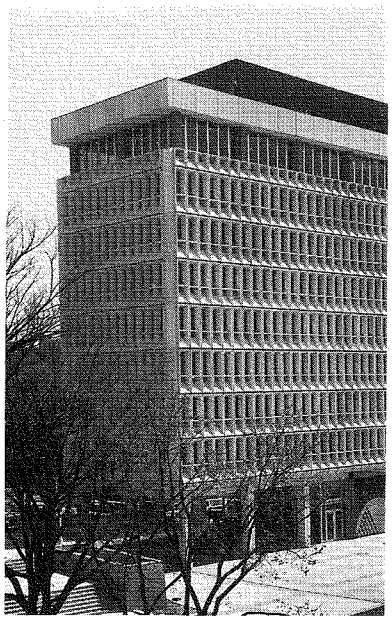


VAN LECK NOTES

Department of Mathematics ✷ University of Wisconsin - Madison ✷ Fall 1997

http://math.wisc.edu

From the Editor ...

The UW-Madison PhD Centennial was held on May 22-24, 1997 with more than 350 people in attendance. The opening reception on Wednesday evening, May 21 was a gala event with the ninth floor lounge of Van Vleck Hall absolutely packed with wall-to -wall Wisconsin people. Everyone was excited to see friends they in some cases had not seen for many years. It was absolutely marvelous to feel the warmth and friendship that exists among Wisconsin graduates, faculty, and friends. Our Wisconsin PhDs were glad to be back!

There were invited lectures on Thursday, Friday, and Saturday morning and all were impressive for their content (mathematics, Wisconsin history, anecdotes, etc.) and delivery. Chancellor David Ward gave a warm welcome to the conference participants on Thursday morning.

The invited speakers and their titles were:

Carl de Boor, *Splines at MRC*
Walter Rudin, *Harmonic Analysis at Wisconsin*
Richard Askey, *Special Functions in Wisconsin*
William Jaco, *Geometric Topology at Wisconsin: The Bing School*
Josh Chover, *Chance at Wisconsin*
George Glauberman, *The Bruck Era*
John Nohel, *Retrospect and Reminiscences of MRC/CMS*
Louis Solomon, *Algebra in Wisconsin from 1880 to 1960*
Michael Crandall, *Wisconsin and Nonlinear Differential Equations*
Robert Brown, *Algebraic Topology from Wisconsin: Some Mathematical Snapshots*
Richard Arratia, *Prime Factorization of a Uniformly Chosen Integer; the Big Picture*
Yiannis Moschovakis, *Logic in Madison, when Kleene was the Man*

One cannot help noticing the various ways Wisconsin enters into the titles of these talks: 'at Wisconsin', 'in Wisconsin', 'from Wisconsin', 'Wisconsin and'.

The coffee breaks in the mornings on the Van Vleck Terrace gave everyone more opportunities to talk with old friends. In the afternoons, there were minisymposia primarily organized by former Wisconsin students. There were sixteen minisymposia containing more than 200 talks and covering a very broad part of mathematics.

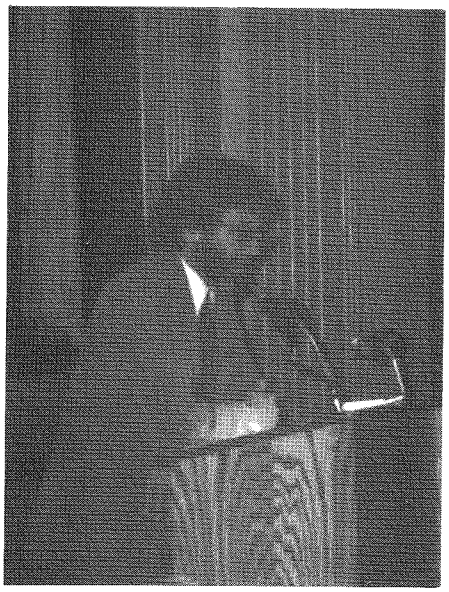
On Friday evening there was a banquet celebration in Great Hall of the Memorial Union, again wall-to-wall Wisconsin people with more than 350 in attendance. Dean Philip R. Certain of the College of Letters and Science spoke to the crowd and Mary Ellen Rudin offered reminiscences. Each dinner table contained a disposable camera and the pictures taken offer proof of the wonderful evening had by all. A few of these pictures are contained in this newsletter.

The remarks that now follow are an edited version of those that I made at the banquet.

We are celebrating this week 100 years of PhD training, advising, and nurturing in Mathematics at UW-Madison. It was essentially 100 years ago today that the first Mathematics PhD was awarded by this university to Henry Freeman Stecker for a thesis entitled "On the roots of equations, particularly the imaginary roots of numerical equations." Stecker went on to have a successful career, primarily at the Pennsylvania State University. The second PhD went to Theodore Running in 1899, whose thesis was titled "On systems of circles derived from three and four base circles." Running was an instructor in Mathematics at Wisconsin for one year after getting his PhD and spent most of his career as an instructor at the University of Michigan.

Enjoying ourselves at the Banquet!

Of the seven PhDs awarded since the end of the first World War in 1918, two of them, the third and fourth, were awarded to women; to Charlotte Elvira Pengra in 1901 for a thesis entitled "On the conformal representation of plane curves, particularly for the cases p=4, 5, and 6" and to Florence Eliza Allen in 1907 for a thesis "The cycle involutions of third order determined by nets of curves of deficiency 0, 1, and 2." Allen was a member of the Department of Mathematics for 45 years retiring as Assistant Professor Emerita in 1948. Pengra was an assistant in the Mathematics Department from 1899-1901. It seems that two-body problems existed even back at the turn of the century. Pengra married Arthur Crathorne, who was a mathematics assistant from 1900 to 1902 and instructor from 1902 to 1904. Crathorne had only a B.S. in mathematics, although he may have gotten a PhD after leaving Madison.



Richard Brualdi
At the banquet

After the war, the training of American doctorates shifted from Europe to this country and the Mathematics Department of Wisconsin assumed an increasingly important role. In the seven years after the war, three more PhDs were awarded, in the years 1920, 1922, and 1923. respectively. Thus in the 28 years from 1897 to 1925, a total of 10 PhDs were given. Since 1926, at least one Mathematics PhD has been awarded each year. In the last 100 years, to within a small integral epsilon, 900 PhDs have been or will have been awarded by this university to men and women who have gone on to have productive and distinguished careers, many having important leadership roles in research, education, and industry. Of these 900 PhDs about 10% were women, a percentage that in the early years was larger, then fell off, and recently has increased, but needs to increase more.

The fact that so many people with PhDs from Wisconsin are at the centennial celebration and here tonight is a testimony to the importance and value they attach to their degrees, the good memories of years spent at Wisconsin, and the importance to them of the many friendships that started here in Madison and continue to this day. As Christina Bahl [PhD 1971, L.Levy] said to me earlier today, the fact that it takes a considerable effort to get everyone's attention in the lecture room we have been using and at the coffee breaks is a good measure of the success of the conference. Everyone is enjoying so much seeing old friends - both fellow students and faculty. I couldn't be happier nor more proud of our PhD alumni.

I would like to recognize *our* PhDs who are here as a way of thanking them for their many contributions to the profession and for being with us during this very special celebration.

At this point I asked Wisconsin PhDs to stand and be recognized according to when they received their degree.

.....1991 to present and beyond
.....1981-90
.....1971-80
.....1961-70
.....1951-60

There were many people present from each of the first four time intervals, but there were only two people present with PhDs between 1951 and 1960 and they were given special recognition.

Hiram Paley in 1959 received his Wisconsin PhD in 1959. His thesis, written under the supervision of Charles Curtis was titled "On Galois subrings of a full ring of linear transformations." Hiram was at the banquet with his wife Jean. He made his career at the University of Illinois.

Wayne Wymore received his Wisconsin PhD in 1955 with a thesis written under the direction of William F. Eberlein with title "On weak compactness in functional analysis." Wayne works at Systems Analysis in Arizona. His wife Muriel was with him.

Moving on to
.....1941-50

There were three people at the banquet with PhDs from these years, all from the year 1947, and five PhDs were awarded in that year, the 72nd to the 76th. So we had 60% of the 1947 PhD class here. To put some of this in perspective, since 1947 more than 800 Mathematics PhDs have been awarded by Wisconsin. The three 1947 PhDs at the banquet were given special recognition as follows.

Fifty years ago today, in 1947, Lowell J. Paige received his PhD from Wisconsin. His PhD advisor was Richard Bruck, the second student of Dick Bruck, and his thesis title was "Neofields." Lowell was accompanied by his wife Betty. Lowell made his career as professor and administrator at UCLA.

Also in 1947, William Leavitt received his PhD from Wisconsin. His thesis written under the direction of R.E. Langer has title "A normal form for matrices whose elements are holomorphic functions." Bill made his career at the University of Nebraska where he served as chair for many years.

In 1947 also, Robert Lee Wilson, father of our current faculty member Robert Lee Wilson Jr., received his Wisconsin PhD. His thesis was written under C.C. MacDuffee and was entitled "A finite method for the determination of the Galois group of an equation with an application to the problem of reducibility." Bob Sr. made his career at Ohio Wesleyan University.

But we're not done yet.
.....1931-40

There were two people from this era.

In 1938, 59 years ago, Robert Christian Bartels was awarded a Wisconsin Mathematics PhD for his thesis "Saint-Venant's flexture problem for a regular polygon." His thesis advisor was Ivan Sokolnikoff. His PhD class contained the 42nd and 43rd Mathematics PhD. Bob made his career at the University of Michigan.

In 1935, 62 years ago, Margarete Caroline Wolf Hopkins received her Mathematics PhD with a thesis "Symmetric functions of matrices" written under the supervision of Mark Ingraham. That same year, her sister Louise Adelaide Wolf also received her PhD with thesis "Similarity of matrices in which the elements are real quaternions" and had the same thesis advisor Mark Ingraham. Their PhD class contained the 35th, 36th and 37th Mathematics PhD.

That brings us to
.....1930 or earlier.

One person stood.

Robert Bartels, Margaret Hopkins, & Betty Hirschfelder

In 1930, 67 years ago Elizabeth Thatcher Stafford walked across the commencement stage and received a Wisconsin Mathematics PhD. Her thesis, "Matrices conjugate to a given matrix with respect to its minimum equation" was also written under the direction of Mark Ingraham. Her class contained the 18th, 19th, and 20th Wisconsin Mathematics PhD. Elizabeth, now with great fondness known as Betty Hirschfelder, was Lecturer in the Mathematics Department beginning in 1944 and Assistant Professor from 1946 to 1954. She co-authored with her then husband, Ivan Sokolnikoff who received a Wisconsin Math PhD in 1931, one year after Betty did, the popular textbook "Higher mathematics for engineers and physicists."

Betty is the benefactor of the Hirschfelder scholarship fund for women in mathematics, physics and chemistry. On Wednesday many of us helped Betty celebrate her 95 birthday and the presentation of the first award from the Elizabeth Hirschfelder-Graduate Women in Math, Chemistry and Physics Fund in Mathematics Phd student Susan Hollingsworth.

