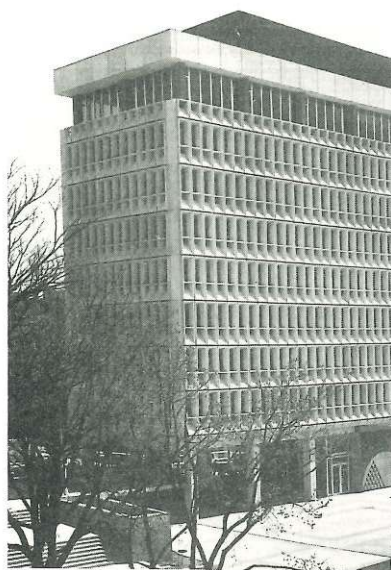




# VAN LECK NOTES

Department of Mathematics \* University of Wisconsin - Madison \* 1999

<http://www.math.wisc.edu>

## *Math Department receives NSF VIGRE Award*

The Department of Mathematics has received a three-year \$1.5 million grant from the National Science Foundation within their VIGRE program: Vertical Integration of Research and Education in the Mathematical Sciences. The VIGRE program was developed by NSF's Division of Mathematical Sciences as a way of increasing the pipeline of domestic students going into mathematics. Besides the demand for mathematicians at universities, there is also a huge demand for well-trained mathematicians in industries.

The Department plans to build on its tradition of excellence in graduate education that goes back more than 100 years, with the successful training of approximately 950 PhDs in Mathematics who now occupy important positions in universities and industries throughout the USA and indeed the world. For more than 25 years it has also had a successful postdoctoral program (the Van Vleck program), with more than 80 Mathematics PhDs continuing their training in research and instruction under the mentorship of established researchers and educators.

The grant provides funding for undergraduate research and other creative experiences, graduate fellowships, and postdoctoral fellowships. The Mathematics Department's program seeks to sustain, strengthen, enhance, revise, and integrate the various areas of mathematics education at UW-Madison: (1) Mathematics Undergraduate Education, (2) Applied Mathematics, Engineering, and Physics Undergraduate Program (AMEP), (3) Mathematics PhD Program within the Department of Mathematics, (4) Applied Mathematical Sciences Interdisciplinary Program within the Center for Mathematical Sciences, and (5) Postdoctoral Training in Pure and Applied Mathematics.

The goals of the program include: broadening the mathematics education of undergraduate and graduate students, and postdoctoral fellows so that they will be able to interact better and communicate effectively with scientists and engineers, and carry out high-level mathematical research; strengthening the traditional undergraduate, graduate, and postdoctoral programs in core mathematics; decreasing the time to the PhD degree.

VIGRE graduate fellowships have been awarded to ten graduate students, seven of whom are new students this year. VIGRE postdoctoral fellowships have been awarded to two mathematicians who have just received the PhD. Several faculty members are beginning research projects with undergraduates that are being funded by the VIGRE grant. You can read more about these people inside this newsletter.

Some of the highlights of our new initiatives include:

A laboratory component in one or more undergraduate courses will be developed that will clearly illustrate the successes and limitations of applied mathematics modeling of physical problems. The experiments would be demonstrations carried out to clearly illustrate points and not to train students for experimentation. Potential courses for such a component are: Applied Dynamical Systems and Chaos, PDEs, Introduction to Applied Mathematics, and undergraduate and graduate Fluid Mechanics.

An Integrated Undergraduate, Graduate, and Faculty Research Lab in Spatial Systems will be developed. Individually and in groups, students will study various spatial systems from combinatorial and probabilistic perspectives, with some use of computer simulation. Research questions that arise in faculty and postdoctoral fellows research will be described to students who investigate these and other questions that surface in their course of investigation. Possible participants included one or two bright high school students, e.g. students from local high schools who are among the winners of the Wisconsin Mathematics Talent Search.

With the effective use of VIGRE funds, we plan to recruit quality American graduate students with offers of traineeships (VIGRE fellowships and Teaching Assistantships); provide graduate students with a quality graduate program, including interdisciplinary training that gives experience in solving practical mathematical problems; reduce the time-to-degree by targeting substantial

fellowship money on a small group of students who have the potential of becoming research mathematicians at top universities and labs.

Cognizant of the fact that many graduates do not work in academic settings, we plan to widen the scope of the current Mathematics PhD program in the Department of Mathematics, supplying our graduate students with the necessary experience in solving practical mathematical problems. To these ends, we are planning to start an Applied Mathematics Consulting Project. This would take the form of nonstandard graduate courses for mathematics graduate students whose main goal is to set up interdisciplinary cooperation, at a research level, between mathematics graduate students and researchers in other fields at the University. This course will be taught for the first time in the spring by Paul Milewski, with the help of the VIGRE Van Vlecks, Dan Knopf and Chris Raymond. The goals of this project are to foster new connections between researchers in

mathematics and other disciplines and to encourage interaction between mathematics graduate students and faculty in other disciplines.

A biweekly VIGRE Brownbag Seminar is meeting this semester with participation from faculty, postdocs, graduate students, and undergraduate students. Attendance averages 25 per meeting. The format for the first few meetings has been short talks describing one's research interests or a specific problem. We follow the "rule" that when someone sits down after talking, someone else gets up and starts talking. At one session, there were four speakers: an undergraduate student, a postdoc, a faculty member, and a graduate student!

The VIGRE program is under the leadership of Richard A. Brualdi, Marshall Slemrod, Eric Bach, Thomas Kurtz, Paul Milewski, and Paul Rabinowitz. The grant has been approved on scientific and technical merit for five years, with an additional \$1 million expected for years 4 and 5.



1999 Wisconsin Reunion in San Antonio, TX

## ANNUAL WISCONSIN REUNION IN WASHINGTON, D.C.

The Tenth Annual Wisconsin Reunion of Wisconsin Alumni and Friends will take place at the annual AMS and MAA meetings in Washington, D.C. on Friday, January 21 from 5 to 7 p.m. The location will be the Embassy Room, in the Omni Shoreham Hotel. As always, there will be hors d'oeuvres, a cash bar, and lots of interesting talk among good friends. Last year there were more than 75 people at the reunion. As usual, we are requesting a contribution of \$5 to help defray the costs. We hope to see you in Washington!

## COMBINATORICS OF LIE TYPE IN MADISON

From June 6 to June 22, 2000, a Conference on Combinatorics of Lie Type will be held in Madison. This conference, being organized by Georgia Benkart, Peter Orlik, and Arun Ram, will honor **Louis Solomon** for his distinguished career.

Invited speakers include: F. Brenti, M. Broué, V. Chari, R. Charney, K. Erdmann, M. Geck, V. Ginzburg, J.C. Jantzen, A. Kleschev, G. Lehrer, P. Littelmann, G. Lustig, O. Mathieu, A. Mathes, A. Okounkov, M. Putcha, M. Reeder, T. Shoji, H. Terao, J. Thibon, M. Wachs, and A. Zelevinsky.

Information, including a registration form, on the conference can be obtained, as it becomes available, at the WEB address <http://www.math.wisc.edu/~comblie/>.

## CONFERENCE ON RINGS AND ALGEBRA

From September 8 to 10, 2000, a Conference on Rings and Algebras will take place in Madison. This conference, being organized by Georgia Benkart and Efim Zelmanov, will honor **J. Marshall Osborn** for his distinguished career.

The invited speakers for this conference are still being determined.

More information, including a registration form, on this conference can be obtained, as it becomes available, at the WEB address <http://www.math.wisc.edu/events/>.



Alejandro Adem

## Letter from the Chair...

It is a pleasure for me to write a few lines for readers of this newsletter. As Chair I have overall responsibility for the 'smooth functioning' of the Department of Mathematics at UW-Madison, a task which may seem rather daunting. Fortunately the University of Wisconsin has a tradition of faculty governance, hence in our department real authority lies with the faculty, implemented through various committees. My main role is to exercise a certain amount of 'persuasion' and make sure that all the bills get paid on time...

This system encourages a great diversity of ideas, and we have no uniform view on research or teaching. Our colleagues are non-conformists, individualistic and downright stubborn--but we wouldn't have it any other way. The 'department' is the collective aggregate of numerous individual efforts, which are constantly changing and interacting. This allows us to engage in meaningful and substantive discussions within a traditionally amiable collegial setting. We do, however, all share the basic goals of total intellectual honesty and the relentless pursuit of knowledge - perhaps the two most essential components of any mathematical endeavor.

In this issue of the newsletter you will read about recent activities here in Madison. I hope that you will find it interesting and informative. As you will see, our department has taken important steps in renovating its research and teaching programs. We will be facing important challenges in replacing our distinguished older faculty (who have been retiring in large numbers), but this will also be an exciting opportunity to shape the department for years to come.

I hope that as a former student or simply as a friend of Wisconsin mathematics you will keep in touch with us, either in writing or by stopping by. For those of you who have provided financial support I wish to thank you for your generosity. Even small amounts have helped provide a 'margin of quality' here in Van Vleck and all the faculty and students are deeply appreciative of your support.

Alejandro Adem  
Chair  
Department of Mathematics

## New Faculty

Two new tenure-track assistant professors and one new associate professor were hired last year:

**Mikhail Feldman**, a new assistant professor, received the PhD from the University of California - Berkeley in 1994; his thesis advisor was L.C. Evans. Feldman's early education, up to a B.A. degree, was in the Ukraine. He was a Lecturer at the University of Pennsylvania from 1994 to 1996 and a postdoctoral fellow at the University of California-Berkeley from 1996 to 1997. From 1997 to 1999 he was Ralph Boas Assistant Professor of Mathematics at Northwestern University.

Dr. Feldman works on nonlinear partial differential equations of elliptic and parabolic type, specifically on variational and geometric evolution problems, viscosity solutions, regularity for elliptic and parabolic systems and free boundary problems. He also works on Monge's mass transfer problem and its application to PDE. Mikhail joined us in Madison this fall and is a wonderful addition for our program in Partial Differential Equations.



**Mikhail Feldman**

**Patrick Speissegger**, a new assistant professor, received the PhD from the University of Illinois in 1996 with a thesis in the area of model theory and its applications to real algebraic geometry, written under the supervision of L. van den Dries. He was a Postdoctoral Fellow at The Fields Institute in Toronto in 1996-97. Since 1997 he has been a Postdoctoral Fellow at the University of Toronto, with a six months leave spent at the Mathematical Sciences Research Institute (Berkeley) in 1998. At Toronto, Patrick is credited with turning around a "moribund" third-year logic course (aimed at students not specializing in mathematics)."

Dr. Speissegger's research lies in the general areas of model theory and real algebraic geometry. The notion of o-minimal expansion of the field of real numbers provides a suitable setting for studying generalizations of the theory of semialgebraic sets, and he is interested in finding new explicit examples of such expansions.

During his years as a graduate student at the University of Illinois, Patrick constructed two such examples in joint work with Lou van den Dries. Both expand the structure of globally subanalytic sets and define the exponential function; moreover, one of them also defines the Riemann zeta function on all real numbers greater than 1, while the other defines the Gamma function on all positive real numbers.

More recently, building on work by Alex Wilkie as well as by Jean-Marie Lion and Jean-Philippe Rolin, he showed that any o-minimal expansion  $R$  of the field of real numbers has in turn an o-minimal expansion  $P(R)$ , called the Pfaffian closure of  $R$ , that is closed under taking solutions to Pfaffian equations. He is currently working with Jean-Marie Lion and Chris Miller, to study further properties of such Pfaffian closures of o-minimal structures. Patrick will join us in Madison for the spring semester of the current academic year.



**Patrick Speissegger**

### VAN VLECK VISITING ASSISTANT PROFESSORS

Five recent PhDs accepted three-year appointments this past year as Van Vleck Assistant Professors: **Markus Banagl**, **Dan Knopf**, **Rajesh Kulkarni**, **Christopher Raymond**, and **Bo Su**. In addition, **Jonathan Pakianathan** who had been a Lecturer for two years accepted a one-year appointment as a Van Vleck Assistant Professor. **Anne Shepler**, who has a two-year NSF Postdoctoral Fellowship, also received a half-time Van Vleck Assistant Professor appointment for the academic years 2000-01 and 2001-02.

