbroek made a presentation in Pavia, Italy to a network of researchers from 13 European universities, on a project that also included graduate students Jeff Kline, Youngmi Hur, Narfi Stefansson and Sangnam Nam. Adrian Jenkins, Tal Sutton, Bret Benesh, Andrew Shallue, and Aaron Weinberg were selected to work with the KTI program in Madison middle and high schools.

We are expecting a large number of new PhDs this year, and many of them have already accepted positions for the fall of 2005. For instance, Holly Swisher will be Ross Assistant Professor at Ohio State University and then will be a tenure-track assistant professor at Oregon State University. Andy Raich has a postdoctoral position at Texas A&M University. Jennifer Halfpap has a tenure track assistant professor position at the University of Montana. Bret Benesh has a four-year position at Harvard University.

New Graduate Students in the Fall of 2004

We had another large and talented group of students beginning graduate study in mathematics this past fall. Their names and undergraduate institutions are listed below.

ADDINGTON, Nicolas	University of Washington
BRAY, Tyler	University of Illinois-Chicago/University of Chicago
DARNALL, Matthew	Humboldt State University
DYSKANT, Raymi	Oberlin College
GETZ, Jayce	Harvard University
HARRIS, Julie	Furman University
HE, Weiyong	China University of Science and Technology
HEGEMAN, James	California Institute of Technology
HUA, Zheng	Zhejiang University
HUANG, Hongnian	China University of Science and Technology
JOSEPH, Matthew	Indian Statistical Institute
KIERNAN, Kathleen	California Institute of Technology
KIM, Hanjun	KAIST
MILOVICH, JR., David	Massachusetts Institute of Technology
NOVER, Harris	California Institute of Technology
PANIKE, Nathan	Stanford University/University of Maryland
PANTEA, Casian	Babes-Bolyai University
POPA, Ioana	Babes-Bolyai University
SIMONS, Julie	University of California-Berkeley
THORNE, Frank	Rice University
TURETSKY, Daniel	Swarthmore College
TURKELLI, Seyfi	Istanbul Bilgi University
WANG, Li	China University of Science and Technology
XIAO, Han	Peking University
YIN, Weidong	China University of Science and Technology

Graduate Program Administrator Sherry Lange Retires

After nearly 30 years as a member of the Mathematics Department support staff, almost 25 of which were spent as graduate program administrator, **Sherry Lange** retired last summer. Sherry was the first contact most of our graduate students had within the university, and she always projected a positive, supportive, and expert impression to our prospective students. She played a critical role in our graduate program with her consummate skill, organization, and professionalism and with her knowledge of all the rules and regulations that concern graduate life. Before her last day, the department wished Sherry happiness in her new life and presented her with a cake (for all to enjoy) and a gift. We miss her. The interim graduate program administrator is Steve Roberts (roberts@math,wisc.edu).

Graduate Award Photos

Ulrike Bostelmann   **Christopher Dwyer**   **Jennifer Halfpap**   **Thomas Kent**

Marco Loskamp   **Daniel McGinn**   **Matthew Ondrus**   **Holly Swisher**

Darren Neubauer   **Jue Wang**

Michael Lau   **Ozgun Unlu and Alejandro Adem**   **Nathaniel Thiem**

Holly Swisher, Keya Zhu, Ken Ono and Kathryn Zuhr

Awards to Graduate Students

At our annual student awards ceremony on May 5, 2004, well-deserved awards were presented to many of our graduate students.

Math Department Teaching Awards were presented to Ulrike Bostelmann, Christopher Dwyer, Jennifer Halfpap, Thomas Kent, Marco Loskamp, Daniel McGinn, Matthew Ondrus, and Holly Swisher.

L&S Teaching Fellow Awards were given to Darren Neubauer and Jue Wang. Each Fellow was given a $1,000 stipend and organized a workshop for incoming graduate students to help them get off to a good start a Teaching Assistants. Darren Neubauer is working on a dissertation with Paul Terwilliger. Jue Wang is working with Fabian Waleffe.