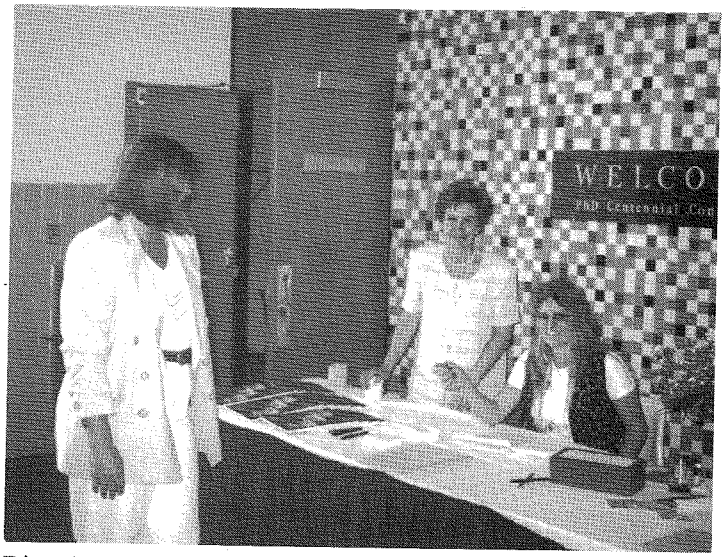
It was wonderful to see Bo... Margarete, and Betty, who all sat at the same table, talk about Wisconsin in the 1930s.

I want to express my warm thanks for all the support shown for their help in getting everything together for the centennial:

A beautiful spring morning on the terrace!

Gen Novara, Sherry Lange, Diane Reppert, Dee Frana, Vicki Leatherberry, Shelly Albrecht, Larry Farnsworth, Ann Caruso, Cindy Dunne, Donna Meerdink, Linda Rice, and Betty Schwartz. Special thanks go to the chair's secretary, my secretary, Deanna Zarecki, without whose enthusiasm for this event, hard work, dedication, and technical skill, this conference would not have succeeded nearly as well as I think it did.

All these people were recognized at the banquet and loudly applauded. Ann Caruso was recognized for her 33 years of service to the Department. The day of the banquet was Ann Caruso's last day on the job. Also recognized were former Departmental administrator



Diane Reppert, Sherry Lange, & Deanna Zarecki

The centennial conference is not just about the past. It isn't only the end of the first 100 years of PhD training that we are celebrating but the beginning of the second 100 years. With the pace of our current lives and the vast technological changes that have already occurred, I don't dare to speculate about the next 100 years. Given the large number of recent and expected retirements, the next several years will see many new faces and I hope an increase in the number of women in the Department. We have been extremely fortunate in the people we have hired recently - all have been wonderful additions to the department. If we continue to hire such high quality mathematicians who are also high quality people, then I am confident that the great Wisconsin tradition in mathematics will continue.

In the last 7 or 8 years we have hired the following people. I will give their native countries (although the PhD may have been earned in this country) to demonstrate the new 'multicultural department' that we have.

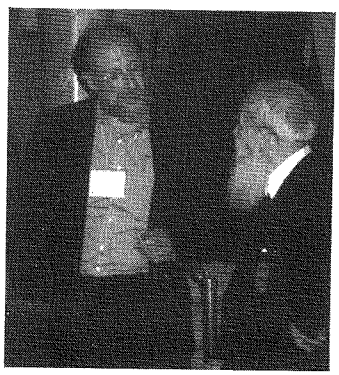
Alejandro Adem (Mexico)
Thanos Tzavaras (Greece)
Franc Forstneric (Slovenia)
Andreas Seeger (Germany)
Robert Wilson (USA)
Steffen Lempp (Germany)
Efim Zelmanov (1990-96) (former Soviet Union)
(now at Yale University)
Yong-Geun Oh (Korea)
Robin Pemantle (USA)
Panagiotis Souganidis (Greece)
Thaleia Zariphopoulou (Greece)
Claudia Neuhauser (Germany)
Paul Milewski (Brazil and France)
Yongbin Ruan (China)
Leslie Smith (USA)
Fabian Waleffe (Belgium).


Friday night reception - A wonderful reunion!

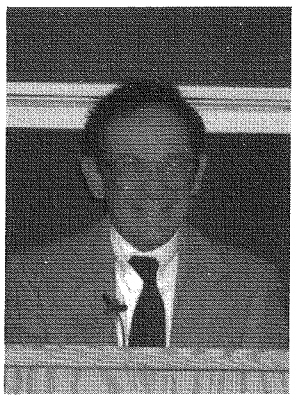
Sylvia Mitchell and former support staff member Mary Mikla Kirk. In addition, at the banquet and given special recognition were Annetta Rosser (Mrs. J. Barkley Rosser), Sally Forelli (Mrs. Frank Forelli), and Dolly Schoenberg (Mrs. Isaac Schoenberg). Besides Dean Certain, there were two other Deans at the banquet: John Bollinger (Dean of the College of Eng-ineering) and his wife Heidi, and Charles Read (Dean of the School of Education, formerly Acting Dean of the Graduate School) and his wife Helen.


George Dinolt & Robert Wilson, Sr.

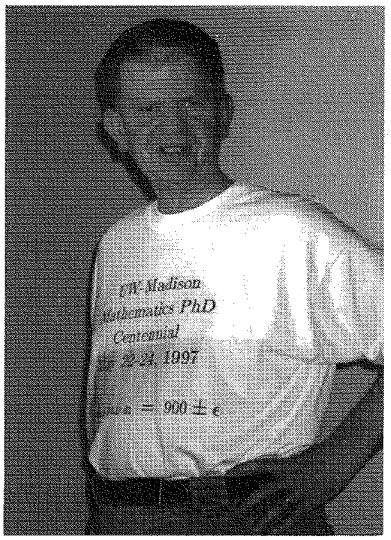
The banquet celebration was very special for all those in attendance. I want to close by acknowledging that the centennial conference was made possible by funding from the Van Vleck account at the UW-Foundation. We are extremely grateful for the use of these funds. (RAB)


Joseph Malkevitch
& Laurence C. Young

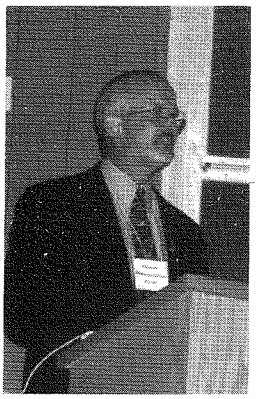
Some Candid Shots...



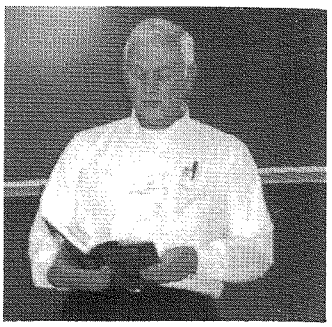
Lou Solomon



Richard Askey

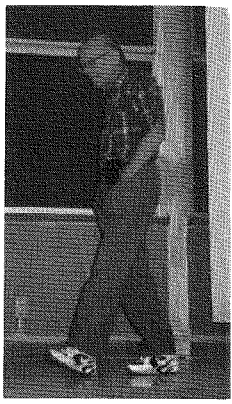


William Jaco

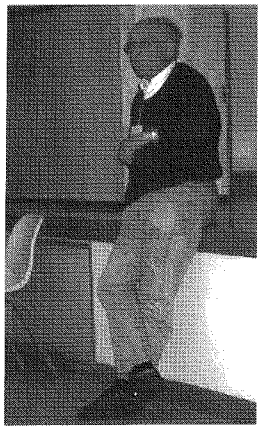


Mike Crandall

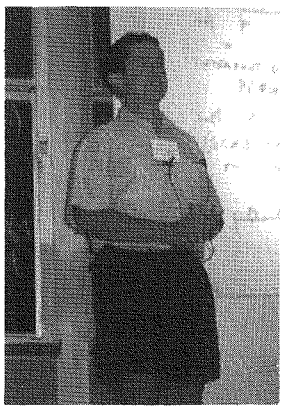
Mary Ellen Rudin



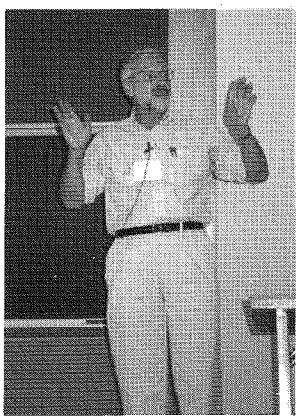
Josh Chover



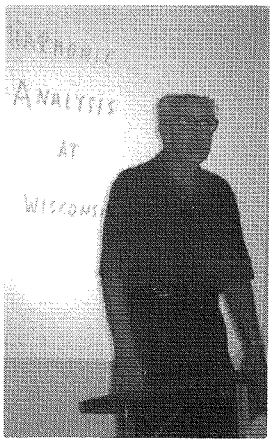
John Nohel



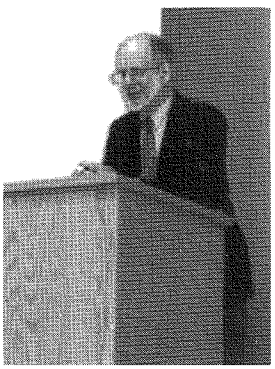
Richard Arratia



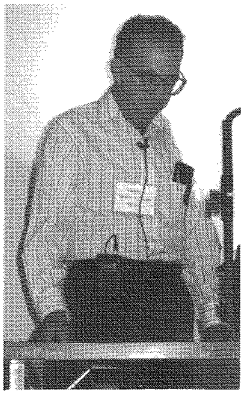
Yiannis Moschovakis



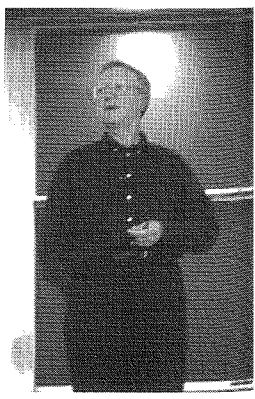
Walter Rudin



George Glauberman



Robert Brown



Carl de Boor

Coming Attractions...

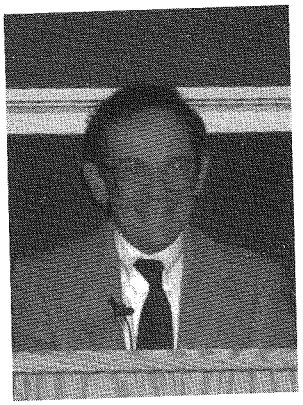
ANNUAL WISCONSIN REUNION IN BALTIMORE

The Eighth Annual Wisconsin Reunion of Wisconsin Alumni and Friends will take place at the annual AMS and MAA meetings in Baltimore on Friday, January 9 from 5 to 7 p.m. The location will be the Chesapeake Room of the Hyatt Regency Baltimore. As always there will be hors d'oeuvres, a cash bar, and lots of interesting talk among good friends. An album of pictures from our PhD Centennial last May will be available for your perusal. Remember those disposable cameras at the centennial banquet! As usual we are requesting a contribution of $5 to help defray the costs. We hope to see you in Baltimore!