**Markus Banagl** received the PhD from the Courant Institute of Mathematical Sciences in 1999 with a thesis "Extending Intersection Homology Type Invariants to non-Witt Spaces" written under the direction of Sylvan Cappell. His research interests are in extending generalized Poincaré duality and intersection homology to non-Witt spaces.

**Dan Knopf** received the PhD from the University of Wisconsin - Milwaukee in 1999. His thesis, under the direction of Kevin McLeod, was titled "Quasi-convergence of the Ricci flow." His research interests are in PDE and differential geometry, particularly geometric evolution equations - the nonlinear heat equations which give rise to curvature flows. His area of first interest is the Ricci flow. Dan is one of our VIGRE Van Vlecks, being partially supported by the Department's VIGRE Grant from NSF.

**Rajesh Kulkarni** received the PhD in 1999 from Indiana University. His thesis "Clifford algebra of binary forms" was written under the direction of Valery Lunts. His research interests are in representation theory of quantized deformations of algebras, geometric approach to Azumaya algebras and Brauer groups, and number theory related to these issues. Rajesh is spending the fall semester at MSRI (Berkeley) on a fellowship and will join us in the spring semester.

**Ken Ono**, a new associate professor with tenure, received the PhD in Mathematics from the University of California - Los Angeles in 1993, with a thesis written under the supervision of Basil Gordon. He spent one year at the University of Georgia, one year at the University of Illinois at Urbana-Champaign, and two years at the Institute for Advanced Study, Princeton before assuming a tenure-track assistant professorship at the Pennsylvania State University in 1997. Dr. Ono is on leave this year and will join us in Madison beginning with the fall 2000 semester. Ken is a 1999-2001 Alfred P. Sloan Foundation Research Fellow and also has received a 1998-2004 NSF Career Award (which combines research with educational activities). This year he was selected as one of the twenty-four 1999 David and Lucile Packard Fellows. The Packard Fellowship is a five year award totaling \$625,000. Since the inception of the Packard Fellowships,

Ken is the 11th mathematician and the 7th UW-Madison faculty member to have received a fellowship.

The Number Theory Foundation, a nonprofit organization which provides private research support for research in number theory and which typically funds conferences, decided this year for the first time to award a Number Theory Foundation



**Ken Ono**

Postdoctoral Fellowship. Ken won the right to offer the position, a two year postdoctoral fellowship (with a possible extension to a third year) which comes with a teaching load of two courses per year.

Ono's primary research interests are in number theory. He works on questions related to elliptic curves, modular forms and partitions. His recent work on partitions, which he describes as "breaking a number up into sums", has led to surprising new perspectives on the deeper structure of connections between partitions and more complicated abstract objects in arithmetic geometry. With the recent solution of the 350 year old "Fermat's Last Theorem" problem, number theory has solidified its position as one of the most publicly visible areas of mathematics. Modern applications of number theory to reliable transmission of information (error-correcting codes) and the secure transmission of information (cryptography) have brought new urgency to research in number theory.

The total number of new faculty hired in the last five years is now ten: Yongbin Ruan, Paul Milewski, Leslie Smith, Fabian Waleffe, Eleny Ionel, James Propp, Arun Ram, Mikhail Feldman, Ken Ono, and Patrick Speissegger. With many more new faculty to be hired in the next several years, there are a lot of changes taking place in Van Vleck Hall.

**Christopher Raymond** received the PhD in Applied Mathematics in 1999 from Northwestern University where his advisor was Bernard Matkowsky. The title of Christopher's thesis was "Melting Effects in Condensed Phase Combustion with Applications to Combustion Synthesis of Materials." His research interests are in combustion modeling where he uses techniques of asymptotic/singular perturbation analysis of nonlinear parabolic systems, combined with numerical simulations using adaptive Chebyshev pseudospectral methods. Chris is also a VIGRE Van Vleck, being partially supported by the Department's VIGRE Grant from NSF.

**Bo Su** also received the PhD in 1999 from Northwestern University. His thesis title was "Existence of  $L^\infty$  solutions for Hamilton-Jacobi equations," and his advisor was G-Q. Chen. His research interests include Hamilton-Jacobi equations, compressible Navier-Stokes equations, hyperbolic conservation laws, and Monge-Kantorovich mass transfer problems.

**Jonathan Pakianathan**, who has been at UW-Madison since 1997, received the PhD from Princeton University in 1997. His advisor was William Browder. His research interests are in algebraic topology, group cohomology, Lie algebras, and group actions. Recently he provided a striking counterexample to a conjecture of A. Adem that the highest torsion in the integral cohomology of a finite p-group should occur infinitely often. He has been a very successful and popular teacher here for two years.

**Anne Shepler** received the PhD from the University of California - San Diego in 1999 with a thesis "Semi-invariants of finite reflection groups" written under the direction of Peter Doyle. Her research interests are in geometry and algebra, specifically finite reflection groups, invariant theory, and hyperplane arrangements. Anne has received an NSF Postdoctoral Fellowship (her mentor is Peter Orlik) and is concentrating on research this year. In 2000-01 and 2001-02 she will be teaching half-time as a Van Vleck Assistant Professor.

## **NEW LECTURER/ RESEARCH ASSOCIATE**

**Maria Loukaki** received the PhD from the University of Illinois in 1999 with a thesis "Normal subgroups of odd-order monomial groups" written under the direction of Everett Dade. Dr. Loukaki's research interests are in representation theory of finite groups and algebraic number theory, and she is working with Marty Isaacs this year.

## Promotions

Four assistant professors were promoted to associate professor with tenure. They are **Paul Milewski**, **Fabian Waleffe**, **James Propp**, and **Arun Ram**. In addition Associate Professor **Yongbin Ruan** has been promoted to (full) Professor.

**Paul Milewski** received a PhD in Applied Mathematics from MIT in 1993 and wrote a thesis under the direction of David Benney. After two years as Gabor Szegö Assistant Professor at Stanford University, where his mentor was Joe Keller, he joined UW-Madison as Assistant Professor in 1995. Paul was an Alfred P. Sloan Research Fellow in 1997-99 and a UW-Madison Lilly Teaching Fellow in 1997-98. Under the latter he developed a course in Applied Dynamical Systems; in this course, he successfully introduced the use of computers for visualization, with the students using programs that he developed for mathematical experimentation. That course is now a regular part of our offerings.

Dr. Milewski is an applied mathematician specializing in asymptotic and numerical methods in fluid mechanics and wave propagation. His goal is to understand complicated physical phenomena using mathematical analysis and scientific computation. Paul has developed a new isotropic equation for three dimensional water waves and has found striking new phenomena for vortical flow in deep and shallow water. With colleague Jean-Marc Vanden-Broeck, he classified the possible singularities which can arise on a free-surface; new axisymmetric singularities and a generalization of the Stokes angle were found. They also did a numerical study of the generation of gravity capillary solitary waves at the front of an object moving below a free surface. Recently, he has been working on nonlinear waves in several dimensions, developing novel numerical schemes to compute solutions of the equations.

**Fabian Waleffe** received the PhD in Applied Mathematics from MIT in 1989. He was a Postdoctoral Research Fellow at the Center for Turbulence Research (Stanford University) from 1989 to 1992. He then

returned to MIT as Lecturer (1992-94) and Assistant Professor (1994-98). He came to UW-Madison as an Assistant Professor of Mathematics and Engineering Physics in spring of 1998.

Dr. Waleffe's primary research area is fluid dynamics, and he focuses on issues related to the phenomenon of turbulence. He is interested in computational, perturbative, and rigorous approaches to the problem, as well as in developing simple models of the main processes. More generally, his interests are in physical dynamical systems with applications in mechanical and aerospace engineering and geophysics. Fabian's current research aims

at elucidating the onset of turbulence in shear flows, such as flows in pipes and channels. He has identified a nonlinear process that appears to be the main ingredient responsible for the bifurcation of shear flows and the maintenance of turbulence. This process, suggested by a massive amount of experimental visualizations of "coherent structures." He formulated that

self-sustaining nonlinear process and demonstrated its plausibility through careful analysis. One of his current objectives is to fully characterize the bifurcations that lead to a turbulent flow. Dr. Waleffe's appointment is 75% in mathematics and 25% in engineering physics (College of Engineering).

After receiving the PhD in 1987 from the University of California - Berkeley, **James Propp** spent one year as a Visiting Professor at the University of Maryland and two years as an Adjunct Assistant Professor at Berkeley. He was on the faculty at MIT from 1990 to 1998 (with leave at the Mathematical Sciences Research Institute in Berkeley

in the falls of 1992 and 1996). Jim was appointed assistant professor at UW-Madison beginning with the 1998-99 academic year but spent the 1998-99 academic year as a Visiting Scholar at MIT, working on a book on the Solution of Fermat's Last Problem and continuing with his research program.



**Fabian Waleffe**

Propp's research is broad and interdisciplinary. He has made contributions to probability (Markov processes, ergodic theory), combinatorics (plane partitions, number theory, graph theory, mathematical games), random tilings, and integer programming. His work combines many subfields of mathematics and impacts Computer Science and Statistical Mechanics. Together with his student David Wilson, Jim invented an algorithm known as Coupling From The Past. This simple and beautiful idea leads to a means of obtaining reliable samples from the (exact) stationary distribution of a Markov chain. A second major area to which Propp has contributed is statistical mechanics and the study of quasi-crystals. Propp and others proved a conjecture about the deterministic limiting shape of a random tiling of a planar region called the Aztec Diamond. Their result is that there is a region of complete order and a region of random orientation, and that the boundary between the phases is exactly circular.

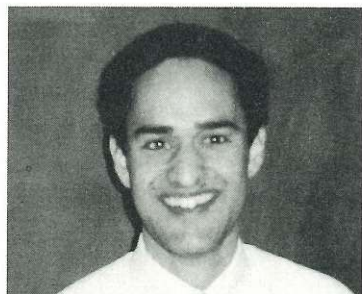


**James Propp**

In addition, to his research, Jim has a multifaceted teaching record. At MIT he worked extensively in his Tiling Lab with undergraduates, who produced good and publishable mathematics. Since joining us in Madison for the fall semester

this year. he is laying the foundation to recreate this Lab here in Madison. As a way of getting to know undergraduates (and for undergraduates to know him), he is taking an active role in the Undergraduate Math Club. Next June, Jim will be an invited speaker at the Formal Power Series & Algebraic Combinatorics (FPSAC) Conference held at Moscow State University in Russia.

**Arun Ram** also became an assistant professor at UW-Madison beginning with the 1998-99 academic year. He received the PhD in 1991 from the University of California - San Diego, spent one year at MIT on an NSF Postdoctoral Fellowship, held a Van Vleck Assistant Professorship at Wisconsin from 1992 to 1995 (partially supported by the same Fellowship), and was Assistant Professor at Princeton University from 1995 to 1999. He was on leave in 1995-96 at the University of Sydney with an Australian Research Council Senior Research Fellowship. Arun joined us in Madison beginning with the fall semester of the 1999-2000 academic year. At Princeton he was co-director of the Graduate Studies Program.



**Arun Ram**

Dr. Ram's research is at the interface between combinatorics and representation theory. He is an expert on Hecke algebras, which have important connections with combinatorics, representation theory, algebraic geometry, and number theory. He has determined the characters of the finite-dimensional Hecke algebras and Brauer algebras, constructed the irreducible representations of affine Hecke algebras, and found a remarkable generalization of the fundamental combinatorial notion of a Young tableau. Arun's formulas for the characters of the Brauer algebra have played a critical role in the theory of random orthogonal matrices in statistics, a topic with

connections to the long-standing problem of determining the zeros of the zeta function.

**Yongbin Ruan** received the PhD from the University of California - Berkeley in 1991. Before joining our faculty as an Associate Professor in 1995, he was a Research Instructor at Michigan State University



**Yongbin Ruan**

(1991-93) and Assistant Professor at the University of Utah (1993-96). Professor Ruan was awarded a Sloan Research Fellowship (1995-97). In 1998 he gave an invited lecture at the International Congress of Mathematicians.