Excellence in Mathematical Research Awards were presented to Michael Lau, F. Nathaniel Thiem, and Ozgun Unlu. Michael, now at the University of Ottawa, worked with Georgia Benkart; Nat, now at Stanford University, worked with Arun Ram; and Ozgun, now at McMaster University, worked with Alejandro Adem. The subject of their theses can be found earlier in this newsletter under new PhDs.

Three graduate students were awarded **Elizabeth S. Hirschfelder Scholarships for Graduate Women**. They were Holly Swisher, Keya Zhu and Kathryn Zuhr. Holly Swisher is working with Ken Ono. Keya Zhu and Kathryn Zuhr are now second year graduate students.

Other News

Richard Askey, Emeritus Professor of Mathematics, was a 2004 Edyth May Sliffe Award recipient for distinguished mathematics teaching in the high school. This honor, given by the NCTM, is bestowed to a select group of outstanding and deserving teachers. Dick was on a panel at the 10th International Congress on Mathematics Education in Copenhagen. He also gave talks at other meetings including: a meeting on assessment at MSRI and meetings on mathematics in Hong Kong, Helsinki, Bavaria, and Tianjin. Dick relates that at the meeting in Hong Kong, after dinner one evening he was walking together with two other participants, two mathematicians and a chemical engineer who is Vice President of City University. They introduced themselves and when Dick mentioned his name, the chemical engineer said: "You taught me calculus." Dick also gave a talk at a meeting on numeracy in Banff-BIRS and helped run a meeting in Wingspread on 28 eighth grade math lessons from 7 countries where videos of these lessons were discussed and the start of a book to make them more useful for professional development was made.

Georgia Benkart gave an invited plenary lecture on "Square ice is very nice, but can you put a match to it?" at the annual AMS-MAA meeting in Atlanta in January 2005.

Nigel Boston, this past summer, traveled around Europe giving lectures on cryptography, group theory, and algebraic number theory at Cambridge, Oxford, London, Berlin, Duesseldorf, and Essen, and a series of talks on graph-based codes in Taipei. This spring he will be a plenary speaker at Journees Arithmetiques in France.

XiuXiong Chen gave a plenary lecture at the AMS meeting held in Newark, Delaware in April 2005. The title of his lecture was "Foliation by holomorphic discs and its application in Kähler geometry". He has also been invited to address the China Mathematical Society at their 70th anniversary meeting this summer.

Shi Jin is spending the spring semester at the IMA in Minneapolis as IMA New Direction Visiting Professor participating in the IMA thematic year on "Mathematics of Materials and Macromolecules." According to ISI Web of Knowledge records, the paper "The Relaxation Schemes for Systems of Conservation Laws in Arbitrary Space Dimensions," *Communication on Pure and Applied Mathematics* 48 (1995), 235-276 by Shi Jin was No. 27 in the rank of most cited papers published in the last ten years in all fields of mathematics (which include biostatistics, mathematics, operations research and statistics). It is the most cited paper published in *Communications* in the last ten years.

Ken Ono gave the Wendell Miller Lectures at Iowa State University in November 2004.

Louis Rall, Emeritus Professor of Mathematics, gave the opening address at the 4th International Conference on Automatic Differentiation held at the University of Chicago, July 19-23, 2004. His paper, "Perspectives on Automatic Differentiation, Past, Present, and Future?" will be published by Springer in the proceedings in 2005. Since Louis's first paper was published in 1955, this 2005 paper marks his 50th anniversary of publication of about 100 papers. Currently he is working on a paper on algorithm transformations to present at a conference on particle beam physics at Miami this year.