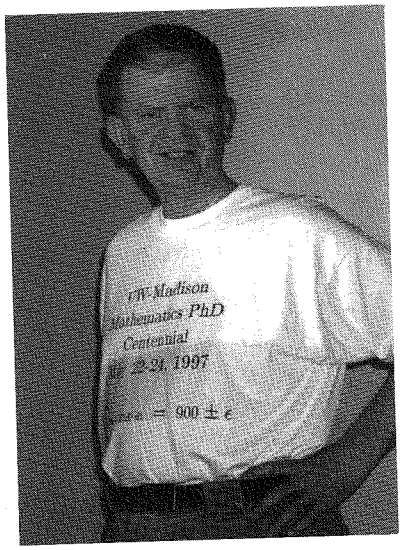
THE HANS SCHNEIDER LINEAR ALGEBRA CONFERENCE

The International Linear Algebra Society will hold its seventh conference at UW-Madison on June 3-6, 1998 and it is being dedicated to Hans Schneider in recognition of his enormous contributions to linear algebra and the linear algebra community. This international conference will bring to Madison 300 or more researchers and educators in all aspects of pure and applied linear algebra and matrix theory. The chair of the organizing committee is Richard Brualdi and included among the committee members are two former students of Hans, Bryan Cain (PhD 1968) and Jeff Stuart (PhD 1986) . Among the invited speakers are R. Barmish of the ECE Department at UW-Madison and former student of Hans, Judith McDonald (PhD 1993). Carl de Boor of the UW-Madison Mathematics and Computer Sciences Departments will give the first ILAS-LAA Lecture on the opening day of the conference and this will be followed by a reception on the ninth floor of Van Vleck Hall. The official residence of the conference will be the newly refurbished Chadbourne Hall at the corner of Park and University Avenues. A special issue of the journal Linear Algebra and its Applications consisting of refereed papers presented at the conference will be dedicated to Hans. There will be a banquet in Great Hall of the Memorial Union on June 5. An excursion to the House on the Rock in nearby Spring Green has been scheduled. The conference has been approved and partially funded by the Participating Institutions of the Institute for Mathematics and its Applications (IMA) in Minneapolis.

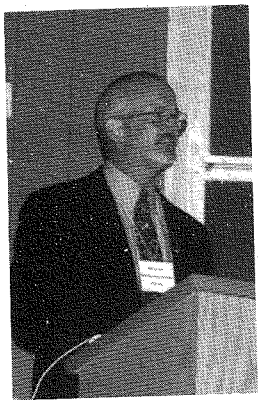
Some Candid Shots...



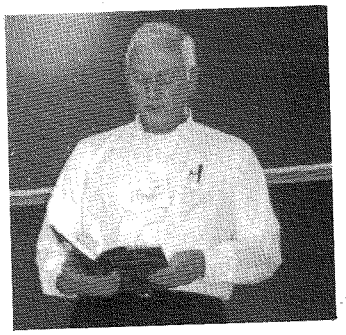
Lou Solomon



Richard Askey



William Jaco



Mike Crandall

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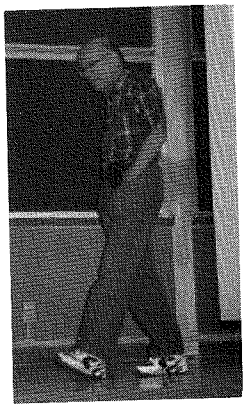
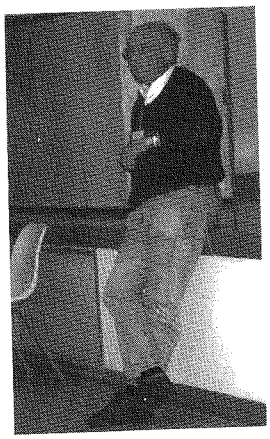
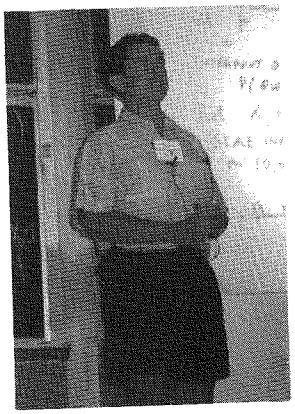


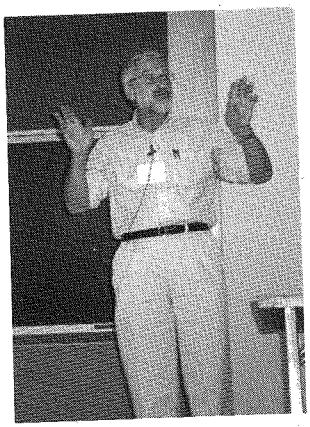
Josh Chover



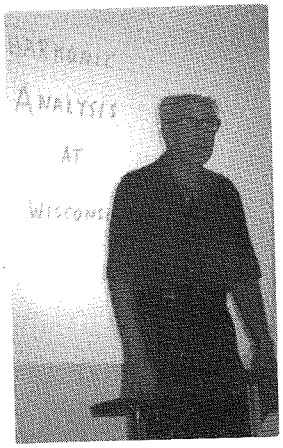
John Nohel



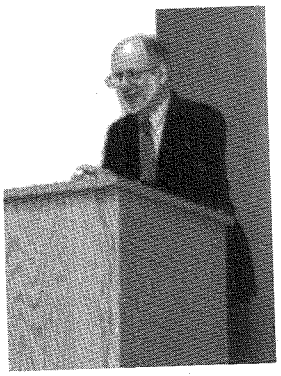
Richard Arratia



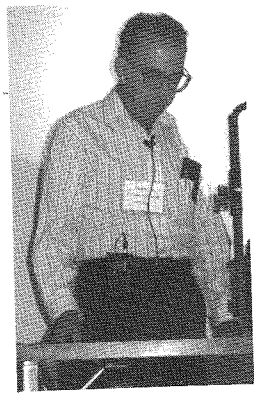
Yiannis Moschovakis



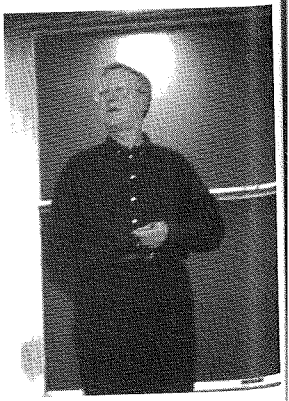
Walter Rudin



George Glauberman



Robert Brown



Carl de Boor

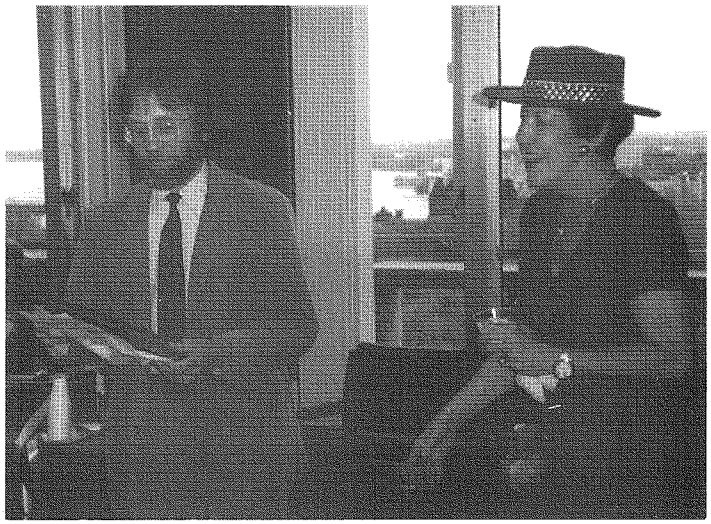
Comings and Goings...

The Faculty Administrative and Supervisory Staff remains the same as last year. Richard Brualdi is Chair, Marshall Osborn is Associate Chair, Dietrich Uhlenbrock is TA Coordinator, Robert Turner is Graduate Coordinator, and Dan Shea is Undergraduate Coordinator. Marshall Slemrod is the Director of the Center for Mathematical Sciences. Alex Nagel remains as Associate Dean for the Natural Sciences in the College of Letters and Science, and Terry Miller remains as Associate Dean for the Physical Sciences in the Graduate School. The Department remains well connected!

Read on for the big change on the second floor of Van Vleck Hall.

Ann Caruso Retires

Longtime Mathematics Department Receptionist Ann Caruso retired in May of 1997. May 14 was proclaimed "Ann Caruso Day" in the Department, and she was greeted early in the morning with her office decorated with balloons and streamers. She was later surprised with a party on the 9th floor lounge in the afternoon with most of the faculty and graduate students in attendance. The Chair spoke these words at the party:



A tearful good-bye

"Born in 19..., well Ann was definitely born in Madison, Wisconsin and grew up in the Greenbush area where her family owned and operated a grocery store. On July 3, 1954, while still a teenager, Ann joined the State Civil Service. On August 1, 1964 she transferred to the Department of Mathematics of the University of Wisconsin, about one year after the Department had moved from North Hall to its present location in Van Vleck Hall.

"In 33 years as receptionist of our Department, Ann has been greeter and welcomer, the first person most of us usually see in the morning in Van Vleck Hall; caregiver to countless faculty, students, and staff; listener and mender; friend, someone to cheer you up when things are not going right; a tremendous source and dispenser of information; a link between home and school; a person who gave stability and continuity to the happenings in Van Vleck Hall.

"What can one say about Ann Caruso? The answer is obvious: Ann is family, a member of the University family, a member of the Mathematics Department family, a member of our family; the first in Van Vleck Hall to know when a new baby is born, the first to know when a loved one is ill. She became a member of our family not by being born into it, but the hard way; by working her way into our lives. She captured our hearts with her enthusiasm, infectious smile, cheerfulness, wit, compassion, and competence. Although there were plenty of other opportunities elsewhere on campus, Ann couldn't leave her family, and for that we are grateful. While Ann will be leaving her working position in the Department she won't be leaving the position she holds in our hearts.

"We wish Ann not a happy retirement but a happy and long new life filled with good health, joy, excitement, and adventure. To help with the adventure we have a gift for Ann, a travel gift certificate good for at least four one-way trips or two round trips on the airline of her choice (provided of course she doesn't insist on flying first class). In addition, we have a Certificate of Commendation from Governor Tommy Thompson for her years of service to the State of Wisconsin.

"So thanks Ann for staying with us all these years, thanks for your wonderful service, thanks for being a part of our lives, thanks for being Ann Caruso. We wish you great and wonderful adventures - Bon Voyage - but we hope that you will come back and see us often. During my remaining time as chair of this Department, your picture will remain in our Rogues' Gallery with the subtitle "Receptionist Emerita." Congratulations and Good Luck!"

New Faculty

We hired two new faculty members in 1996-97. They were Associate Professor **Leslie Smith** and Assistant Professor **Fabian Waleffe**. They will be joining us for the spring semester of the current academic year.

Leslie received a B.A. in Physics from Harvard University in 1983 and a PhD in Mathematics from MIT in 1988. She was a Postdoctoral Fellow at the Center for Turbulence Research at Stanford University/NASA Ames Research Center, a Research Associate in the Program in Applied and Computational Mathematics and the Department of Mechanical and Aerospace Engineering at Princeton University, and since 1993, an Assistant Professor of Mechanical Engineering at Yale University. Her appointment at Madison is three-quarters time in Mathematics and one-quarter time in Mechanical Engineering.

Smith's research interests are in statistical physics, turbulence and turbulence modeling for engineering and geophysical applications, and applied mathematics, stability theory, and fluid dynamics. She describes one of her research programs, crossover from 2D to 3D behavior and application to geophysical flows, as follows:

"An incompressible fluid can achieve a statistically steady state if the Navier Stokes equations are subject to an external force at wavenumber k=k_f. In 3D, conservation of energy by the nonlinear term leads to a positive energy flux for k>k_f. In 2D, the additional conservation of entrophy leads to a negative flux of energy for k<k_f. Thus one speaks of a forward cascade of energy in 3D and an inverse cascade of energy in 2D. We have recently initiated a study of the crossover from 2D to 3D turbulence with numerical simulations of forced turbulence in a small-aspect-ratio domain. We have

discovered new, steady-state flows in which a forward and an inverse cascade of energy exists simultaneously. In addition to its fundamental nature, this study has applications to geophysical flows, for example, the transfer of energy generated by convective storms. Our initial study focused on randomly driven turbulence in a periodic domain, with and without rotation. By varying the rotation rate and the aspect rate, a continuous transition from 2D to 3D behavior has been realized. Coherent forcing and non-periodic boundary conditions are topics of current research. Addition of stable stratification is a longer term goal."