Dr. Ruan's research area is geometry & topology and, increasingly so, mathematical physics. His presence at Madison has contributed enormously to the vigorous renewal of our program in geometry & topology. His work is at the forefront of one of the most active areas of mathematical research. Yongbin is founder of a new and important theory called quantum cohomology, which is used to define invariants for classifying symplectic manifolds. With An-Min Li he found the first instances of geometric maps which induce isomorphisms or homomorphisms (preserving algebraic structure) of quantum cohomology. The maps that they discovered belong to the subject of birational geometry, and one of Ruan's programs is to understand the deep relationship between quantum cohomology and birational geometry. His second major program is the solution of two conjectures in algebraic geometry - the Mumford conjectures concerning characterization of rational surfaces in higher dimensions by purely cohomological conditions. These conjectures fit into

Ruan's quantum cohomology theory, and their solution may lie in physics, which is the origin of quantum cohomology.

## **MELINDA CERTAIN GRANTED AN INDEFINITE APPOINTMENT**

**Melinda Certain** (PhD 1974, R. Askey), who has been a Faculty Associate in the Department of Mathematics since 1988, was recently granted an indefinite appointment. As the name suggest, an indefinite appointment has permanent status and is for an indefinite term; it is the analogue of tenure for academic staff appointments. Dr. Certain is the coordinator of the very successful Wisconsin Emerging Scholars Program (WES) whose main goal is improved success in calculus for minorities and other groups of people which historically have been under-represented in advanced mathematics, science, and engineering. The program, open to all qualified students, recruits minority and rural students (defined to be students from small graduating classes). A major part of this recruiting takes place in the summer when new freshmen come to Madison for the Summer Orientation and Registration Program.

In addition to the crucial leadership role in WES, Melinda also teaches one course each semester and engages in important outreach activities involving area public schools. Included among these is the UW Mega Math Meet for 5th and 6th graders in rural Dane County (outside of Madison). Eight regional meets lead to the Mega Math Meet in Madison, typically in May, at which eight teams vie for three trophies. The mathematics enthusiasm and excitement at these meets is something worth experiencing. It has become traditional for the Chair to greet the students and their teachers and to pose a problem, requiring some insight. At the last

two meets, one bright student - much to the surprise of the chair - solved the posed problem in just a few minutes! The student was awarded an elementary math book as a prize.



**Melinda Certain**

## Visiting Faculty

As usual, we have a number of visiting faculty this year, who are teaching and collaborating in research with our mathematics faculty.

### FALL SEMESTER TEACHING VISITORS INCLUDE:

**Michael Benedikt** from Bell Laboratories (Naperville, Illinois). Dr. Benedikt (PhD 1993, H.J. Keisler) is one of our recent alumni. His field of interest is mathematical logic.

**Rodney Downey** from Victoria University of Wellington (New Zealand). Professor Downey received the PhD from Monash University (Australia) in 1982. His research area is logic and computability theory.

**Joan Hart** from the University of Dayton (Ohio). Professor Hart (PhD 1996, K. Kunen) is also one of our recent alumni. Joan spent three years at Union College in Schenectady (New York) as a postdoctoral research and teaching fellow. Her fields of interest are set theory and mathematical logic.

**István Juhász** of the Mathematical Institute of the Hungarian Academy of Sciences (Budapest). Professor Juhász, a frequent visitor to Madison, works on set theory and mathematical logic.

Professors Benedikt, Downey, Hart, and Juhász are lecturing to graduate students in logic at different times throughout the fall semester.

**Edward Keppelmann** of the University of Nevada - Reno. Professor Keppelmann (PhD 1991, E. Fadell) is also an alumnus of Madison. Ed's research field is algebraic topology, especially fixed point theory. He is associate chair of the Mathematics Department at Reno.

**Yiming Long** of the Nankai Institute of Mathematics, Nankei University (P.R. of China). Professor Long (PhD 1987, P. Rabinowitz) is Dean of the College of Mathematics at Nankei University. His fields of interest include partial differential equations, dynamical systems, global analysis, and symplectic geometry.

**Ernesto Vallejo-Ruiz** of the Instituto de Matemáticas, UNAM (Mexico). Professor Vallejo-Ruiz received the PhD from the Heidelberg University in Germany in 1988. His fields of interest are representation theory of groups, algebraic combinatorics, and algebraic topology. Ernesto has also received a Fulbright Grant from the J. William Fulbright Foreign Scholarship Board.

### SPRING SEMESTER TEACHING VISITORS INCLUDE:

**Sergey Bolotin** of Lomonosov Moscow State University. Professor Bolotin, a frequent visitor to Madison - he last taught at UW-Madison in 1996, received the PhD in 1982 from Lomonosov Moscow State University. Sergey's main scientific interests lie in dynamical systems, variational methods, Hamiltonian systems, and stability theory.

**Sergey Ivashkovich** of the University Lille-I (Villeneuve d'Ascq, France). Professor Ivashkovich received the PhD from Moscow State University in 1983 and the Doctor of Science from the Steklov Institute (Moscow) in 1994. His areas of research interest include extension properties of meromorphic and holomorphic mappings, singularities of holomorphic bundles, and pseudo-holomorphic curves in complex and symplectic geometry.

## Honorary Fellows

As usual a number of individuals have come to Madison for all or part of the academic year to work with our faculty. Those appointed as Honorary Fellows this year are given below, along with the dates of their stay in Madison, their home institution, and sponsoring faculty member.

Choi, Jeongwhan, 1/20/99-2/28/2000, Korea Univ. (M. Shen)  
Dolfi, Silvio, Sem. 2/ 99-2000, Univ. of Florence (I.M. Isaacs)  
Hirschfeldt, Denis R., 8/15/99-9/30/99, Cornell Univ. (S. Lempp & R. Solomon)  
Imay, Martha T., 8/29/99-9/13/99, Ciudad Univ., Mexico (H. Schneider)  
Li, Anmin, 9/1/99-12/31/99 Sichuan Univ, P.R. China (Y. Ruan).  
Melian, Jorge, 3/2000-12/31/2000, Univ. of La Laguna, Spain (S. Angenent)  
Moreto, Alexander, 8/1/99-12/31/99, Univ. del Pais Vasco, Spain (I.M. Isaacs)  
Sangroniz Gomez, Josu, 11/1/99-12/5/99, Univ. del Pais Vasco, Spain (I.M. Isaacs)  
Tam, Bit-shun, 8/21/99-9/6/99, Tamkang Univ., Taiwan (H. Schneider)  
Wieczorek, Wojciech, 7/28/99-7/28/2000, (Y. Ruan)  
Wolf, Thomas (PhD 1977, I.M. Isaacs), academic year, 1999-2000, Ohio Univ. (I.M. Isaacs)  
Zhiming, Jiang, 12/16/99-12/15/2000, E. China Univ. of Sci. & Tech., P.R. China (R. Brualdi)

## Sabbaticals and Leaves

Three faculty members are on sabbatical for all or part of the academic year.

**Robert E.L. Turner** is on sabbatical all year studying and doing research in the Department of Applied Mathematics of the University of Pisa (Italy). He is working on applications of mathematics to neurophysiology. One aspect of the work is the continuation of his project of modeling the neural control of locomotion in the parasite "Ascaris suum." Another aspect is the development of a "Primer of Mathematics for Neurosciences" for instructional purposes. Bob was the Graduate Coordinator in the department for the years 1996-99.

**Anatole Beck** is also on sabbatical all year at the London School of Mathematics (England) where he has been a frequent visitor. He is working there on the

Rendezvous Search Problem (RSP) with Steve Alpern. The RSP involves the optimal way for two searchers to find each other along a linear course such as a road or river. Anatole hopes to involve undergraduate and graduate students in research on the RSP upon his return.

**Joel Robbin** will be on sabbatical in the spring semester at the ETH (Zurich) working with Dietmar Solomon. They will be studying the relations between (phase space) path integrals and symplectic geometry. Joel hopes to become more knowledgeable about the interface between mathematics and physics, knowledge that he can effectively use in his undergraduate and graduate teaching.

In addition to these sabbatical leaves, a number of other faculty are on research leave during this academic year. **Georgia Benkart** will be at MSRI (Berkeley) in the spring semester, participating in their algebra program. **Yong-geun Oh** is on leave again this year, spending the fall semester at RIMS, Kyoto University (Japan) and the spring semester at the Korean Institute for Advanced Study (KIAS) in Seoul (Korea). **Jean-Marc Vanden-Broeck** has a second year leave at the University of East Anglia (England). **Stephen Wainger** will be on leave at Princeton University in the spring semester. **Robin Pemantle** is on leave this year at Stanford University.

### TEA WITH JEAN-MARC VANDEN-BROECK

Waiting in the grocery check-out line last winter and reading the National Enquirer to compensate for the boredom, you may have been surprised to come to page 51 and see the headline:

#### *Nutty Professor Spends \$720,000 To Stop Teapots from Dribbling,*

with a picture of "wild-haired math professor" Jean-Marc Vanden-Broeck pouring a cup of tea from a dribbling (of course) teapot.

Jean-Marc, who has been on leave from UW-Madison these last two years at the University of East Anglia (Norwich, England), studies fluid flows. This study naturally led him to the "riddle" of why tea dribbles down the underside of a teapot's spout, rather than pouring cleanly. The \$720,000 refers to the research support Vanden-Broeck has received from government agencies to conduct research on fluid dynamics.

According to Vanden-Broeck, after spending a month applying his fluid flow techniques to studying the dribbling tea phenomenon: "Tea, or any fluid, dribbles down any design or shape of pot or pouring apparatus." He discovered that "the pressure in the fluid underneath the spout is very low. The fluid therefore gets pushed on to the spout by natural atmospheric pressure." Professor Vanden-Broeck's work applies to all fluid movement and has application to a variety of situations where liquid hits a hard surface such as the resistance of waves to a ship's hull.

This dribbling teapot story was also featured in a WEB-site ITN Online where the following quotes occurred:

From the marketing manage of the British Tea Council: "We welcome the professor's findings, and if he finds a cure for dribbling teapots that would really be fantastic."

From a spokeswoman for china teapot makers Wedgewood: "The art of pouring still tea still rests with the pourer, no matter how fine the teapot is." (Obviously, this person does not appreciate the scientific method.)

From a spokesman for Britain's Department for Trade and Industry: "If it is true, we congratulate the professor on his discovery. I am sure tea drinkers around the land tonight owe him a vote of thanks."

From the marketing communications manager of Twinings Tea: "My family has been pondering many aspects of the fine institution of tea drinking for 300 years, but I must confess the dribbling spout phenomenon has not been on that agenda. But it does come as a great relief to know that we can now sit back and enjoy a cup of tea without the frustration of wondering why the teapot dribbles."

Is it possible to design the "perfect teapot?" Jean-Marc thinks so but he needs to do more work to calculate the correct proportions. If he is successful, our expectations are that he will then become Sir Jean-Marc.



## Potluck Dinner Honors Retirees

Our traditional Department Potluck Dinner was held on April 24, 1999 in the ninth floor lounge of Van Vleck Hall. As usual, the occasion was very warm and supportive, with a large turnout and a wonderful feast of culinary creations by faculty and spouses.

The gathering also gave an opportunity to recognize the full retirements of three longtime colleagues: **Fred Brauer**, **Seymour Parter**, and **Hans Schneider**. The then chair recalled the career of each of the retirees with some more personal remarks provided by others.

**FRED BRAUER** received the PhD from MIT in 1956. He taught at the Universities of Chicago and British Columbia before joining UW-Madison in 1960. He was chair of the Department from 1979 to 1982. He officially retired in 1996 and began post-retirement service which, to our loss, he ended early at the end of the 1998 fall semester.