Amos Ron is the PI on a large NIH grant to develop a novel mathematical methodology for NMR spectroscopy, a critical step in finding the 3D structure of proteins in solutions. The project involves a consortium of researchers from UW-Madison, the University of Connecticut, and Stanford University. This project is also the PhD topic of current graduate student Jeffery Kline. Another participant is Hamid Eghbalnia (PhD 2000, A. Assadi). Amos was also a co-chair of a year-long activity that was hosted by the Institute for Mathematical Sciences in Singapore and was devoted to the theory and applications of data representation.

Alumni News and Comments

http://math.wisc.edu/directories/alumni.html

H. Turgay Kaptanoğlu (PhD 1991, W. Rudin) and **Semra Öztürk Kaptanoğlu** (PhD 1995, A. Assadi) are on sabbatical, until July 2005, from Middle East Technical University in Ankara, Turkey visiting Mathematics Department of the University of Virginia at Charlottesville, VA. Turgay has a Fulbright grant, is hosted by James Rovnyak for a project on Hankel operators, and expects to work also with Barbara MacCluer and Thomas Kriete on composition operators. Semra has a TUBITAK (equivalent of NSF in Turkey) grant and is hosted by Brian Parshall. Both are concentrating on research with no teaching duties whatsoever, something that they have been dreaming of for several years. Their email addresses remain as kaptan@math.metu.edu.tr and semra@math.metu.edu.tr.

Henry Haslach (PhD 1979, S. Husseini) is coauthor, with Ronald Armstrong, of the book *Deformable Bodies and Their Material Behavior* published by Wiley in 2004. This upper level text introduces tools that allow designers of devices involving deformable bodies to avoid material functional failure. It includes three-dimensional stress and deformation analysis as well as material failure modes, such as plastic deformation, fracture, fatigue, and creep. These topics are discussed for structural metals, ceramics, composite materials, concrete, elastomers, polymers, wood, paper, and biological tissue. The goal is to encourage more successful engineering design by joining techniques of mechanics and materials science. Henry is a Lecturer in the Department of Mechanical Engineering of the University of Maryland in College Park and can be reached at haslach@eng.umd.edu.

Olga Holtz (PhD 2000, H. Schneider) has completed her Junior Humboldt in Berlin and is now in a postdoctoral position at the University of California in Berkeley.

Dan Knopf, who spent three years in Madison as a VIGRE Van Vleck Visiting Assistant Professor, is now a tenure-track Assistant Professor at the University of Texas in Austin.

Jeremy Lovejoy (PhD 2000 (Penn State), K. Ono), who was a VIGRE Van Vleck Visiting Assistant Professor in 2000-03 has just been awarded a permanent CNRS position at the University of Paris 7 (Jussieu).

Ernie Solheid (PhD 1985, R. Brualdi) received a *Certificate of Meritorious Service* from the Mathematical Association of America at the annual AMS/MAA Prizes and Awards Ceremony in Atlanta in January 2005. He was cited for the impeccable organizational job he has done for seven years as Meeting Coordinator for the semi-annual meetings of the Southern California-Nevada Section of the MAA.

Matt Boylan (PhD 2002, K. Ono) is completing his VIGRE Postdoctoral appointment at the University of Illinois at Champaign-Urbana and will be Palmetto Professor of Mathematics at the University of South Carolina starting in the fall of 2005.

Death Notices

LeRoy "Lee" Cooper died on March 9, 2004. Lee received a Masters degree in mathematics from UW-Madison in 1962 and did some work towards a PhD. For seventeen years he taught and worked in the Math Tutorial Program.

Kevin McDougal (PhD 1989, R. Brualdi) died suddenly on August 16, 2004. Kevin was a Professor of Mathematics at UW-Oshkosh. At his death he was just completing a sabbatical and was writing a book on discrete mathematics.

Carla Wofsy (PhD 1971, J. Chover) died in August of 2003 after a long battle with breast cancer. Carla was a Professor of Mathematics at the University of New Mexico and also was affiliated with Los Alamos Labs.

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Richard A. Brualdi, Editor
Department of Mathematics, University of Wisconsin
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(brualdi@math.wisc.edu)

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