Fabian received a Ingénieur Civil degree from the Université de Liège, Belgium in Mécanique Physics in 1985 and a PhD in Applied Mathematics from MIT in 1989. He was a Postdoctoral Fellow at the Center for Turbulence Research at Stanford University/NASA Ames Research Center for three years before becoming an Assistant Professor of Applied Mathematics at MIT in 1994. His appointment at Madison is three-quarters time in Mathematics and one-quarter time in Engineering Physics.

Waleffe's research interests are in fluid dynamics, instabilities, self-sustaining dissipative structures, turbulence, and rotating flows. He participated in the first European Astronaut selection in 1991 and was among the last ten Belgian candidates. Fabian describes one of his research directions as follows:

"The mathematical description of turbulence in fluids is undoubtedly one of the central and long-standing problems in continuous applied mathematics. Although the nonlinear partial differential equations that describe fluid flows - the Navier-Stokes equations - have been known for over fifty years, we still do not have rigorous results about the existence of solutions, nor do we have effective techniques to approximate relevant solutions. The lack of effective approximation techniques severely limits our ability to predict fluid flow in numerous situations of engineering, geophysical and astrophysical interests. As a basic science issue, turbulence in fluids is such a common phenomenon that we ought to understand its origin, at least. My current research aims at elucidating the onset of turbulence in parallel shear flows [such as flow in pipes and channels]. In the past few years I have identified a nonlinear process that is responsible for bifurcation of shear flows. The objectives are now to fully characterize that process. In its simplest form, the nonlinear process takes the form of new steady solutions of the Navier-Stokes equations for the boundary conditions corresponding to shear flows. ... The new solutions and their subsequent bifurcations will then provide a path to understanding the nonlinear dynamics of shear flows and the onset of turbulence."

Leslie and Fabian are the proud parents of a baby boy Roger born on April 22, 1997.

Van Vleck Visiting Assistant Professors and Lecturers

All of our Van Vlecks this year are continuing from last year. They are **Mirna Dzamonja**, **David Moulton**, **Jiye (Jay) Yu**, and **Mariko Arisawa**. Mariko was a Research Associate last year and is a Van Vleck this year.

We hired three Lecturers on two-year appointments. They are David Alvarez who received the PhD from UC-Berkeley in 1997, Gary Brookfield who received the PhD from UC-Santa Barbara in 1997, and Jonathan Pakianathan who received the PhD from Princeton in 1997. David's research interests are in harmonic analysis and geometric questions related to Kakeya type maximal functions (his thesis advisor was Tom Wolf). Gary's research interests are in rings and modules (his thesis advisor was Ken Goodearl). Jon's research interests are in algebraic topology and cohomology of groups (his thesis advisor was Bill Browder). All three were hired for a balanced combination of research and teaching potential. Gloria Mari-Beffa who was a Van Vleck last year has been hired as Lecturer for this year. In addition to these people, we hired a number of Lecturers and Faculty Assistants over the summer in order to cover larger-than- expected enrollments, brought about by an increase in the number of new freshmen this year - nearly 6,000.

Honorary Fellows

Again this year we have a number of Honorary Fellows who come to Madison to work with our faculty. Appointed Honorary Fellows this year, with their home institution and sponsoring faculty member, are:

Bolotin, Sergey, Lomonosov Moscow State University (Paul Rabinowitz)
Gao, Yi Hong, Institute of Theoretical Physics, Beijing (Yongbin Ruan)
Go, Junie, Univ. of St. LaSalle, Phillipines (Paul Terwilliger)
Hu, Jianxun, Zhongshan Univ., China (Yongbin Ruan)
Hwang, Geum Sug, Pusan U. of Foreign Studies, South Korea (Richard Brualdi)
Izquierdo, Jose, Univ. de Zaragoza, Spain (Georgia Benkart)
Kwon, Sae Ran, Daelim College of Technology, South Korea (Georgia Benkart)
Li, Anmin, Sichuan Univ., China (Yongbin Ruan)
Muthuvel, Kandasamy, UW-Oshkosh (Arnold Miller)
Park, Suk Bong, Korea Military Academy (Richard Askey)
Zhao, Kaiming, Institute of System Science, Academia Sinica, China (Marshall Osborn)

VISITING FACULTY

As usual, we have several distinguished visiting faculty this year.

Michael Crandall, Professor of Mathematics at UC-Santa Barbara, is a Visiting Professor in the fall semester. Mike was on our faculty from 1974 to 1990. He received the PhD from UC-Berkeley in 1965. He was Chair of the Department of Mathematics at Santa Barbara from 1993 to 1996. His speciality is partial differential equations and during his stay here he is working with Takis Souganidis and Paul Rabinowitz.

Menachem Magidor, Professor of Mathematics at the Hebrew University in Jerusalem, is also a Visiting Professor for one month in the fall semester. He received the PhD from the Hebrew University in 1972, and his research interests are in mathematical logic (set theory and model theory) and computer science (distributed processes and related logics, artificial intelligence, and object oriented programming). He will be delivering a series of lectures to logic students and faculty and will be working with our logic group during his stay.

Andrea Sorbi, Associate Professor of Mathematics at the University of Siena in Italy, is a Visiting Associate Professor for one month in the fall semester. Andrea received the PhD from CUNY (New York) in 1987. His research interests are in computability theory, enumeration reducibility, and enumeration degrees. He is working primarily with Steffen Lempp during his stay in Madison. He also is delivering a series of lectures to logic students and faculty.

Eberhard Hermann, Senior Researcher at Humboldt University on Berlin, is also a Visiting Associate Professor for one month in the fall semester. He received the PhD from Humboldt University in 19? His research interests are in mathematical logic. As with the oth two visiting logicians in the fall, he will be delivering a series lectures to logic students and faculty. He will also be workir primarily with Steffen Lempp.

Russell M. Reid (PhD 1979, D. Russell), Associate Professor o Mathematical Sciences at Michigan Technological University, is Visiting Professor for the entire 1997-98 academic year. His researcl interests are in control theory of partial differential equations nonharmonic Fourier series, surface waves on fluids, and numerica methods and mathematical software. At Michigan Tech, Russell designed, wrote, and implemented instructional materials for a calculus course integrating a computer lab with traditional lecture-based materials.

Jie Xiong, Assistant Professor of Mathematics at the University of Tennessee, is a Visiting Assistant Professor for the fall semester. Jie received the PhD in Statistics from UNC-Chapel Hill in 1992, and his research interests are stochastic differential equations, Markov processes, stochastic analysis, and mathematical finance. He is working with the probability group, especially Tom Kurtz, while in Madison.

In the spring semester, **Elias M. Stein**, Professor of Mathematics at Princeton University, will be a Visiting Professor for two months. Stein was a student of Antoni Zygmund at the University of Chicago receiving the PhD in 1955, and in a career of more than forty years, has been and continues to be the leading expert in modern harmonic analysis. He holds honorary doctorates from Peking University and the University of Chicago. During his stay in Madison, he will be working with Alex Nagel, Andreas Seeger, and Stephen Wainger.

SABBATICALS AND LEAVES

Four faculty members are on sabbatical leave during all or part of this academic year.

Alejandro Adem has a year-long sabbatical which he is spending primarily at the Max Planck Institute in Bonn. During his sabbatical Alejandro plans to explore topics related to Galois cohomology and arithmetic and to learn new methods from mathematical physics. He will also hopes to develop a new approach to teaching an undergraduate course in topology.

Franc Forstneric also has a year-long sabbatical in which he will visit several universities in Europe with about half the time spent at the University of Ljubljana in Slovenia where he will work with J. Globevnik. He plans to continue his research program in several complex variables, focusing on holomorphic automorphisms of C^n, proper holomorphic embeddings, and flows of holomorphic vector fields.

Stephen Wainger has a fall semester sabbatical at the Mathematical Sciences Research Institute (MSRI) in Berkeley during their half-year program in Harmonic Analysis. The purpose of the program is to explore and expand recent applications of harmonic analysis to partial differential equations. While at MSRI Steve plans to continue his long-time collaboration with Elias Stein.

Wayne Dickey has a spring semester sabbatical. He plans to be based in Madison taking several research trips. He will be continuing his research into the behavior of elastic structures under various loadings, in particular, he will study the predicted deformation of rings and arches in the context of geometrically exact nonlinear theories.

In addition to these sabbatical leaves, **I. Martin Isaacs** will be on leave in the spring semester at the Center for Communications Research of the Institute for Defense Analyses at San Diego. **Hiroaki Terao** is on leave for the full academic year at Tokyo Metropolitan University in Japan.

FACULTY RETIREMENTS

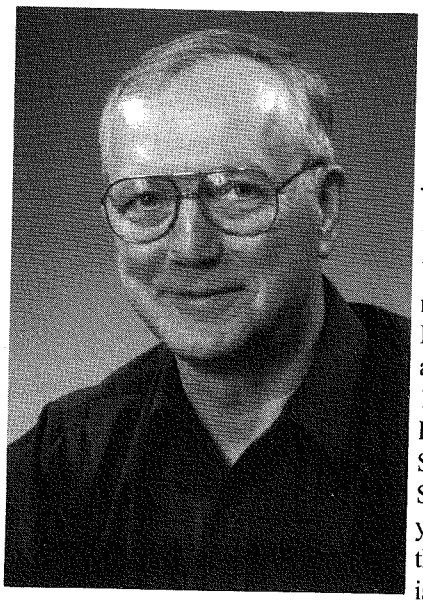
There were three retirements this past academic year. **Jake Levin**, who was a member of the mathematics faculty since 1963, retired at the end of the fall semester of the 1996-97 academic year. **D. Russell McMillan, Jr.**, who has been a member since 1966, retired at the end of the 1996-97 academic year. **Rod Smart**, who first came to Madison in 1962, also retired at the end of the 1996-97 academic year. Rod has arranged post-retirement teaching for four years and will teach two courses per year from 1997 to 2001. All have been awarded emeritus status.

Post-retirement teaching is being phased out by the College of Letters and Science. For 1997-98, agreements for employment will be for a maximum of two years. In 1998-99, the final year of the program, one year will be considered. This year twelve emeritus faculty are teaching (one or two courses) as part of a post-retirement teaching agreement.

Dedications, Honors, and Awards...

Carl De Boor Elected to the National Academy of Sciences and Receives Steenbock Professorship

Carl de Boor, Professor of Mathematics and Computer Sciences, was among the 60 scholars elected this year to the National Academy of Sciences. Carl grew up in East Germany and received the PhD from the University of Michigan in 1966. He was on the faculty of Purdue University when in 1972 he joined the Mathematics and Computer Sciences Departments at UW-Madison. He was named P.L. Chebyshev Professor of Mathematics and Computer Sciences in 1983 and Steenbock Professor of Mathematical Sciences in 1987. The Steenbock Award is for ten years, and Carl was given the award again in 1997. It is endowed through the generosity of Mrs. Evelyn Steenbock and, according to the Graduate School Dean Virginia S. Hinshaw, the "level and flexibility of this research support and the selection process places this professorship among the most prestigious ever awarded by this University."



de Boor's speciality is approximation by spline functions. Splines were introduced in the 40's (by the late I.J. Schoenberg of Wisconsin) as a means for approximating discrete data by curves. Their practical application was delayed almost twenty years until computers became powerful enough to handle the requisite computations. Since then they have become indispensable tools in computer-aided design and manufacture (cars and airplanes, in particular), in the production of printer's typesets, in automated cartography, and in many other areas, often concealed at the core of elaborate software packages, Carl is the worldwide leader and authority in the theory and applications of spline functions. His contributions have been more fundamental and numerous than any other researcher in this field, ranging from rigorous theories through highly efficient and reliable algorithms to complete software packages. Carl has made UW-Madison a major international center in approximation theory and numerical analysis, attracting students, faculty, and visitors from all over the world. He is also a thoughtful teacher and has a tremendous ability to pass on his vast knowledge and understanding, and is always among the first to adapt and to promote new instructional tools.