Fred's research interests have been and continue to be in differential equations and population biology, studying and modeling population growth, predator-prey systems, and infectious diseases. For many years Fred was the department's connection with the biologists scattered all over this campus. He has worked on the development of many courses in the department, including most recently two courses on probability and dynamical systems for biologists, courses which we believe will turn out to become standard fare for biology. Fred has co-authored six textbooks and, in addition, authored a research monograph. Seven students completed PhD dissertations under his guidance.

Fred was devoted to the department and readily volunteered to serve on committees and to teach wherever he was needed. As most

everyone knows, Fred and Esther have moved to British Columbia to be near one of their children and family. The result is that we don't get to see Fred and Esther as much as we'd like to. But we do expect regular visits.

Bob Wilson provided some personal remarks about Fred, as did Carlos Castillo Chavez, Fred's 4th PhD student, who came from the IMA in Minneapolis with his family to be with Fred and us that evening.



**Carlos Castillo Chavez  
and others**

**SEYMOUR PARTER** received the PhD from New York University in 1958, writing a thesis under Lipman Bers. After two

years at Indiana University and three years at Cornell, he came to Madison in 1963 with appointments in both Mathematics and Computer Sciences. He officially retired in 1996 and did post-retirement service for three years until it ended in the fall of 1998. Seymour was chair of the Computer Sciences Department from 1968 to 1970.

Seymour's research interests have been in applied and computational mathematics. His research has been broad and influential including contributions to iterative methods for the numerical solution of PDEs, eigen- and singular-values of Toeplitz forms, one of my favorites - analysis of Gaussian elimination using graph theory, and norms and spectral equivalence of elliptic PDEs. I was pleased to have the opportunity to contribute to a joint paper with Seymour during my first year here at Wisconsin. I still have a vivid memory of that year when so many math faculty were living in University Houses.

Seymour took on many important national responsibilities during his long career: President of SIAM, Chair of the Conference Board of Mathematical Sciences, and the Committee on the Undergraduate Program in Mathematics, Managing Editor of the SIAM Journal on Numerical Analysis, to name a few. A special issue of this journal was dedicated to Seymour on the occasion of his 65th birthday. Thirteen students have written dissertations under his supervision, some in Mathematics and some in Computer Sciences.

I view Seymour as one of the wise people in the Department who one could always count on for penetrating insight at department meetings and other occasions. Seymour and Ruth are expert skiers, downhill and cross-country, with Ruth's passion for dancing complementing Seymour's passion for running.

Jake Levin provided some personal reminiscences, and took advantage of the chair's request to provide such remarks which included these words: "I must admit that you were not the first person to come to mind in this case. But Carl de Boer is out of town and so are Marshall Slemrod and Si Hellerstein." Jake's particular way to tell us he was fourth choice resulted in great laughter.

**HANS SCHNEIDER** received the PhD in 1952 at the University of Edinburgh with a thesis written, at least nominally, under A.C. Aitken. According to Hans, he received essentially two words of advice from Aitken: READ FROBENIUS. Those of us who know Hans well know he took this advice to heart; he even called his computer Frobenius. This was good advice that shaped Hans' mathematical career. After seven years at Queens University in Belfast, including one year on leave at Washington State, Hans joined our mathematics department in 1959. He served as chair of the Department from 1966 to 1968. In 1988 he was named James Joseph Sylvester Professor of Mathematics. Hans officially retired in 1993 but continued post-retirement service which ended in the fall of 1998.

Hans has been an active and influential linear algebraist for nearly 50 years - an enormous length of time. The different areas of linear

algebra to which he has made fundamental contributions are many: nonnegative matrices, M-matrices, norms, numerical ranges, combinatorial and graph-theoretic matrix theory, Jordan and spectral theory, inertia and stability theory, matrix scalings, cone preserving maps, matrix polytopes, ... I can't think of any more influential or more important linear algebraist in this century.

Hans became editor-in-chief of the journal "Linear Algebra and its Applications" (LAA) in 1972 and he developed it into a major mathematics journal. He was instrumental, indeed the driving force, in the creation of ILAS, the International Linear Algebra Society. He was the founding president of the Society and served as president from 1987 to 1996. It was with some trepidation that I assumed the ILAS presidency in 1996 because of the risk involved in following in his giant footsteps.

Sixteen students have written dissertations under Hans' guidance, with one more yet to come. Two of them, Bob Wilson and Yvonne Nagel, are here tonight, his 7th and 9th student, respectively.

Throughout his career, Hans has enjoyed enormous support from his wife Miriam. She has managed to give this and at the same time have a remarkable career as a Madison violinist and violin teacher.

Marshall Osborn provided some anecdotes about Hans and Miriam and their early years together in Madison.

John Nohel, being in Zurich, sent some personal and congratulatory remarks about each of the retirees to be read at the gathering.

Each of Fred, Seymour, and Hans has contributed immeasurably and in different but important ways to this department and our lives in it. Each of them has been with us for nearly forty years - Fred for 38, Seymour for 36, Hans approaching 40. We owe them a debt of gratitude.

After noting the recent and impending birthdays of the retirees and other distinguished people present, the "traditional" birthday cake went to **Mary Ellen Rudin** who celebrates her 75th birthday on December 7, 1999. A rousing rendition of Happy Birthday To Everyone (!) closed this part of the program. The program itself closed with some remarks by Alex Nagel, Don Passman, and Hans Schneider about the retiring chair, Richard Brualdi.

**Larry Levy**, who announced his retirement too late to be included in the festivities reported above, retired from active teaching in May, 1999. This academic year he is spending much of his time traveling and working with collaborators (normally via email). He will spend one month at MSRI in Berkeley, three months at the University of Leeds (England), and will also make shorter visits to Italy and Mexico.

Larry Levy received the PhD in 1961 from the University of Illinois, after receiving both a B.S. (1954) and M.S. (1956) from the Juilliard School of Music. He began his professional mathematical career in 1961 with an appointment as Assistant Professor, becoming Professor in 1971. He spent 38 years at UW-Madison, including one year as Visiting Professor at Wayne State University in 1989-90.

Larry's mathematical research has focused on the module theory of commutative and almost commutative rings, studying in particular, their Krull-Schmidt properties and direct-sum cancellation. Larry writes long papers, often over 100 pages in length. In recent years, he has solved a number of classical problems concerning elementary divisor theory. His interest and dedication to undergraduate teaching is evident from the two undergraduate textbooks he wrote: "Geometry: Modern Mathematics via the Euclidean Plane" (1970) and "Trigonometry with Calculators" (1983). Larry was very interested in teaching in our new multimedia classroom B130 Van Vleck Hall, and paid careful attention to details concerning it. Fourteen graduate student theses were supervised by him. His students remain among his favorite coauthors.

Larry is known in the Department as a gifted pianist, and there were many occasions when we had the pleasure of hearing him perform. We hope there will be more such opportunities.

Expected retirements this year include **Phil Miles** and **Marshall Osborn**. Also **Howard Conner** has been teaching under a post-retirement teaching agreement which ends this year. In addition, **Si Hellerstein** and **Rod Smart** whose post-retirement agreements do not end until 2001 have announced their plans to fully retire at the end of this academic year.



**Seymour Parter, Richard Brualdi, Hans Schneider,  
and Fred Brauer**

## *Dedications, Honors, and Awards...*

### **DAVID GRIFFEATH AND YONGBIN RUAN RECEIVE VILAS ASSOCIATE AWARDS**

Professors **David Griffeath** and **Yongbin Ruan** have been named Vilas Associates by the Graduate School for the years 1999-2001. These competitive awards provided summer salary support for two years, and \$10,000 in flexible funds each year for expenses incurred in pursuit of scholarly activity. That brings to seven the number of such awards won by members of the department in the four years of the Vilas Associates Program.

You can read about Yongbin Ruan in the column of this newsletter concerning his promotion to Professor.



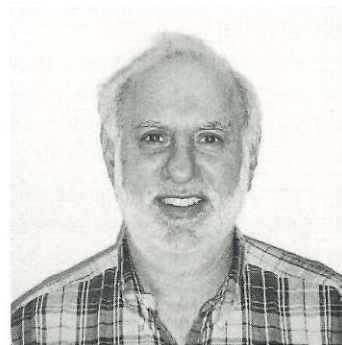
**David Griffeath**

**David Griffeath** received the PhD in 1976 from Cornell University. He came to UW-Madison in 1977 as an assistant professor, and was promoted to associate professor in 1980 and full professor in 1983. He was an Alfred P. Sloan Research Fellow in 1982-84.

David is a leader in the explosive development of the theory of interacting particle systems. The goal of this theory is to develop models for random spatially distributed phenomena, with motivation coming from diverse sources such as magnetism, the spread of disease in a forest, or noise in the transmission of a satellite photo. The rapid growth of the field has depended on several essential ingredients. In his early research, David did fundamental work on the new tool of coupling. Another ingredient has been the identification of new models. With collaborators, he introduced cyclic particle systems which provide one of the simplest and most striking examples of a “self-organizing” system long sought by theoretical physicists and others. In the last decade, a third important ingredient has been the use of computational methods to explore the behavior of complex systems. These methods have been used by David to both discover new mathematical phenomena and to identify productive methods for rigorous mathematical treatment. With Bob Fisch (PhD 1988, D. Griffeath), he has developed Windows-based software for the simulation of particle systems that allow one to explore complex models without specialized equipment or sophisticated programming expertise. Together they won the 1998 EDUCOM/NCRIPTAL Award for Best Mathematics/Best Integrated Software: Graphical Aids for Stochastic Processes (GASP). David’s website the “Primordial Soup Kitchen” was featured in the October 1998 issue of Science.

### **DONALD PASSMAN WINS NATIONAL MAA TEACHING AWARD**

**Donald Passman**, Richard Brauer Professor of Mathematics, is one of three recipients of the Deborah and Franklin Tepper Haimo Award for Distinguished College or University Teaching of Mathematics. Passman was selected to be the recipient of the 1999 Distinguished Teaching Award of the Wisconsin Section of the Mathematical Association of America, and he became the Wisconsin Section’s nominee for the national award. The award will be presented at the Joint AMS-MAA Prize Ceremony on January 20, 2000, at the national meeting in Washington, D.C. There will be a Special Session on January 21, in which Don will give a 25-minute presentation on teaching - either a short exemplary lecture on a mathematical topic or a lecture on what he perceives to constitute outstanding teaching. Don has chosen as his title “The End of Calculus.”



**Don Passman**

In last year’s newsletter we reported on Don’s selection for the UW-System Underkofler Excellence in Teaching Award.

### **RICHARD ASKEY ELECTED TO THE NATIONAL ACADEMY OF SCIENCES**

**Richard Askey**, Gabor Szegő Professor of Mathematics, was elected to the National Academy of Sciences in April of this year.

It can be said, and indeed it has often been said, that Richard Askey is the foremost living specialist on the theory of special functions, perhaps even the best who ever lived. He is the “Great Master” of special functions and perhaps as no other, is responsible for the revival of the field of special functions in the last twenty years. His work has had extraordinary impact on a variety of fields within mathematics and on other areas of science as well. He is an inspiring teacher and historian of mathematics, deeply involved in current efforts to improve mathematics education at all levels.

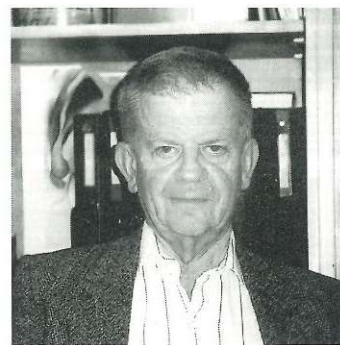
Thanks to the work of Richard Askey, the field of special functions has become very central in mathematics. Special functions are objects with extraordinary properties which allow them a wide range of applicability. The simplest examples are the trigonometric functions. These are included in a larger family introduced by Euler and Gauss, the hypergeometric functions, which include most of the functions used in mathematical physics and other areas of application.

The field of special functions (and its companion field of orthogonal polynomials) is one of the oldest areas in mathematical analysis. There is a vast literature concerning them, almost too large for one

person to absorb - although Askey has done the impossible and assimilated essentially all of it! There was a time, say thirty or forty years ago, when prevailing wisdom said that the field was played out, a backwater with nothing important left to be done. Askey had the foresight to take up this discipline and show that there were a wide variety of entirely new things to be done, accompanied by a wide variety of applications. He has systematized the whole subject of hypergeometric orthogonal polynomials; the results have been summarized by others in a large wall chart called "Tableau d'Askey." He has stimulated a whole generation of mathematicians to explore the connections between his field of special functions and the rest of mathematics.

About twenty years ago, Askey began to combine his expertise on special functions with the study of  $q$ -series, another subject with Eulerian roots and the  $q$ -analogues of classical special functions and orthogonal polynomials. Although  $q$ -series have some connection to problems in number theory, for example via theta functions, or the famous partition identities of Rogers and Ramanujan, they too would have been considered a backwater twenty years ago. Again Askey showed prescience in his choice of problems. These series have come to the forefront in contemporary mathematics: they occur for example in the character theory of infinite dimensional (Kac-Moody) Lie algebras. In the direction of applications,  $q$ -series have been a major force behind recent progress on exactly solved models in statistical mechanics. There are also connections with quantum groups, a field of intense current activity. Askey has unearthed and extended results of Rogers which led to new families of polynomials known as the Askey-Wilson polynomials and the "sieved" polynomials. One of the triumphs of mathematical analysis in the last fifteen years, de Brange's proof of the Bieberbach conjecture, rests on an inequality for orthogonal polynomials due to Askey and his collaborator George Gasper. Askey has been a key player in the revival of interest in Ramanujan and has applied some of Ramanujan's integrals to hypergeometric and basic

hypergeometric series. In 1999 he co-authored the book "Special Functions" (Encyclopedia of Mathematics and its Applications, Cambridge University Press) with George Andrews of Penn State University and Ranjan Roy of Beloit College.



**Richard Askey**

A special issue of "Methods and Applications of Analysis" was recently dedicated to Dick Askey, on the occasion of his 65th birthday in June 1998, with more to come. The special editors of these issues are Mourad E.H. Ismail of the University of South Florida (and in the past a frequent visitor to Madison) and Dennis Stanton (PhD 1977, R. Askey). To quote from their preface: "Dick played a central role in the recent advances in multivariable special functions and orthogonal polynomials. He formulated many conjectures and pointed many talented people in the right directions. He always has had the right intuition and his predictions have always been borne out. If Dick were born in the middle ages he would have undoubtedly been condemned for practicing witchcraft."

Richard Askey, who has been on the UW-Madison faculty since 1963, deservedly has been called a "national treasure." There is no one else like him on the international mathematical scene.

Election to the Academy is an honor regarded as only second to the Nobel Prize. The Department of Mathematics now has three members in the Academy; besides Askey, Carl de Boer and Paul Rabinowitz are also members.

## *Special Lectures...*

On March 17, 1999, Professor Emerita **Cathleen Morawetz** of the Courant Institute of NYU gave the Fourth Wolfgang Wasow Memorial Lecture. The title of her lecture was "Variations on the Wave Equation." Professor Morawetz provided the following description of her lecture, which was received with great enthusiasm by faculty and graduate students:



**Cathleen Morawetz**

"Many variations or what should more properly be called perturbations of the wave equation may be studied by conservation laws based on invariance properties and a well known theorem of Emmy Noether. As a model we begin with the Tricomi equation and a generalization that is invariant under translation in the  $x$  direction and derive a very useful conservation law. For higher dimensions we

consider some variations that do not necessarily preserve the conservation laws but yet we can find good estimates, decay theorems and asymptotic validity by preserving some positivity. These include reflecting obstacles and semilinear variations.

"Finally we come to black holes and wave equations and the problem of finding a metric to describe a black hole mathematically. Here we find special difficulties introduced by singularities. Estimating becomes much harder because the perturbation to the wave equation is also quasilinear. These properties are described using the model of Christodoulou."

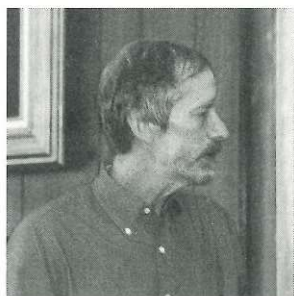
Dr. Morawetz was introduced with the words:

"Cathleen Synge Morawetz is a powerful mathematician who has made pioneering contributions in partial differential equations and wave propagation. Her work has led to practical advances in aviation - wing design, in geometric optics - radar and sonar, and many other applied areas.

"Dr. Morawetz has spent most of her career at NYU where she received a PhD in 1951 and is now Professor Emerita. She was President of the American Mathematical Society in 1995 and 1996, and is a member of the National Academy of Sciences. Recently, she was awarded the National Medal of Science, one of only 362 scientists of all persuasions to have been so honored since the first award in 1962 and the first woman mathematician to be so honored.

"We are very pleased to welcome her back to Madison after about a 20 year absence to give the Fourth Wolfgang Wasow Memorial Lecture."

The Fifth Memorial Lecture will be given next spring by L.C. Evans from UC-Berkeley.



**Robert MacPherson**

Professor **János Kollár** of the University of Utah was the Spring 1999 Distinguished Lecturer. Professor Kollár, who is now at Princeton University, is an acclaimed algebraic geometer. He visited the department during the week of April 15, 1999 and gave two lectures. The first was aimed at advanced undergraduate students and graduate students and was on "How small can a polynomial be near infinity?" According to Yongbin Ruan, this was "a rare opportunity for our students" to hear a lecture on such a topic by a distinguished

algebraic geometer. Professor Kollár provided the following abstract of this talk:

"Let  $f$  be a polynomial of degree  $d$  in  $n$  variables. Let  $\|(x_1, \dots, x_n)\|$  be the square root of  $x_1^2 + \dots + x_n^2$ . It is clear that

$$|f(x_1, \dots, x_n)| < C \|(x_1, \dots, x_n)\|^{d\}}$$

for suitable  $C > 0$ . The aim of the lecture is to consider when a reverse inequality

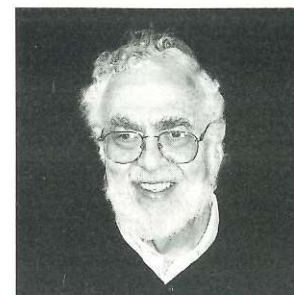
$$|f(x_1, \dots, x_n)| \geq c \|(x_1, \dots, x_n)\|^{M\}}$$

holds, with suitable  $c > 0$  and  $M$ . In many cases, for instance if  $f$  is linear, no such inequality can hold. Our aim is to understand for which polynomials such a bound exists and to find the optimal value of  $M$ ."

Professor Kollár's second talk was titled "The topology of real and complex algebraic varieties" of which a summary is: "The aim of this talk is to consider to what extent the topology of an algebraic variety determines its algebraic properties. I will begin by defining algebraic varieties and surveying the basic results of Milnor, Sullivan and Thom. Then I outline the recent solutions to a conjecture of Nash in dimension three."

**Robert MacPherson** of the Institute for Advanced Study is the Fall 1999 Distinguished Lecturer. He visited the department on November 17-19, 1999 and gave three stimulating talks: "Geometry of Arrangements of Subspaces," "intended especially for graduate students and undergraduates; "Topology of Modular Varieties" to the Topology seminar; and "On Hecke Correspondences," to a general Colloquium audience.

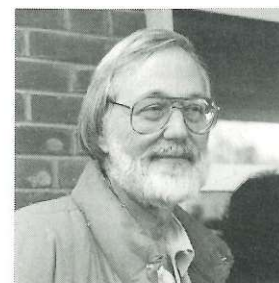
Professor **John Milnor** of SUNY at Stony Brook gave a campus lecture on December 11, 1999. Professor Milnor's lecture, "Pasting together Julia Sets", was sponsored by the University Lectures Committee. His many honors include: 1962 Fields Medalist, member of the National Academy of Sciences, 1967 National Medal of Science winner, and 1989 winner of the Wolf Prize. The lecture drew such a large audience that it had to be moved to one of the large lecture rooms in Van Vleck Hall.



**Gene Golub**

The fourth annual lecture in the series related to the Elsevier journal *Linear Algebra and Its Applications* - the LAA Lecture - was given by **Gene Golub**, Fletcher Jones Professor of Computer Science at Stanford University, on May 7, 1999. The title of the lecture was "Iterative Methods for Solving Linear Systems." Professor Golub, noted for his work in the use of numerical methods for solving scientific and engineering problems, is a former President of SIAM and a member of both the National Academy of Engineering and the National Academy of Sciences. He provided the following description of his lecture: "We discuss several problems in connection with solving linear systems. First, we consider various pre-conditioners for solving a variety of problems. This includes pre-conditioners for solving indefinite systems, and non-symmetric problems, especially when the skew-symmetric part of the matrix is dominant. Next, we describe the use of inner and outer iteration methods for solving problems where it is not possible to solve the equations using the pre-conditioner exactly. We attempt to restore the rate of convergence of the problem. Finally, we analyze the convergence properties of a method when the initial vector is considered to be a random vector. We give some numerical examples."

The Fifth LAA Lecturer will be **Alan Edelman** of MIT with the lecture scheduled for March 24, 2000.



**John Milnor**

## Conference news

**THE HS-GRAPH** As reported in last year's newsletter, the 7th ILAS (International Linear Algebra Society) Conference, the "Hans Schneider Linear Algebra Conference," was held in Madison on June 3-6, 1998. A double volume of "Linear Algebra and its Applications" containing papers presented at the conference is being published this fall and is dedicated to Hans.

In a tribute to **Hans Schneider** in that volume, written by Richard Brualdi, a labeled graph was defined, motivated by the observation that Hans has had 67 different co-authors. The HS-graph (H,S), modeled after the well-known Erdős-graph, has vertex set H consisting of the set of linear algebraists (so subject to change). Two vertices are joined by an edge in S provided their names appear together on a joint paper. In this graph, the degree of the vertex labeled Hans Schneider has degree (valence) equal to 67. The HS-number of a vertex is defined to be the length of the shortest path to the vertex Hans Schneider, abbreviated HS. Thus, the only vertex with HS-number equal to 0 is the vertex HS itself; a vertex X has HS-number equal to 1 provided X has written a paper with HS (so there are currently 67 vertices with HS-number equal to 1), and has HS-number equal to 2 provided X has not written a joint paper with HS but X has written a joint paper with some vertex Y who has written a joint paper with HS. The following problem was posed: Determine the connected components of the HS-graph, and the diameter of the component containing HS (the largest HS-number of a vertex in that connected component).

**RICHARD BRUALDI'S 60TH BIRTHDAY** (September 2, 1999) was celebrated at the meeting of the International Linear Algebra Society (ILAS), held in Barcelona in July 1999. On the occasion of ILAS President Brualdi's birthday, Alan Hoffman (IBM) gave an invited address entitled "On Brualdi's Generalization of Gersgorin's Theorem". Hoffman began his talk by saying that he had always been a little jealous of the result in question because it was so simple and so elegant.

Bryan Shader (PhD 1990, R.A. Brualdi) and Hans Schneider (UW faculty 1959-) organized a mini-symposium that was very neutrally entitled "Combinatorial Matrix Theory" in order to surprise Richard. The following former students of Richard's were among the speakers at the mini-symposium: Suk-Geun Hwang (PhD 1985), who spoke on some joint work with T.S. Michael (PhD 1988), Han-Hyuk Cho (PhD 1988), and Bryan Shader. Two former visitors to UW, and coauthors of Richard, also spoke in the mini-symposium: Alex Pothén (Vis. Asst. Prof. 1990 - 1991) and Peter Gibson (Hon. Fellow, 1974-1975).