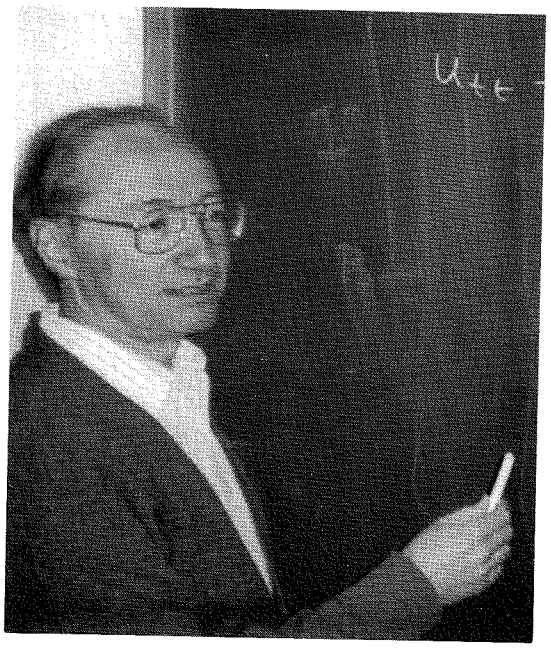
Paul Rabinowitz Wins Birkhoff Prize

Professor Paul Rabinowitz has been awarded by the American Mathematical Society (AMS) and the Society for Industrial and Applied Mathematics (SIAM), the 1998 G.D. Birkhoff Prize for his outstanding contributions to mathematics. Paul was particularly cited by the selection committee for his influential contributions to the field of non linear analysis. Paul received the PhD in Mathematics from New York University in 1966, and before coming to Madison as an Associate Professor in 1969, he was an Assistant Professor at Stanford University. He was named E.B. Van Vleck Professor of Mathematics in 1986 and received an honorary doctorate from the Universite' de Paris VI in 1992. He has held many visiting positions and is a sought-after speaker at universities and conferences all over the world.

The citation for the Prize reads in part:

> "Perhaps more than anyone else Paul Rabinowitz has deeply influenced the field of non linear analysis. His methods for the analysis of nonlinear systems has changed the way we think of them. His global bifurcation theorem is astonishing for its many applications. He discovered that under certain circumstances a local linearized analysis forces the existence of a global bifurcation. This is a very powerful result that is quoted very often. In 1977, Paul Rabinowitz was the first person to prove the existence of periodic solutions of Hamiltonian systems on a starshape energy surface. ... [This] is of fundamental importance to mechanics. Paul Rabinowitz broke new ground to invent general mini-max methods for problems not necessarily satisfying the Palais-Smale [compactness] condition and that are indefinite. ... He has also introduced the use of sophisticated topological tools to obtain multiple solutions of nonlinear problems. Rabinowitz is a powerful mathematician who combines abstract mathematics with concrete applications to problems arising in various fields."

The Birkhoff Prize (which has a monetary value of $4,000) is awarded only every five years. Recent recipients have been Mark Kac, Clifford Truesdell, Paul Garabedian, Elliot Lieb, and S.R.S. Varadhan. There will be a presentation ceremony at the Joint Prize Session at the annual meeting of the AMS and MAA in Baltimore in January.



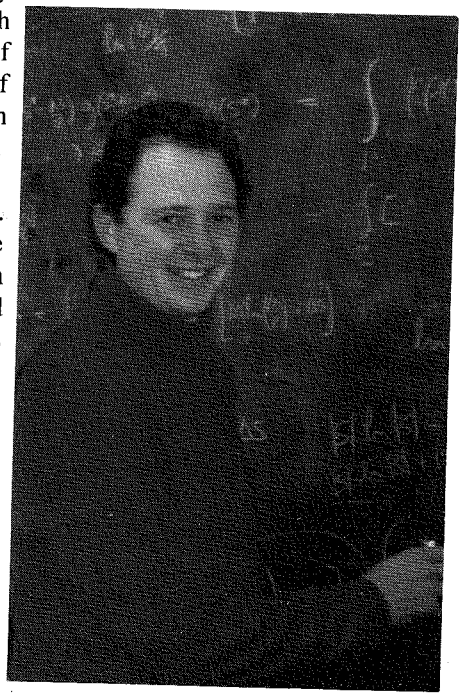
Andreas Seeger Wins Vilas Associate Award

Professor of Mathematics Andreas Seeger was named a Vilas Associate by the Graduate School. This highly competitive award provides two summers of research salary and $10,000 in flexible research support. In announcing the award Graduate School Dean Virginia Hinshaw said that it is "clear evidence of the respect and confidence in your work felt by your colleagues."

Andreas received the doctorate degree from the Technische Hochschule in Darmstadt, Germany in 1985. He was a Postdoctoral fellow at the Mathematical Sciences Research Institute in Berkeley and an Assistant Professor at Princeton University before joining our faculty as an Associate Professor in 1990. His research interests are in Harmonic Analysis and its applications to Partial Differential Equations. In 1994 he solved a major problem of Harmonic Analysis concerning an estimate for Calderon-Zygmund operators with rough kernels that had been open for about forty years. Seeger was the organizer (with Steve Wainger) of the very successful IMA summer program on Harmonic Analysis that was held in Madison in 1996.

Paul Milewski Is Named an Alfred P. Sloan Research Fellow and a Lilly Teaching Fellow

Assistant Professor of Mathematics Paul Milewski has been awarded a Sloan Fellowship by the Alfred Sloan P. Foundation. According to President Ralph Gomory of the Foundation, these are "extraordinarily competitive awards" with nominations for most of the very best scientists of Milewski's generation from around the country.

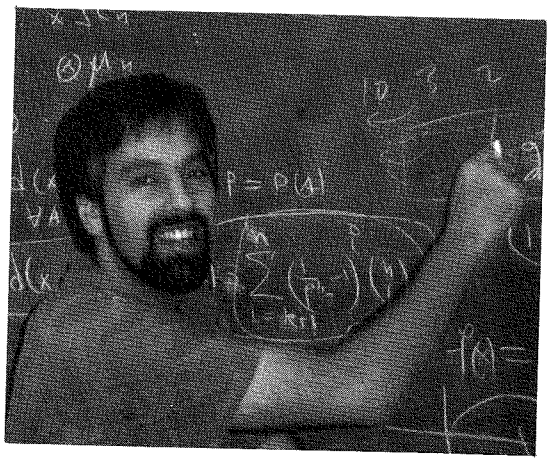


Milewski received a B.S. and M.S. in Aerospace Engineering from Boston University in 1988/89 and the PhD in Mathematics from MIT in 1993. He spent two years as a Gabor Szego Assistant Professor at Stanford University before coming to Madison in 1995. His research interests are in applying asymptotic and numerical methods to study problems of physical relevance in fluid mechanics and wave propagation, Paul is a very important player in the expansion of interdisciplinary activities in the Department.

In addition, Paul has been awarded by the College of Letters and Science a Lilly Teaching Fellowship for 1997-98. This award was based on his proposal to develop a course on "Applied Dynamical Systems, Chaos, and Modeling." This course will be of interest to mathematicians and scientists (physical and biological) whose work involved modeling of physical phenomena. It is expected to be an important and popular course in our interdisciplinary offerings on the undergraduate level. It will be offered in the spring semester of 1997-98. Paul is an excellent teacher and receives high evaluations from students and faculty who have observed him. This fellowship is an important recognition of his teaching accomplishments and future promise. Paul will receive a course teaching reduction and $1,000 in research monies.

Robin Pemantle and Thaleia Zariphopoulou Awarded Romnes Fellowships

Associate Professors Robin Pemantle and Thaleia Zariphopoulou have been awarded H.I. Romnes Fellowships by the UW-Madison Graduate School. This fellowship is named in honor of H.I. Romnes, late Trustee President of the Wisconsin Alumni Research Foundation. According to Dean of the Graduate School Virginia S. Hinshaw: "With this fellowship, the University recognizes proven potential and provides an opportunity for critical judgement by the Fellow on the best strategies for development of an outstanding research program. The award gives each Fellow $50,000 of flexible research support for a five year period.



Robin was nominated for his award within the Division of Physical Sciences by the Mathematics Department. His research interests in probability theory include tree indexed processes, random walks, particle systems, percolation models, rapidly mixing Markov chains, and sample path properties of Brownian motion. He also has research interests in combinatorics and optimization. Pemantle received the PhD from MIT in 1988 and was Andreotti Assistant Professor of Mathematics and NSF Postdoctoral Fellow at Oregon State University before he came to Madison in 1991. Previous honors and awards have included a Presidential Faculty Fellowship, a Sloan Fellowship, the Rollo Davidson Prize, and a Lilly Teaching Fellowship.

Thaleia was nominated for her award within the Division of Social Science by the Department of Finance in the School of Business where she holds a three-quarters time appointment. The other quarter

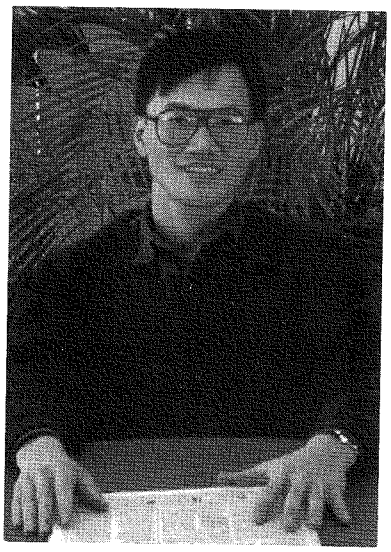
of her appointment is in the Department of Mathematics. Her research interests are in mathematical finance modeling and

stochastic control with application to the theory of finance. Zariphopoulou received a B.A. in Electrical Engineering from the National Technical University of Athens and the PhD in Applied Mathematics from Brown University in 1989. She was an Assistant Professor at Worcester Polytechnic Institute before coming to Madison as an Assistant Professor of Business and Mathematics in 1991. Thaleia also received a prestigious Sloan Fellowship in 1995.

YONG-GEUN OH PROMOTED TO ASSOCIATE PROFESSOR

Assistant Professor of Mathematics Yong-Geun Oh was promoted to Associate Professor with tenure this past year. Yong-Geun received a B.A. in Mathematics in 1983 from Seoul National University in Korea and a PhD in Mathematics from Berkeley in 1988. His research area is symplectic geometry as a quantization of ordinary topology. Before accepting the position at Madison in 1991, Oh spent one year as a Postdoctoral Research Fellow at the Mathematical Sciences Research Institute in Berkeley, and two years as a Research Instructor at the Courant Institute of New York University. He was on leave in 1991-92 at the Institute for Advanced Study in Princeton. In the fall of 1994 he was a Visiting Fellow at the Isaac Newton Institute in Cambridge, England.