Other participants in the ILAS meeting included Wisconsin Ph.D.'s Bryan Cain (PhD 1967, H. Schneider), David Carlson (PhD 1963, H. Schneider), Judi MacDonald (PhD 1993, H. Schneider), Nancy Neudauer (PhD 1998, R.A. Brualdi), and Jeff Stuart (PhD 1986, H. Schneider), and former Wisconsin faculty members Wayne Barrett (Van Vleck Asst. Prof. 1975 - 1977), Daniel Hershkowitz (Van Vleck Asst. Professor, 1983-1985), Michael Tsatsomeros (Vis. Asst. Prof. 1992) and Chi-Kwong Li (Van Vleck Asst. Prof. 1986 - 1988), who gave the Olga-Taussky/Jack Todd plenary address, "Recent studies on the numerical range", to an audience of about two hundred participants.

*Contributed by Hans Schneider, Bryan Shader, and Jeff Stuart*

### \$\$ FUNDS AND CONTRIBUTIONS \$\$

We hope that you will consider giving to the Departmental General Fund at the UW Foundation, or one of the special funds also held at the Foundation. The special funds are: Wolfgang Wasow Memorial Lecture Fund, Stephen Cole Kleene Memorial Fund for Logic Students, Department of Mathematics - Elizabeth Hirschfelder Fund for Graduate Women in Mathematics, Chemistry & Physics, H. Jerome Keisler Prize for a Logic Thesis, R. Creighton Buck Undergraduate Prize for Creativity in Mathematics. If your employer matches contributions, then you are effectively doubling your contribution.

Donations can be earmarked for the Mathematics Department or one of the named funds and sent to:

UW Foundation, P.O. Box 8860, Madison, WI 53708-8860.

## CONFERENCE ON SINGULAR AND OSCILLATORY INTEGRALS JANUARY 7-11, 1999

As reported in last year's newsletter, a conference on Singular and Oscillatory Integrals was held in Madison on January 6-11, 1999. The conference was dedicated to the mathematical contributions of **Steve Wainger** during his distinguished career at the University of Wisconsin-Madison. The organizing committee consisted of Anthony Carbery, Alexander Nagel, Andreas Seeger, and James Wright (PhD 1990, S. Wainger). The invited speakers at the conference included:

William Beckner, University of Texas-Austin; Michael Christ, University of California-Berkeley; Charles Fefferman, Princeton University; Robert Fefferman, University of Chicago; Allan Greenleaf, University of Rochester; Nets Katz, University of Illinois-Chicago; Carlos Kenig, University of Chicago; Akos Magyar, UW-Madison; Detlef Muller, Christian-Albrechts-Universitit Kiel; Kate Okikiolu, University of California-San Diego; Duong H. Phong, Columbia University; Fulvio Ricci, Politecnico di Torino; Christopher D. Sogge, Johns Hopkins University; Elias M. Stein, Princeton University; Wilhelm Schlag, Princeton University; Terence Tao, University of California-Los Angeles; Guido Weiss, Washington University-St. Louis; Thomas Wolff, California Institute of Technology; Sarah Ziesler, University College Dublin and Dominican University. In addition, Anthony Carbery (University of Edinburgh) and James Wright (University of New South Wales) gave lectures which were instructional in nature and were targeted at graduate students and recent PhDs.

Participants were welcomed by the chair, whose remarks included:

"On behalf of the Department of Mathematics I am very pleased to welcome you to Van Vleck Hall and UW-Madison. Probably the most important information I can give you is that the best place to buy winter parkas, boots, hats, and gloves is at Fontana, half way down State Street. My toboggan is parked on the plaza of Van Vleck Hall for getting down Bascom Hill. If you are interested in ice-fishing, Yongbin Ruan can lend you the appropriate equipment. There are two people in the department - Jean-Pierre Rosay and myself - who are crazy enough to ride bicycles under the current conditions. The Yellow Jersey bicycle shop, also on State Street, rents bicycles. Jean-Pierre and I can give you pointers on how to bike up snow-packed hills and stop on ice-slicks (actually while riding a bicycle on an ice-slick, it's best not to try to stop).

"Madison has a long and distinguished tradition in analysis. To name a few of the outstanding analysts who have spent most of their career here, let me mention: E. B. Van Vleck, R.E. Langer, R.C. Buck, W. Wasow, L.C. Young, W. Rudin, and Steve Wainger whose impressive mathematical contributions are being recognized at this conference.

"Steve, who was recently named Antoni Zygmund Professor of Mathematics, is completing his 34th year in our Math Department. He has been and is a dedicated and loyal mathematician, colleague, and friend. Steve is an exceptionally talented person with a big and generous heart. I personally am very delighted to see him in the spotlight this week."



**Steve Wainger enjoying the banquet**

The conference opened with a talk by Alex Nagel on "Remarks on the mathematical work of Stephen Wainger." To quote from his talk: "Steve has worked on problems in all of the following list of areas - series expansions in special functions, the theory of probability, function theory in one variable, function theory in several variables, partial differential equations, singular Radon transforms, Littlewood-Paley theory, and number theory. ... By my count, he has collaborated on papers or co-edited proceedings with thirty-four other

mathematicians. He has supervised sixteen Ph.D. theses." Following a description of some of the mathematics Steve has worked on, Alex went on to include the following comments: "Steve has an uncanny sixth sense that seems to tell him that there is a good theorem lurking out there. ... Steve loves and lives to share his ideas. He is personally and mathematically gregarious ... He is an almost unbelievable mix of enthusiasm, generosity, warmth, mathematical insight, and what, for lack of a better word, I can only call other-worldliness."

A banquet was held in the Wisconsin Memorial Union on January 9. Several people offered reminiscences and stories, usually humorous, about Steve Wainger. That so many people came to a conference during the coldest part of winter in Madison is evidence of the affection, admiration, and respect so many people have for Steve.

# The Stephen Cole Kleene Mathematics Library

On May 14, 1999, the Mathematics Library in Van Vleck Hall was dedicated as the **Stephen Cole Kleene Mathematics Library**. Taking part in the ceremony were **Phillip R. Certain**, Dean of the College of Letters and Sciences and **H. Jerome Keisler**, Vilas Professor of Mathematics. A new sign for the library is now in place (see accompanying photo), and a picture of Kleene and a plaque are now displayed in a prominent place in the library. On hand for the ceremony were Louis Pitschmann, Associate Director for College Development of the General Library System and Sandra Pfahler, Associate Director for Member Libraries. Also on hand were Barbie McConnell, the new Librarian of the Kleene Math Library and her assistant, Thomas Adeetuk. Regrettably, Shirley Shen who retired in 1998 as Math Librarian after more than 30 years of dedicated service to our library was unable to attend.

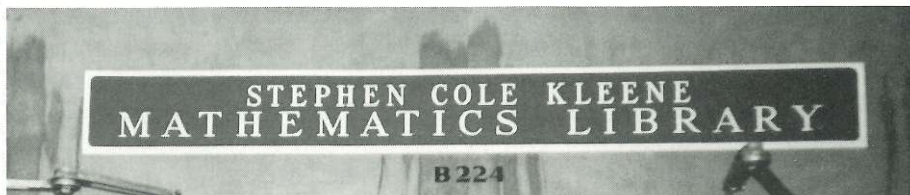
**Stephen Cole Kleene** was born on January 5, 1909 in Hartford, Connecticut. He received a Bachelor of Arts degree from Amherst College in 1930, and a Ph.D. from Princeton University in 1934 under the tutelage of Alonzo Church. Kleene first came to Madison in 1935 as an instructor and in 1937 was promoted to assistant professor. During the next several years he spent time at the Institute for Advanced Study in Princeton, taught at

Amherst College, and served in the U. S. Navy, earning the rank of lieutenant commander during World War II. He returned to Madison in 1946, was promoted to full professor in 1948, and remained on the faculty for the remainder of his

career. He became the Cyrus Colton MacDuffee Professor of Mathematics in 1964.

Steve built a widely acclaimed logic group in the Mathematics Department. He served as chair of the Mathematics Department (1957-58 and 1960-62). He also served as chair of the Department of Numerical Analysis (now Computer Sciences) Department

(1962-63) and acting director of the Mathematics Research Center (1966-67). Kleene was the Dean of the College of Letters and Science from 1969 to 1974. In 1969 he was elected to the National Academy of Sciences; in 1983 he was awarded the American Mathematical Society Steele Prize for his seminal papers of 1955 on recursion theory and descriptive set theory. In 1990 Steve Kleene won the National Medal of Science, the country's highest scientific honor.



Steve Kleene was one of the pioneers of 20th century mathematics. Beginning in the 1940's, he helped lay the foundation for theoretical computer science. He played a seminal role in the foundation of recursion theory, a rigorous mathematical theory of computable functions which describes those functions that can be calculated by a digital computer. One of the reasons for the importance of recursion theory is that it can be used to show that some mathematical problems can never be solved no matter how much computing power is available. Kleene wrote many very influential papers and two books: "Introduction to Metamathematics" (1952) and "Mathematical Logic" (1962). He was co-author of the book "The Foundations of Intuitionistic Mathematics" (1965).

Kleene retired from active service at the University of Wisconsin - Madison in 1979 and was professor emeritus until his death on January 25, 1994.

We in the Department of Mathematics owe a lot to Steve Kleene. Steve was chair of the Building Committee during the four years from 1958 to 1962 in which Van Vleck Hall was planned and constructed. As he once wrote, "being Chairman of the Building Committee was a more time-consuming job than being Chairman of the Department." The 9th floor conference room in Van Vleck Hall was funded partly by the National Science Foundation in their program for funding facilities for science research. Steve drafted the original proposal to NSF from which we quote:

"Mathematical research is produced normally by a combination of active group discussion, and long hours of concentrated and relatively isolated individual work. The rooms for these activities are the mathematicians' laboratories, and are as important to mathematicians as are laboratories of the commonly understood sorts to other science departments."

Steve's arguments were persuasive to NSF and they granted \$50,000 which was matched by the Wisconsin Alumni Research Foundation.

Originally, the thought was to put the conference room on the third floor, close to the administrative offices.

Steve and the Building Committee then realized that, on the contrary, it would be better to be as far away from the administrative offices as possible (not something that probably took a lot of discussion!). As a result a new 9th floor was added to the building plans. We also owe to Steve the wonderful alcove at the northeast corner of the conference room, where a round table now sits. According to the architects' original plans, this corner was to be the end of the stairway with a straight wall running east with a closet "suitable for storing folding chairs." It was Steve who realized the wonderful vista of Lake Mendota that would be provided if the northeast corner were open. (Thanks, Steve!)

Besides the laboratory of a place for informal discussions and a quiet place for contemplation, the other "laboratory" for mathematicians is the library where mathematical papers and books are archived. Of course, in our increasing

reliance on electronic storage and access, the role of the library is changing dramatically. But a mathematics library no matter what form it may take will continue to be of paramount importance. By naming our library the Stephen Cole Kleene Mathematics Library we honor a person who played an important role in the development of our department and its building.



**Dean Phil Certain**



**H. Jerome Keisler**

# *Student and Instructional News...*

## *Undergraduate*

### UNDERGRADUATE RESEARCH

Four of our undergraduate mathematics majors were chosen to participate in Research Experiences for Undergraduates (REUs) this past summer. **Suzy Reichel** (a freshman) and **Matt McGinley** (a sophomore) participated in an REU at Tulane University in New Orleans. Suzy worked with James Rogers on "Continuous Images of Nonseparating Plane Continua." Matt, who worked with Frank Tipler, did his project on "A compact exact solution to Einstein's Field Equations in which matter escapes from black holes."

**Ryan Gantner** participated in an REU at the University of Maryland, Eastern Shore; the title of his project was "Sequential and Parallel Implementations of the Lanczos Algorithm for Symmetric Matrices" and it was under the direction of Prof. Daniel Okunbor (computer science). **Scott Simon** was part of an REU at Iowa State University. His project was titled "Scientific Computing: Superconductivity" under the direction of Prof. Janet Peterson

Four of our undergraduates are involved with research projects with faculty this year, under the auspices of our VIGRE grant. They are: **Lydia Diemer** (A. Assadi) on modeling visual perception of perspective in art and architecture, **Ann Scheels** (D. Griffeath) on ergodic behaviour of models for emergence of traffic jams, **Ryan Gantner** (R. Brualdi) on  $(0,1)$ -matrices and Young tableaux, and **Paul Brodhead** (S. Lempp and R. Solomon) on logic and computation theory.

### UNDERGRADUATE MATH CLUB

The Undergraduate Math Club is off to a very enthusiastic start this academic year. Officers of the club are: **Ann Scheels**, President; **Alex Miller**, Vice-President; **Katie Condon**, Secretary; and **Gina Olstad**, Treasurer. Activities being planned include a GRE-Study Group and Problems of the Week. A WEB site has been constructed (<http://www.math.wisc.edu/~mathclub/>) that contains updates on the schedule, the problems, and useful links. The first talk of the semester was given by **Jim Propp** on "Number friezes, number walls and other tabular recurrence schemes." Jim Propp has also given a talk on topics related to undergrad research. **Marty Isaacs** gave a talk with title "Dirty children, unfaithful husbands and similar problems."

Ideas for future programs include: talks by faculty, graduate students, and undergraduate students, math games (e.g. Mafia. Werewolves), movies (e.g. Pi), play readings, ... **Dan Shea** and **Jim Propp** are two faculty members who have taken an active interest in the Math Club.

### LINKS PROGRAM

The LINKS program (formerly called the Foundation Coalition) is a cooperative program, funded by the National Science Foundation, involving the College of Engineering and the Departments of Mathematics, Chemistry, Physics, Computer Science, and Statistics. This semester certain sections of courses in math, chemistry, physics and engineering are linked, with sections in statistics, and computer science scheduled for linking in future semesters. **Robert Wilson** is part of the interdepartmental group of organizers. Marty Isaacs, Dan Shea, and Bob are currently teaching math courses which are participating. The program creates linked packages of sections a student can enroll in, which promise to cooperate in everything from assignment schedules to what and how material is covered.

### UNDERGRADUATE SCHOLARSHIPS AND PRIZES

This past year our annual Graduate Student Awards Ceremony, held on May 5, was renamed **Student Awards Ceremony** to include undergraduate awards too.

The undergraduate scholarship committee (Patrick Ahern, Gloria Mari-Beffa, Dan Shea (chair) and Paul Terwilliger) selected undergraduates, who came highly recommended by faculty, for scholarships for study at UW-Madison this year.

First, **Thomas Dorsey**, who graduated this past year, has won the **R. Creighton Buck Undergraduate Prize for Creativity in Mathematics** (\$750). Tom is in graduate school at the University of California - Berkeley this year.

The Prof. Linnaeus W. Dowling Scholarship (\$1000) went to **Jonathan Giffin**.

Mark Ingraham Scholarships went to **Matthew McGinley** (\$1000) and **Ann Scheels** (\$500).

David Lawrence Young Memorial Fund Scholarships went to **Ryan Gantner** (\$1000), **Scott B. Simon** (\$750), **Eric H. Weigle** (\$750).

The Irma L. Newman Memorial Fund Scholarship went to **Nicos Savva** (\$500).

## MATH MAJORS ATTEND PI MU EPSILON CONFERENCE

The math honorary society Pi Mu Epsilon has sponsored a mid-west regional undergraduate conference at St. Norbert's College in DePere since 1986. This year's representation from UW-Madison included **Matt McGinley**, a third-year student majoring in Math and Physics, and **Geir Helleloid**, a second-year student in Math and Computer Science. Matt gave a report on his undergraduate research carried out at Tulane University last summer in astrophysics; he chose the catchy title "How to escape from black holes and live forever" to describe this work. Geir spoke on some problems in the "Evaluation of integrals arising in ground-state energy calculations;" these integrals arose in his summer work in a chemistry project at UW-Eau Claire.

Research projects for undergraduates seem to be a good way to engage talented undergraduates in active learning: they get an opportunity to apply their past course work, and are motivated to learn new mathematics, by the requirements of their research problems. There was a lot of enthusiasm at this conference, which is always well-organized by Prof. Rick Poss of St. Norbert's.



(L to R) Matt McGinley, Geir Helleloid, Winston Yang, Keith Chavey, Pavle Juranic, and Dan Shea

Also attending were second-year Math major **Pavle Juranic**, grad student **Winston Yang**, and departmental Undergraduate Adviser **Dan Shea**. Typically, students from schools throughout the mid-west region attend, and there are good opportunities to meet old friends. Keith Chavey (PhD 1991, R. Brualdi) was there with a group of his students from UW-River Falls. *Reported by Dan Shea*

## NEW GRADUATE COURSE ON TEACHING COLLEGE-LEVEL MATHEMATICS

**Bob Wilson** and **Steve Bauman**, along with graduate student **Abbe Herzig**, ran a course last spring on teaching college level mathematics. The course, being offered as a seminar, is also being given in the fall semester of the current academic year. Beginning with the spring semester, it will be available in the timetable as a regular course.

The course has drawn a mixture of graduate students and faculty/staff. Last spring quite a bit of time was spent going over calculus reform programs, and more generally, changes being considered in "first-two-years" courses, examining both the specifics

of particular reform programs and also the results of how such programs can be evaluated. One of the topics being considered this semester is assessment of faculty, now required at many institutions: How can we get useful information about teaching effectiveness which is not just measuring popularity? How are the goals for a course set? The latter is something that graduate students are not generally exposed to in a teaching-assistant role. All people involved in the course are interested in improved teaching, but for the graduate students expecting to work in academia, there is the additional goal to be better prepared for the world they will be moving into upon graduation. *Reported by Bob Wilson*

## WISCONSIN MAA SECTION REPRESENTATIVES MEET WITH GRADUATE STUDENTS

Last winter, three representatives from the Wisconsin Section of the MAA, Charlotte Chell (PhD 1969, J.B. Rosser) of Carthage College, John Frohlinger of St. Norbert's College, and Aaron Trautwein also of Carthage College, held an informal information sharing session with graduate students on "Life in the Real (and Complex) World – Going from Graduate Student to Professor." Topics that were discussed included:

- ◆ What different kinds of colleges and universities might I go to?
- ◆ What are the differences between them regarding teaching responsibilities?
- ◆ What are the research and publishing expectations of different kinds of institutions?
- ◆ What support systems are there for young faculty?

Besides furnishing an opportunity for our graduate students to hear what it is like to be a mathematics professor at a small college, the session was also an information gathering one for the MAA to learn about what kinds of support the MAA can provide to graduate students about to start a career.

# Graduate

## FIFTEEN PhDs AWARDED IN 1999

The new doctors, with their thesis advisor, thesis title, and new location are listed below.

**Chang, Chia-Chin**, M.-C. Shen, Nonlinear theories of forced surface waves in a circular basin, 2140 Meadowland Dr #202, Sheboygan WI 53081.

**Hong, Sunggeum**, A. Seeger, Weak type estimates for some multipliers of Bochner-Riesz type, Global Analysis Res. Ctr., Seoul National U., Seoul 151-742, Korea.

**Huang, Daode**, R.A. Brualdi, Biclique partitions and generalized tournament matrices, 3203 Allen St. #203, Falls Church VA 22042. Capital One Financial Co.

**Kang, Youngok**, J.-M. Vanden-Broeck, Gravity-capillary waves in the presence of constant vorticity, 882-1 Sinmandeuk-dong, Bak-gu, Busan Korea 616-110.

**Kersey, Scott N.**, C. deBoor, A minimizing spline curve under near-interpolatory constraints, Visiting Asst Prof, Mathematics, Case Western Reserve U., 10900 Euclid Av, Cleveland OH 44106-7058.

**Kim, Yong Jung**, A. Tzavaras, Scaling invariance and hyperbolic conservation laws, Postdoctoral Fellow, Inst for Math & It's Appl (IMA), U. Minn., 207 Church St SE, Minneapolis MN 55455.

**Liu, Chia-Hsin**, D. Passman, Group identities, polynomial identities and generalized polynomial identities, Visiting Asst Prof, Applied Math., Nat'l. Sun Yat-sen U., Kaohsiung 80424, Taiwan ROC.

**Lotfallah, Wafik B.**, H.J. Keisler, Strong laws in finite model theory, Lecturer, Faculty of Engr., Cairo U., 9 Saray St., Manial, Cairo Egypt 11451.

**Meda-Guardiola, Ana**, P. Ney, Conditional laws and dominating points, Universidad Nacional Autonoma de Mexico (UNAM).

**Ozugurlu, Ersin**, J.-M. Vanden-Broeck, The effect of surface tension on capillary gravity waves, U. Arizona, Tempe AZ 85281.

**Park, Jeng Yune**, R.A. Brualdi, The weight hierarchies of product codes and outer product codes, Madison, WI.

**Ponomarenko, Vadim**, R.A. Brualdi, Some results on jump systems and Rota's conjecture, Asst Prof, Dept Math, Trinity U., 607 Kings Ct, San Antonio TX 78212-7200.

**Rho, Yoomi**, R.A. Brualdi, Progress on three problems in graph theory, (168-34 Sungbug-dong, Sungbug-gu, Seoul Korea) Postdoctoral Fellow, Seoul National U., Seoul Korea.

**Teixeira, Joao**, H.J. Keisler, Elliptic differential equations and their discretions, Faculty Assistant, UW-Madison, Math Dept., 480 Lincoln Dr. Madison WI 53706.

**Tsai, Chung-Hsien**, M.-C. Shen, Contributions to a fifth order model equation for steady capillary-gravity waves over a bump, 103, Wu-Chen W. 3rd St., Taichung, Taiwan.

## NEW GRADUATE STUDENTS

Twenty-five new graduate students enrolled in the fall of 1999. Their names and undergraduate institutions are listed below.

|                     |                          |
|---------------------|--------------------------|
| AHN, Jae-Cheul      | Seoul National U.        |
| BISGARD, James      | U. Washington            |
| COSSEY, James       | U. Chicago               |
| DE LA VEGA, Ramiro  | U. Los Andes             |
| DEKA, Lipika        | U. Cambridge             |
| FORRAY, Susan       | Whitman College          |
| HOFFMANN, Jeremy    | U.S. Naval Academy       |
| HUR, Youngmi        | KAIST                    |
| KEMPEN, Scott       | Marquette U.             |
| KERBESHIAN, Sarah   | Pomona College           |
| KIM, Yeon Hyang     | Pohang U. of Sci.& Tech. |
| LE, Brian Dung Minh | SUNY-Geneseo             |
| LYALL, Neil         | U. Edinburgh             |
| MC QUISTAN, Michael | U. Nebraska-Lincoln      |

|                     |                      |
|---------------------|----------------------|
| ONDRUS, Matthew     | Ripon College        |
| POPUNKIOV, Boian    | American U. Bulgaria |
| RUSHTON, Joshua     | U. Idaho             |
| SCHOENFELDER, Neils | U. Alaska-Fairbanks  |
| SCHULTE, Mark       | St. Olaf College     |
| SPAETH, Peter       | Penn State U.        |
| SUTHERLAND, Jamie   | Whitman College      |
| TEMPLE, Kathryn     | U. of Washington     |
| THIEM, F. Nathaniel | Macalester College   |
| TRIGG, Scott        | Lawrence U.          |
| UNLU, Ozgun         | Middle East Tech. U. |
| WARD, Mark          | Denison U.           |
| WEINBERG, Aaron     | Williams College     |

Of these students, Michael McQuistan and Kathryn Temple were awarded by the Graduate School a two-year WARF Prize Fellowship. James Cossey, Susan Forrey, Scott Kempen, Michael McQuistan, Joshua Rushton, Kathryn Temple, Neils Schoenfelder, and Aaron Weinberg have been awarded VIGRE Fellowships (see the lead article on the new VIGRE program in this newsletter).

## AWARDS TO GRADUATE STUDENTS

Our annual Graduate Student Awards Ceremony was renamed **Student Awards Ceremony** and broadened to include Undergraduate Awards as well. The ceremony was held this year on May 5. Undergraduates receiving awards are listed in the undergraduate section of this newsletter. The following graduate students were recognized with an **Excellence in Teaching Award** for three/four semesters of excellent teaching: **Joni Baker, Antonio Behn, Gautam Bharali, Arthur Engelman, Jeffrey Hildebrand, Richard Karwatka, Manuel Lladser, Sangnam Nam, Narfi Stefansson, and Julia Velikina**. Each was presented with a certificate and a \$75 gift certificate for use at the University Bookstore.