In writing about his research area, Yong-Geun has said: "Although the physical world is quantum mechanical in nature, our perception of it is rooted in classical mechanics. Thus one is often confronted with the problem of constructing a quantum formulation of a system from a knowledge of a classical approximation to it. This process is called 'quantization' in physics, and over the years from the dawn of this century many different quantization schemes have been developed. Unfortunately, it has been known from the very early stage of quantum mechanics that quantization is not a straightforward proposition. One difficulty is that while the classical approximation to a given system is unique, there are many different quantum systems which have the same classical approximation. ... The area of symplectic topology is very new and currently is undergoing very rapid and exciting progress in its own and is also having a lot of interaction with 3 and 4 dimensional topology. This is one of the places where there is an extensive interplay between several different disciplines in mathematics: geometry, analysis, and topology."



In his recent work, Oh has focused on the theme of quantization, in a certain broad sense, of the ordinary homology via the Floer theory on the cotangent bundle. He has established a new framework in symplectic topology in which the existing approaches in the area can be unified via the Floer homology theory.

THREE FACULTY RECEIVE INVITATIONS TO LECTURE AT ICM

International Congresses of Mathematicians (ICM) take place every four years. They are supported and assisted by the International Mathematical Union (IMU). The next Congress will take place in Berlin on August 18-27, 1998. Approximately 150 mathematicians from all over the world are invited to speak at the Congress. Three of our faculty members have received prestigious invitations to speak at the Congress. They are Associate Professor **Yongbin Ruan** and Professors **Maury Bramson** and **Stephen Wainger**. Yongbin Ruan will speak in the section on Differential Geometry and Global Analysis. Maury Bramson will speak in the Probability section, while Steve Wainger will speak in the Harmonic Analysis section. Ruan has been on our faculty as an Associate Professor since 1995, having moved here from the University of Utah. Wainger came to Madison from Cornell University as an Associate Professor in 1966. Bramson, who came to Madison from the University of Minnesota as a Professor in 1987, has announced his resignation and will return to Minnesota at the end of this academic year.

Mathematics Department Receives Large Gift from Skinner Trust

Dr. Ernest Brown Skinner was a member of the Wisconsin Department of Mathematics from 1892 to 1934. His son Merrill Skinner di recently and $314,720.17 from his Trust has been assigned in memory of his father as a gift to the Department of Mathematics. A commit is currently considering how to best make use of this unexpected large gift. One suggestion that is currently being considered is to create endowment and to use the expendable earnings to support a (short-term) visitor program. Such a visitor program has been high on Department's priority list for a long time. Creating an endowment means that the gift will be available to the Department for a very long ti and additional contributions can be received,

$$ FUNDS AND CONTRIBUTIONS $$

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, 1848 University Ave., Madison, WI 53705.

The Elizabeth "Betty" Hirschfelder Birthday Celebration

On May 21, 1997 the University of Wisconsin Foundation and the College of Letters and Sciences presented the 95th Birthday Celebrati of Betty Hirschfelder (nee Stafford). All faculty of the Mathematics Department were invited as were all women graduate students. Be received the B.A. and M.A. degrees in 1923 and 1924 from Pembroke College, formerly the Women's College in Providence's Bro University. She moved to Madison to accept a fellowship with one of her former Brown professors, Dr. Mark Ingraham, who had joined t mathematics faculty at the University of Wisconsin-Madison. Betty received the PhD in Mathematics in 1930 under the tutelage of Ingraha The title of her thesis was "Matrices conjugate to a given matrix with respect to its minimum equation." Betty's PhD class contained the 18 19th, and 20th Wisconsin Math PhDs. Betty taught mathematics for almost twenty years at Madison, and co-authored the book "Hig Mathematics for Engineers and Physicists" with her th husband (and Wisconsin mathematics faculty member) I Sokolnikoff. Later she was to marry Joseph Hirschfelder the Chemistry Department. She retired in 1954 as assist professor with tenure.

Susan Hollingsworth, Betty Hirschfelder, & Dean Phillip Certain

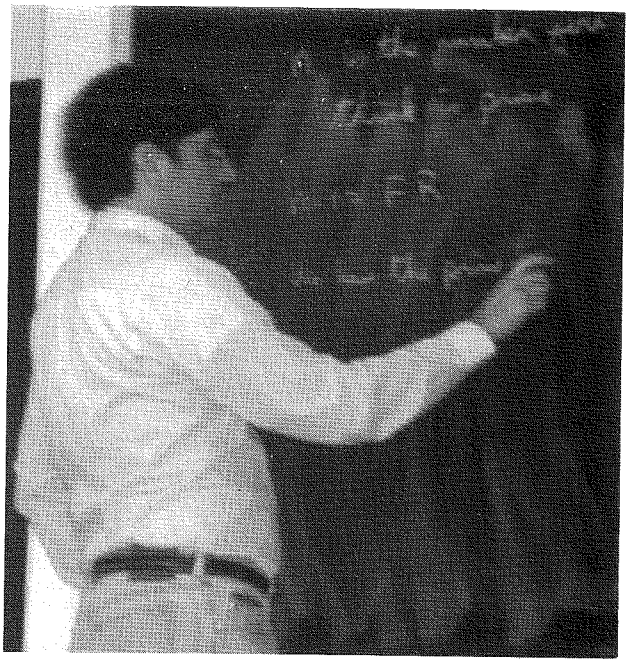
The following is a tribute to Betty sent with the lunche invitation:

"Throughout her life, Betty has demonstrated a spec commitment to math and science and has been especia supportive of women in science. She has established f funds at the University of Wisconsin Foundation recognize outstanding work in chemistry, support professorship in chemistry, support a distinguished visiti lecturer in chemistry, and help women graduate stude pursuing advanced degrees in math, chemistry, and physics.

"Betty continues her involvement with the Univers through her generous philanthropy and vari departmental activities. She spends most of her time Madison, but enjoys winters in Santa Barbara, Californi

Special Lectures...

In 1996-97 the Department of Mathematics initiated a new Distinguished Lecture Series. Our Spring 1996-97 Distinguished Lecturer was Professor **Carl Pomerance** of the University of Georgia. Professor Pomerance visited the Department from April 15 to 17, 1997 and gave a series of three lectures on modern number theory and its applications. The title of his lectures were: "Witnesses for Composite Numbers", "Prime Proofs", and "An improved n-1 Test." The first talk concerned the problem of determining whether a given large number is prime or composite, and tests of Selfridge and Grantham were discussed. In his second talk, Pomerance surveyed some of the highlights of primality proving algorithms over the past century, from Lucas and Lehmer to Adleman and Huang, including some recent results from a paper of Konyagin and Pomerance. According to Pomerance, the goal of a polynomial time deterministic primality test seems 'tantalizingly close.' The third talk contained some of the details in the Konyagin-Pomerance paper.



Carl Pomerance

Our Fall 1997-98 Distinguished Lecturer was Professor **Michael Crandall** of UC-Santa Barbara who as reported elsewhere is spending the entire fall semester in Madison. Mike gave two special lectures in October of this year. The first was titled "What is a partial differential equation anyway?" while the second was on "Some highlights of the theory and applications of viscosity solutions." Mike's vast knowledge of the history and technical parts of partial differential equations was apparent throughout both of his lectures.

The LAA Distinguished Lecturer in 1996-97 was Professor **Ludwig Elsner** of the University of Bielefeld in Germany. His lecture, which was given on May 9, 1997, was titled "Variations of the Hoffman-Wielandt Theorem." The Hoffman-Wielandt Theorem gives a bound on the sum of the squares of the absolute value of the differences of the eigenvalues of two normal matrices A and B in terms of the Frobenius norm of the difference A-B. Generalizations have been made to joint eigenvalues of k-tuples of commuting normal matrices, operators in Hilbert Space, and so on. Professor Elsner has been at Bielefeld since 1976 and has been an associate editor of the journal Linear Algebra and its Applications (LAA) since 1983.

Our third Wolfgang Wasow Lecture was to have been given last spring by Professor **Louis Nirenberg** of the Courant Institute (NYU) on "Degree Theory beyond Continuous Maps." Because of illness, Professor Nirenberg had to cancel but we are expecting him to deliver his lecture this coming spring.

Our Spring Distinguished Lecturer this year will be Professor **Elias Stein** of Princeton University who, as reported elsewhere, will spend two months in Madison in the spring of 1998.

Special Public Lecture

Professor **Carlo Cercignani** of the Department of Mathematics of the Politecnico di Milano in Italy delivered a special public lecture on "The Life of Ludwig Boltzmann" on December 1, 1997. This lecture was supported by the University Lectures Committee and sponsored by the Departments of Mathematics, Physics, and Engineering Physics, and the Center for the Mathematical Sciences. The lecture was held in Sterling Hall to allow for a TV broadcast to other UW-System campuses. In his lecture, Professor Cercignani introduced Boltzmann as the man who gave a convincing explanantion of the paradoxical matter of time irreversibility in everyday life and in theoretical mechanics. He described the life of Boltzmann from his birth in Vienna in 1844 to his tragic suicide in Duino in 1906. He talked about the equation, now called Boltzmann's equation, that Boltzmann established in 1872 and its use by mathematicians, chemists, physicists, and engineers in their study of dilute interacting particle systems. He also described Boltzmann's three trips to the USA with particular emphasis on the last one, to California, described by Boltzmann hinself in his account entitled "Die Reise eines deutschen Professors ins Eldorado." Professor Cercignani, who received an honorary doctorate from the University of Paris IV in 1992, is writing a biography of Ludwig Boltzmann.

Student and Instructional News... Undergraduate

Math Club

With Richard Askey as Faculty Advisor and Tom Dorsey and Katie Thompson as organizers, the 1997-98 Math Club is off to a rousing start. The Math Club meets on Thursdays in the 9th floor conference room of Van Vleck Hall. Talks this semester have included: I. Martin Isaacs on "Soccer balls, pentagons and Euler", Michael Bleicher on "Perfect and Friendly Numbers", and Mirna Dzamonja on "Cardinal Arithmetic." Attendance at these talks has been great with about 50 people in the audience.

Undergraduate Scholarships

The Undergraduate Scholarship Committee (Dan Shea and Paul Terwilliger) selected last year the following students for undergraduate Math Scholarships:

Frank D. Cady Scholarship (to a needy and outstanding student majoring in math): $1500 to **Thomas Dorsey**. At the time of the award, Tom was a second-year student in the honors program.

Professor L. Wayland-Dowling Scholarship Fund (to a student majoring in math): $500 to **Joshua Sack**. At the time of the award, Josh was a first year student in the honors program who took Math 340H (Elementary Linear Algebra) and 521 (Advanced Calculus).

Mark Ingraham Scholarship Fund: $500 each to **Karen Lewis** , **Robert Sundling**, and **Miu Fung**. Karen, Robert, and Miu were, at the time of the award, all second-year students in the honors program.

R. Creighton Buck Undergraduate Prize for Creativity in Mathematics: $500 to **David Corris**. While in high school, David won a four-year Van Vleck Talent Search Scholarship. He has now graduated with a double mathematics and economics major in the honors program. He was cited for his contributions to our departmental Undergraduate Seminar and Putnam Exam team, and his use of mathematics in honors projects for two of his courses.

Seattle Chapter of the Wisconsin Alumni Association Awards Scholarships: The Seattle Chapter made available this year two scholarships worth $2,000 each to UW-Madison students. The scholarships were to be awarded to undergraduate women who are studying mathematics and have need. The Seattle Chapter awarded the scholarships to **Karen Theresa Lewis** of Milwaukee and **Andrea Lynne Glaza** of Reedsville.

Curriculum Changes

Math 221-222-223

Our Calculus Committee headed by Professor Robert Wilson has recommended, and the Department has approved, some major changes in the basic calculus sequence Math 221-222-223. The most important is that the 5-credit course Math 223 is offered for the last time this semester. Beginning with Semester II, 1997-98 the three credit course Math 234 will replace Math 223, and the number of credits in the basic calculus sequence is reduced from 15 to 13. This change is being accomplished by moving some topics on first-order differential equations from their present place in Math 223 to Math 222. Vector calculus is being moved from its present place in Math 222 to Math 234, although the introduction to vector algebra and geometry currently in Math 222 will remain there. The treatment of second-order differential equations now in Math 223 will be omitted from the basic calculus sequence. Math 234 is now primarily a multivariable calculus courses. Students who want a substantial introduction to differential equations will now take Math 319 (Techniques in Ordinary Differential Equations). Math 319 will no longer assume that students have had studied differential equations, beyond the introduction to first-order equations given in Math 222.

Math 231 and Math 232

These are two new introductory courses in probability (Math 231) and dynamical systems (Math 232) being developed by Professor Fred Brauer for students in the biological sciences. Each has a prerequisite of one semester of calculus and is independent of the other. Examples and applications appropriate to undergraduate biology courses will be included in both. It is anticipated that while some biology students who now take second semester calculus (Math 222) will take one or both of these courses instead, many others who now take only one semester of calculus will go further in mathematics. Math 231 is a two credit course and will be offered for the first time this spring. Math 232 is a three credit course and will be offered for the first time next fall.

Math 415

This is a course newly titled "Applied Dynamical Systems, Chaos and Modeling" which is being revised by Professor Milewski to include stronger mathematical foundations with applications from many areas of science. The subject area of dynamical systems concerns the study of the time evolution of equations modeling physical phenomena. The time evolution can be continuous (e.g. in the motion of planets) in which case the mathematical equations are usually ordinary differential equations) or discrete (e.g. change of population of species in an ecosystem) where the equations are difference equations. More recently, the term 'dynamical systems' has been used to describe many far reaching qualitative results on such equations. The best known success of modern dynamical systems theory is the description of the phenomenon of chaos. Chaos is a term used to describe complicated temporal behavior in a deterministic system of equations. In chaotic systems, arbitrarily close initial data diverge exponentially fast, and thus the long time solution of the equations to a particular initial data is usually physically irrelevant. Thus quantitative results are not always useful.

Dynamical systems results, because of their general nature, are applied widely in many fields of research: medicine, engineering, biology, physics, ecology, economics, atmospheric and oceanic sciences, etc. This interdisciplinary course requires a solid foundation in the first two years of undergraduate mathematics. It will focus on the applications of the theory with many examples taken from the above fields. The course will cover, as a minimum, the following topics: phase-plane analysis for differential equations in one-, two-, and three-dimensions, one-dimensional difference equations, bifurcations (local and global) of solutions, chaos, strange attractors, and fractals. These topics will be applied to: vibrations, biological rhythms, lasers, chemical oscillators, population problems, and so on. Computer technology and visualization will be made use of to improve the students' understanding of the material.

MATH TUTORIAL PROGRAM CELEBRATES 20TH BIRTHDAY

The Math Tutorial Program (MTP) is 20 years old this fall. The program was initiated by the Mathematics Department to improve the final course grade of students who might otherwise drop, fail, or receive a very low grade if they received regular instruction only.

The program began October 10, 1977, under Director Walter Potter (PhD 1974, I.M. Isaacs), with 70 students and 3 staff members offering small group tutoring for Math 112 (College Algebra) and Math 221 (Calculus I). Claire Rider has been the Director since 1988 and has overseen a large expansion of the Program. This semester it has enrolled 328 students and has a staff of 7. The staff includes both TAs and academic staff. The Program also has expanded its support of courses to now include courses ranging from Intermediate Algebra to Calculus II (Math 101, 112, 113, 211, 213, 171/272, 221 and 222). Part of this expansion is a result of a Undergraduate Initiative At-Risk Grant through the Chancellor's Office.

The Tutorial staff offers workshops, "What are You Expected to Know in Your Math Class?" at the beginning of each semester to enable students to be aware, early in the semester, of the expectations both in preparation and in study time. Approximately 580 students attended these during Fall, 1997. The Tutorial staff also offers advice about study skills, test-taking strategies, and time-management, and assists in proctoring exams for students who have special needs.

In a study drawn from Math 112 in 1991-94, looking at students who received a D or F on the first course exam (a major criteria for acceptance into the Tutorial Program), a comparison was made of students who participated in the Program with those that did not. The MTP students had a success rate of about 50% compared to about 26% for non-MTP students and their percentage of drops was less than one-half of that of the non-MTP students. The MTP Home Page can be viewed at http://math.wisc.edu/~tprogram.

ELECTRONIC CLASSROOM

The Department has a high-tech classroom now, replacing the small lecture room B107. This room is equipped with twenty powerful PC workstations, networked to each other and to the world. The stations are arranged so that they can be used by individual students or small groups. The room can accommodate a class of up to forty students. The computers are supported by a file and printer server located elsewhere, with a printer in the classroom where students can print their work. Because of the shared file server, many programs which the students use can be loaded just once and still appear to each student to exist on the local computer. The computer classroom is available for the department to schedule, rather than being assigned by the timetable office, so we can use it in various ways. Some classes and seminars have been meeting there regularly, others come on a fairly regular basis for a "lab" session while having most classes in a conventional classroom, and yet others just use the room for an occasional session. One ongoing use of the room is for the Computers and Math series run by Yvonne Nagel, which has included things as varied as instruction for graduate students in how to use our computer systems and demonstrations of innovative uses of computing in teaching, for use in large lecture halls, for lab assignments, or for use in this same classroom.

One course which has made a lot of use of this facility is Math 132, the third semester of the sequence for students preparing to be elementary school teachers. This sequence replaced the previous courses for these students several years ago, after changes in certification requirements by the Wisconsin Department of Public Instruction had the effect that the number of hours of mathematics (not math methods) courses these students take was doubled. The 130-131-132 sequence places a large emphasis on collaborative learning, with work in small groups replacing lectures in many classes. In Math 132, Mathematical Models, some teachers (Bob Wilson, Terry Millar, Tom Roby, ...) have used the computer classroom for more than half of the class meetings. A typical session has the students working in pairs, using the spreadsheet program Excel. One project, for example, has them model population growth and resource usage in a fictional country. The mathematical background required of these students would not enable them to model exponential growth analytically. Using a spreadsheet they can create a model which shows if and when population outstrips resources, with both numeric and graphical displays, and lets them discover how the behavior of the model changes when they change the parameters they have used in creating it. This has been very successful measured either by the student's enthusiasm or by the understanding they later display on conventional exams.

Another course that is making substantial use of the electronic classroom is Math 319 (Techniques in ordinary differential equations) as taught by Paul Rabinowitz. Using MATLAB and its capabilities with respect to differential equations, students have been able to tackle questions that would have been too onerous in the past.

TALENT SEARCH

The annual Talent Search Honors Day was held on May 7, 1997. As a result of their exceptional performances on the problem sets this year, twenty-two high school (in some cases middle school) students from all over the state of Wisconsin were invited to Madison for the day. The students and their teachers were treated to an exciting program including a talk "Experimental Number Theory" by Professor Rod Smart and a talk "New Views of the Universe" by Professor John S. Gallagher of the Department of Astronomy. Included on the program was a tour of the Department of Astronomy in Sterling Hall.

As a result of their outstanding performance on a special scholarship exam, three students were awarded Van Vleck Scholarships worth $4,000 a year for four years provided they enroll at UW-Madison. They were: Chad Keever of Homen High School, Po-Shen Li of Madison's Memorial High School, and Wei Ho of New Berlin West High School.

You can try your hand at a couple of the problems sent out last year.

Problem: Let S be a set of positive integers containing 1, 2, 3, and 4. Suppose that for every subset of S consisting of four distinct integers, the sum of that subset is also a member of S. Prove that 1000 is a member of S.

Problem: (New Year's problem) Let m and e be positive integers and suppose that N=1997m/(m+1997^e) is an integer. Find all possible values for N.

Graduate

TWENTY-SEVEN PHDS AWARDED IN 1997

Twenty graduate students were awarded PhDs this past year. They are listed below along with their advisors, title of thesis, and new location if known:

Alrefaei, Mahmoud, S. Andradottir, "Discrete stochastic optimization using random search" (degree joint with Industrial Engineering).

Arratia-Quesada, Argimiro A., D. Joseph, "On the existence of normal forms for logics that capture complexity classes," Depto. de Matematicas, U. Simon Bolivar, Apartado 89000, Caracas 1080-A, Venezuela.

Benjamin, Diane Mullan, I.M. Isaacs, "Character degrees and structure of solvable and p-solvable groups," Dept. Mathematics, UW-Platteville, Platteville WI 53818.

Catoiu, Stefan, D. Passman, "Ideals in enveloping algebras," Visiting Asst. Prof., Dept. of Math., Temple U., Philadelphia PA 19122.

Chen, Hsing-Hsia, J. Strikwerda, "Preconditioning for regular elliptic systems," Dept. of Math., Chung-Yuan U., Chung-Li, 320 TAIWAN.

Chen, Ming-Li, A. Assadi, "Cohomology representations."

Eisen, Nicolas, J.-P. Rosay, "Holomorphic sections of an orientable vector bundle."

Hermann, Paul D., R.W. Dickey, "Symmetric and unsymmetric buckling of circular arches," Technical Services Staff, Epic Systems Corp., 5301 Tokay Blvd, Madison WI 53711.

Huang, Wenchao, H. Schneider, "On the theory of inertia and stability of polytopes and cones of matrices," Morgan Stanley & Co., 750 7th Ave., NY, NY 10019

Kim, Yong Cheol, A. Seeger, "On the maximal Bochner-Riesz operator," Dept. of Math., 1, Anam-dond, Sungbuk-ku, Seoul 136-701 Korea.

Kribs, Christopher, F. Brauer, "Core recruitment effects in modeling a sexually transmitted disease," Asst. Prof. of Math., U. Texas @ Arlington, PO Box 19408, Arlington TX 76019-0408

Lee, Jaesung, P. Ahern, "An invariant volume mean operator and its iteration in the bidisc," Topology & Geometry Research Center, Kyung-Buk Univ., Kyung-Buk, Korea.

Lewis, Heather, P. Terwilliger, "Homotopy and distance-regular graphs," Nazareth College, Rochester, NY.

Lindhurst, Scott, E. Bach, "Computing roots in finite fields and groups with a jaunt through sums of digits."

Logan, Mark J., L. Solomon, "Homology and invariants of reflection groups and Lie algebras," Visiting Asst. Prof., U. of California-Santa Cruz.

Milinkovic, Darko. Y. Oh, "Floer homology and stable Morse homology in symplectic geometry," Visiting Scholar, Math.Inst., Acad. of Sci. of the Czech Rep., Zitna 25, CZ-11567, PRAGUE, Czech. Rep.

Montgomery, Aaron Glee, S. Husseini, "Lusternik-Schnirelmann category and simplicial sets," Visiting Asst. Prof., Purdue U. North Central, 1401 S.US 421, Westville IN 46391-9528.

Ortiz, Carlos, H.J. Keisler, "Truth and approximate truth in metric spaces," Asst. Prof., Dept. of Comp. Sci, & Math., Beaver College, Glenside PA 19038-3295.