**David Kung, Eric Egge, Abbe Herzig, & Berit Nilsen** (David & Berit were last year's L&S Teaching Fellows)

**Abbe Herzig** and **Olga Holtz** were chosen to be this year's mathematics recipients of the **Hirschfelder Fund Scholarship** (\$1,650). This fund is made possible by the generous contribution of Betty Sokolnikoff Hirschfelder (PhD 1930, M. Ingraham).

Olga is writing a thesis on matrix theory under the direction of Hans Schneider. Her paper "Not all GKK  $\tau$  matrices are stable" was recently published in which she disproved four conjectures (of Carlson 1974, Engel & Schneider 1976, Varga 1978, and Hershkowitz 1992) all at once.

As reported above, Abbe has just begun to work on a thesis on math education under the direction of Bob Wilson; the topic is "the intellectual culture of mathematics and its role in graduate school attrition." Olga Holtz also has received a "Alfred P. Sloan Doctoral Dissertation Fellowship" for the 1999-2000 academic year. (This is the last year that the foundation will be awarding these fellowships.)



**Abbe Herzig & Olga Holtz**



**Professor Dan Rider, Patrick Swickard, and Dean Phil Certain**

In addition, four graduate students were honored with **Sustained Excellence in Teaching & Service Awards**, given in recognition of excellence in teaching over a longer period of time and of substantial and noteworthy service contributions to the department:

**Ted Ridgway, Jorge Garcia, Simon MacNair, and Ana Meda-Guardiola**.

They were also presented with a certificate and a \$75 gift certificate for use at the University Bookstore.

Also recognized at the ceremony were: **David Kung** who received one of eight **Excellence in Teaching Award** for 1999 (\$1,000) from the Graduate School in a university-wide competition. This award was presented to David on April 19, 1999. He is a man of many talents, in mathematics, the violin (he plays with the Madison Symphony), and in teaching. He has organized our popular Sidewalk Math and worked on several department committees. David is working on a thesis in harmonic analysis under the direction of Professor Andreas Seeger.

**Eric Egge** and **Abbe Herzig** were each chosen as **L&S Teaching Fellow** for 1999 (\$700). Eric and Abbe are exceptional teachers with special pedagogical interests and talents and gave a workshop during Welcome Week this fall. Abbe is working on a thesis in mathematics education with Bob Wilson, and Eric with Paul Terwilliger in algebraic combinatorics.

## 1999 FRENCH-FELTEN AWARD TO PATRICK SWICKARD

Patrick Swickard, a second year graduate student, has been selected to receive a 1999 French-Felten Award for Inspirational Teaching as a TA in the College of Letters and Science. The award was established to recognize and reward teachers at an early stage in their careers. Five or six awards are given annually to TAs who have just completed their first year of teaching. The award was presented to Patrick at a ceremonial dinner on October 21.

## Other News...

**Richard Askey** was the Lecturer at the 1999 MAA North central Section Summer Seminar held at the University of Minnesota, Duluth on August 9-13, 1999. The title of his lectures was "Counting and Calculus."

**Fred Brauer** gave lectures in June at the Centro Internacional de Ciencias in Cuernavaca, Mexico, as part of their year program in Mathematical Biology. In July he was the principal lecturer for the Rocky Mountain Mathematics Consortium Summer School in Laramie, now being organized by Bryan Shader (PhD 1990, R. Brualdi). Fred, who is now an emeritus faculty member, has moved to Vancouver.

**Franz Forstneric** was elected this year as an associate member of the Slovenian Academy of Sciences and Arts (SAZU).

**John Harvey** gave one of the Barrett Lectures at the University of Tennessee, Knoxville this past June. The title of his lecture was "Teachers, Technology and the 21st Century."

**Robert Wilson** recently gave a lecture at UW-Waukesha in their campus-wide lecture series on issues and ideas. He talked about what research in chaos and complex systems may have to say about how we know things in the real world.

Many of our current Van Vleck Assistant Professors competed successfully for NSF research grants. Included among these are second year Van Vlecks **Weimin Chen**, **Akos Magyar**, and **Sarah Witherspoon**.

**Robert Wilson** and **Leslie Smith** are working with faculty in the College of Engineering as it prepares for re-accreditation under the new and very different ABET-2000 accreditation process.

**Jack Carson** has joined the staff of the Mathematics Tutorial Program.

The Department of Mathematics recently joined the Mathematical Sciences Research Institute (MSRI) in Berkeley as a participating institution. It continues as a participating institution of the Institute for Mathematics and its Applications (IMA) in Minneapolis.

**Richard A. Brualdi** has been elected as a Trustee of MSRI.

The UW-Madison is changing its data and reporting system from DARS (Degree Auditing Reporting System) to ISIS (Integrated Student and Information System). Last year **Robert Wilson** was one of six people from across campus who were instructors for the faculty and staff who will be using ISIS. ISIS is currently in operation but is being modified as difficulties with it arise. It is changing substantially the way that the department can input and access student information.

## Alumni News and Comments

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

**Michael Crandall**, former UW-Mathematics faculty member and now at the University of California-Santa Barbara, was honored at the joint meetings in San Antonio last January with a Leroy P. Steele Prize for Seminal Contribution to Research. The award was given for two seminal papers "Viscosity solutions of Hamilton-Jacobi equations" (joint with P.-L. Lions), Trans. Amer. Math. Soc. 277 (1983), 1-42, and "Generation of semi-groups of nonlinear transformations on general Banach spaces (joint with T.M. Liggett), Amer. J. Math. 93 (1971) 265-298. According to the citation, Mike Crandall is one of the leaders in the world in applying abstract ideas to concrete applications. His work has had "wide ramifications in diverse applications, including control theory, image processing, phase field models, front propagation, and the Perron procedure for degenerate fully nonlinear elliptic or parabolic equations." In his response, Mike recognized his co-authors and the "enormous impact of MRC" on the development of mathematics.

**Richard C. Detmer** (PhD 1972, J. Cannon) is now Professor and Chair of the Department of Computer Science of Middle Tennessee State University.

**Jacob (Jaap) Korevaar**, former member of the UW-Madison Mathematics Department (1952-64), visited Madison the week of October 18, 1999. Jaap spoke in the Analysis Seminar on "Chebyshev quadrature recognizes algebraic curves and surfaces."

**Doron Zeilberger** (not a UW-Madison alumnus) has an opinions webpage (<http://www.math.temple.edu/~zeilberg/OPI NIONS.html>). Opinion 30 (The Math Grad Program of U-Wisc, Madison, Should Be Emulated) says in part: "Have you ever met a bad speaker who got his Math Ph.D. from Wisconsin? Or for that matter have you ever heard a bad talk by a faculty member from Madison? I bet you didn't. All the talks that I have heard were always excellent. It is also clear that the speakers were very well-rounded, and had a very good grounding in ALL of Math."

"It was Dave Bressoud who mentioned this to me back in 1985. It must be something in the chilly Madison air, or the stature of such excellent teachers (and mathematicians!) like..."

"Hopefully, one day one of the Madison faculty would write the recipe down, so that we can all enjoy the dish."

**Gary Ebert's** (PhD 1975, R.H. Bruck) partial explanation to the "Madison phenomenon" is: "I have always felt the same way about Madison, but of course I am biased. But faculty there, even the very powerful ones, devote a lot of time to teaching and take it very seriously. This makes an impression on grad students. Madison also has a TA mentoring program that works very effectively. I probably told you this story before. But I will never forget walking the halls of the Math Dept in Madison, hearing Walter Rudin and R.H. Bing having a heated discussion. Upon getting closer, I learned it was not about some abstract mathematical question, but rather about how best to teach trigonometry! Evidently they were both teaching trig that semester, and each felt they had the secret to best conveying the material. At Madison, everyone (even superstars) taught beginning courses like trig and precalculus from time to time."

**Jennifer Quinn** (PhD 1993, R. Brualdi) has been promoted to Associate Professor with tenure at Occidental College in Los Angeles.

## Death Notices

**Harry C. Mullikin** (PhD 1968, S. Gudder) died in an auto accident on March 29, 1999. He was William Polk Russell Professor of Mathematics at Pomona College and served the College in many capacities including department chair and acting associate dean of students. Five times he won an award for distinguished teaching.

**William H. Row** (PhD 1969, D.R. McMillan) University of Tennessee, died on August 3, 1999. He was Associate Professor of Mathematics at the University of Tennessee, Knoxville.

### OBITUARY

#### JOHN A. NOHEL

(OCTOBER 24, 1924 - NOVEMBER 1, 1999)

Professor Emeritus John A. Nohel died in Switzerland on November 1, 1999 at the age of 75. John was born in Czechoslovakia and spent his early childhood there, emigrating with his parents to the USA in 1939. He became a U.S. citizen in 1943 and served in the Pacific during WWII as a fire-controlman 2nd class on the U.S.S. Yosemite. In 1948 he received a B.S. in Electrical Engineering from the George Washington University, and a Ph.D. in Mathematics from MIT in 1953 under Norman Levinson. After eight years at the Georgia Institute of Technology, John joined our faculty at UW-Madison in 1961.

At Wisconsin, John was Chair of the Department during the turbulent years of 1968-70. He was Director of the Mathematics Research Center (MRC) from 1979 to 1987, and was the founding director of the new Center for Mathematical Sciences from 1987 to 1990. In 1984 John was elected a fellow of the American Association for the Advancement of Science. He had ten Ph.D. students, wrote more than eighty research papers, and co-authored or edited twelve books. He retired from active teaching in 1991 but not from an active professional life. With great pleasure, John served as main editor of Levinson's Selected Works, a demanding project that he completed in 1997.

John's research interest initially focused on Volterra integro-differential equations. In later years, his interests changed to mathematical problems in viscoelasticity and non-Newtonian fluid dynamics. He had many collaborators, especially during his years as Director of MRC.

For many years, John worked for Amnesty International and helped many politically persecuted colleagues in the mathematical community. He joined the Human Rights Commission for Mathematicians in 1977, serving as chair from 1979 to 1981. He was an avid supporter of young mathematicians throughout his career. Following the "Velvet Revolution" he took a keen interest in young Czech mathematicians.

In all his years at Wisconsin, John had a very active professional and personal life. His zest for life and his gregarious nature; his passionate interest in music, opera, the arts; his love of the outdoors (hiking, skiing, ...), good food and wine; his love of conversation, his humor, all contributed to making John the well-loved and interesting person he was.

John was preceded in death in 1988 by his devoted first wife Vera. In 1992, he married Liselotte Karrer and moved to Zurich where he began a new happy and adventurous life. Together, John and Liselotte traveled extensively including several trips to Madison where they were greeted and hosted by many friends.

Besides Liselotte Karrer Nohel, John is survived by his three children and their spouses, Richard Nohel and his wife Karen Anderson Nohel, Audrey Nohel, and Tom Nohel and his wife Lu Hong.

# VAN LECK NOTES

is published annually by the  
Department of Mathematics of the University of Wisconsin-Madison.  
480 Lincoln Drive, Madison, WI 53706-1388

Phone: (608) 263-3054  
Email: [recep@math.wisc.edu](mailto:recep@math.wisc.edu)

Fax: (608) 263-8891  
Home Page: <http://www.math.wisc.edu>

**Richard A. Brualdi**, editor ([brualdi@math.wisc.edu](mailto:brualdi@math.wisc.edu))  
**Deanna Zarecki**, technical editor ([zarecki@math.wisc.edu](mailto:zarecki@math.wisc.edu))

University of Wisconsin-Madison  
Department of Mathematics  
480 Lincoln Drive  
Madison WI 53706-1388

NONPROFIT ORGANIZATION  
U.S. POSTAGE  
PAID  
MADISON, WISCONSIN  
PERMIT NO. 658