Skarabot, Jure, A. Seeger, "Bounds for the Besicovitch type maximal operator."

Sneyd, Elizabeth, R.A. Brualdi, "Tolerance graphs and pseudo-interval graphs," New Zealand.

Strom, Jeffrey A., S. Husseini, "Category weight and essential category weight," Visiting Prof., Wayne State U., 1150 FAB, Detroit MI 48202.

Szydlik, Stephen D., P. Orlik, "Milnor fiber complexes for rank 2 Shepherd groups and a note on the Poincare polynomials of an arrangement." Asst. Prof. of Mathematics, UW-Oshkosh, 800 Algoma Blvd., Oshkosh WI 54901.

Uen, Wuu-Nan, J. Harvey, "A descriptive study on the mathematical teaching styles of junior high mathematics teachers in Taiwan," Taiwan.

Varolin, Dror, F. Forstneric, "The density property," Asst. Prof. of Math., U. of Michigan, Ann Arbor MI 48109-1109.

Westlund, Eric R., P. Orlik, "The boundary manifold of an arrangement," University of Wisconsin, Madison, WI 53706.

Yeh, Chien-Ning, H.J. Keisler, "O-minimal expansions of ordered sets with unary functions."

Yoo, Jaechil, S. Parter, "Numerical solvers for the Galerkin least squares methods," Dept. of Math., KAIST, 373-1 Kusong-dong, Yusong-gu, Taejon, Korea 305-701.

New Graduate Students

Thirty new graduate students enrolled in the Mathematics Department in the fall of 1997. Their names and institutions from where they graduated are:

Alkan, Emre	Bogazieci Univ.	Karwatka, Richard	UW-Parkside
Basamakov, Kostadin	Univ. of the South	Kim, Inwon	Seoul National Univ.
Bharali, Gautam	Indian Inst. Tech.	Lladser, Manuel	Univ. of Chile
Chen, Kenneth	Univ. of Texas-Austin	Miller, Daniel	Penn State Univ.
Chen, Elizabeth	Albion College	Mombauer, Guido	Rheinische Friedrich Wilhelms Univ.
Cookson, Timothy	Univ. of Maryland	More, Maria	Davidson College
Davies, Simon	Univ. of Auckland	Morrill, Thayer	Miami Univ.
Fowler, Brian	Univ. of Warwick	Patterson, Tyson	Rose-Hulman Inst. of Tech.
Gerber, Kenneth	Washington Univ.	Petro, Matthew	Univ. of Michigan
Gill, Louis	Oklahoma Univ.	Potamites, Elizabeth	Univ. of Chicago
Hamblin, James	Cornell Univ.	Rebai, Adnan	UW-Madison
Hangelbroeck, Thomas	Western Illinois. Univ.	Russell, Colin	Penn State Univ.
Herzig, Abbe	UW-Madison	Tiu, Cristian	Univ. of Bucharest
Hu, Shengda	Sichuan Univ.	Voelker, Meta	Illinois Wesleyan Univ.
Humbarger, Hans	Purdue Univ.	Yang, Winston	California Inst. of Tech.

Teaching Awards For TAs

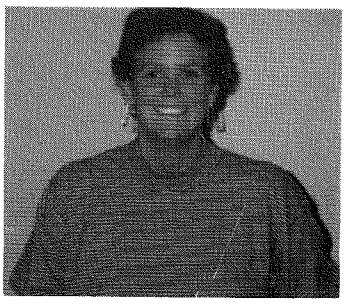
The Teaching Assistant Evaluations Committee (Rod Smart (chair), Dan Rider, Dietrich Uhlenbrock) last year selected five TAs to receive "Excellence in Teaching Awards": **David Kung, Mark McKinzie, Ana Meda-Guardiola, Darko Milinkovic, Vadim Ponomarenko**. Each of them was honored for outstanding accomplishments as a teacher and was given a $75 gift certificate and a certificate of the award suitable for framing. Receiving the "Sustained Excellence in Teaching and Service Award" this year were **Susan Hollingsworth** and **Aaron Montgomery**. Susan was cited for her consistent superior teaching evaluations and for her efforts in teaching 'satellite-calculus' sections of Math 221, 222, and 223. Aaron was also cited for his superior teaching evalauations and for his efforts in coordinating Math 113. In addition, Aaron served for two years on the Teaching Evaluations Committee.

(Top) Darko Milinkovic, Vadim Ponomarenko, Mark McKinzie, David Kung; (Bottom) Christopher Kribs, Susan Hollingsworth, Ana Meda-Guardiola; (Missing) Aaron Montgomery

Cheryl Grood

The "Distinguished Service Award" went this year to **Cheryl Grood**. Cheryl was cited for her many contributions to the Department of which the following are only some: member of the Graduate Program Committee for two years, member of the Committee on Teaching Assistant Policies and Procedures, founder of the Madison chapter of the Noetherian Ring (an organization of women graduate students and faculty), organizer of a mentor program in which women math graduate students are paired up with women undergraduate math majors for support and encouragement, calculus TA coordinator for two years, coordinator of the summer orientation for international teaching assistants.

Stephanie Edwards was named a College of Letters and Science Teaching Fellow for 1997. The selection of Fellows recognizes the high performance of individuals as a TA. Stephanie received a check for $500 and lead a workshop for new College teaching assistants on August 29 before classes began this fall.



Stephanie Edwards

Christopher Kribs who was named a Teaching Fellow for 1996 received an "Excellence in Teaching Award" from the Graduate School in 1997. These awards, worth $1,000, are competed for by TAs all over campus and are given to recognize outstanding contributions to instruction and high quality graduate work.

Susan Hollingsworth Is First Hirschfelder Scholarship Winner

The first award recipient of the Elizabeth Hirschfelder - Graduate Women in Mathematics, Chemistry and Physics Fund was Susan Hollingsworth of the Department of Mathematics. The award is a $10,000 fellowship for dissertation research. Susan, who is studying combinatorics and graph theory, was presented with the award at a ceremony at the 95th birthday luncheon for Elizabeth Hirschfelder (described elsewhere in this newsletter).

The following graduate students were awarded fellowship money from the Graduate Assistance in Areas of National Need Program of the Department of Education: Philip Apps, Antonio Behn, Brent Hetherwick, Olga Holtz, Marie Huedepohl, Rajesh Kasturirangan, Michael Lang, Wafik Lotfallah, Sangnam Nam, Dejan Slepcev, Maciej Smuga-Otto, Halldor Stefansson, Stephen Tanner, Taras Vovkivsky. Evan Griffiths and Guido Mombauer received university fellowships.

Noetherian Ring

The UW-Madison chapter of the Noetherian Ring has been meeting regularly this fall semester. Those giving talks have included Lynne Butler of Haverford College who spoke on "Lattices of subgroups of finite abelian p-groups and subspaces of finite dimensional vector spaces over F_p", Nancy Ann Neudauer of UW-Madison, who spoke on "Bicycling on the Isthmus: graphs, graphs and graphs", and Ellen Kirkman of Wake Forest University who spoke with the Ring in an informal gathering.

Alumni News and Comments

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

Garth Dickie (PhD 1995, P. Terwilliger) received this year a Technical Achievement Award (Certificate) from the Academy of Motion Picture Arts and Sciences. The award text read: "To Perry Kivolowitz, for the primary design, and Dr. Garth A. Dickie for the primary algorithmic development of the shape-driven warping and morphing subsystem of the Elastic Reality Special Effects System. This subsystem forms the core of an efficient and easy-to-use system which greatly simplifies the creation of shape-changing visual effects in motion pictures."

According to Garth: "There were eight certificates, four plaques, and one statue awarded in the Technical Achievement Award category. Elastic Reality software runs on Silicon Graphics, Macintosh, and Windows machines. I did most of the work in question during the summer of '92, when I should have been studying for qualifying exams - and in fact I didn't pass the ones I took that fall, and had to try again. Now I'm back working at the same place. It was certainly a surprise to have Helen Hunt mention our names during the main academy awards ceremony."

Sylvia Wiegand (PhD 1971, L. Levy) is now President of the Association of Women in Mathematics (AWM). Sylvia is Professor of Mathematics at the University of Nebraska and is spending a sabbatical this year at Michigan State University and Purdue University. Sylvia has been elected to the Nominating Committee of the American Mathematical Society for 1998.

Shaun Cooper (PhD 1995, R. Askey) writes that he has been doing a lot of traveling recently. He went to a Workshop on Special Functions and Differential Equations in Madras in January, 1997 followed by a two-week visit to the University of Sidney (Australia), Shaun also writes: "I've had an excess of exercise - 20+ hours per week, recently, while training for a 100km run which was two weekends ago. I ran 7:22:30, which qualifies me to run in the NZ team at the World 100 km Championships in Holland, in September 1997." Shaun is at Massey University in New Zealand.

Matt Kaufmann (PhD 1978, J. Barwise) writes: "I received "Van Vleck Notes" yesterday and read "From the Editor...". The first paragraph was one of the most amazing things I've ever read, because my wife is a social worker and we play the music at a contra dance once a month. She's often said that it's a good idea to pair up social workers with math people (well, she might have said "computer science people") - anyhow, that paragraph really seemed like it was written for us! Thanks."

Michael Starbird (PhD 1974, M. Rudin) has been elected as a member-at-large of the Council of the American Mathematical Society.

Mary Beth Ruskai (PhD 1969, Physics) has also been elected as a member-at-large of the Council of the American Mathematical Society.

This and That...

- The second annual Math Department Dance was held in Tripp Commons of the Memorial Union on September 27. This year's theme was a multicultural contra-and folk-dance. The dance leaders were Sanna and Mars from Evanston, Illinois who are well-known throughout many parts of the country. Particularly noteworthy was Sanna's own creation, the Matzah-rena. More than forty people enjoyed a vigorous social evening.

- **Paul Rabinowitz** has been elected to a three-year term on the Board of Directors of the Institute for Mathematics and its Applications (IMA) at the University of Minnesota. Paul has also been elected to the AMS Nominating Committee for 1998.

- **John Nohel** has completed his part as Co-editor of the Selected Papers of Norman Levinson. John writes that it took 20 months of hard work but that it was well worth the effort. The papers will be published, expected by the end of the year, by Birkhauser-Boston in 2 volumes each about 1100 pages long.

- **Anatole Beck** has written a book about THE KNOWLEDGE BUSINESS, that being education, research, invention, innovation and creativity. The thesis is that this is a very profitable business for the human race as a whole, even when only economic benefits are considered. The book is not yet published but it can be found on his home page at http://math.wisc.edu/~beck/book/.

- The WEB site the "Promordial Soup Kitchen" of **David Griffeath** was featured in SCIENCE magazine's WebWatch column in its October issue. The site is devoted to research on cellular automata - collections of mathematical objects that individually are governed by simple rules but are highly complex in the aggregate. It can be viewed at http://math.wisc.edu/~griffeat/welcome.html.

- **Hans Schneider** and Bertram Huppert (U. Mainz) are editors of Helmut Wielandt's "Mathematical Works," the two volumes of which have now been published by de Gruyters. The first volume contains an essay on subnormal subgroups by Marty Isaacs. The second volume contains Wielandt's notes on analytic matrix theory published here for the first time. These notes are based on a course given at UW-Madison by Helmut Wielandt in 1966-67 and the notes were prepared by Robert Meyer (UW-Madison, Computer Sciences Department). The commentary on the notes in the "Mathematical Works" is by George P. Barker (PhD 1969, H. Schneider).

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