DEPARTMENT OF MATHEMATICS NEWSLETTER
University of California, Davis

Winter 2002

Message from the Chair

by John Hunter

Another academic year, 2001-02, has passed, and it was an eventful and successful year for the Department of Mathematics. It was my first full year as Department Chair and, to my great surprise, I survived! It is my belief you can never be fully prepared for the position of Chair and the challenges in store. However, there are many rewards, not least of which is the continued success and growth of our Department and its members. With that, I am pleased to report on some of the highlights of the past year 2001-02 in the Department of Mathematics.

In the area of national and international awards, our faculty — as usual — has many impressive achievements. To name a few: **Alexander Soshnikov** was awarded an Alfred P. Sloan Fellowship; **Albert Fannjiang** was awarded an American Mathematical Society Centennial Fellowship; **Craig Tracy** was awarded the SIAM Pólya Prize (jointly with his coworker **Harold Widom** for their groundbreaking work on random matrices); and **Anna Schilling** was awarded an Alexander von Humboldt Fellowship, which will enable her to carry out research in Germany. In other marks of recognition, two of our faculty members (**Bruno Nachtergaele** and **Craig Tracy**) were invited speakers at the International Congress of Mathematicians held in Beijing in August, 2002, and **Roger Wets** was awarded a Doctor Honoris Causa — the highest honorary title that a University can award — by the University of Vienna in January 2002, for his scientific achievements.

Mathematics faculty were particularly strong in securing grant funding for their research work this past year. There were 8 new grants totaling $1,333,587 in extramural dollars for 2001-02. Overall, the Department administered 40 extramural grants with a cumulative budget amount of $6,576,395. The Department also began its NSF-funded VIGRE program this year, which provides integrated research programs for undergraduates, graduate students, and postdoctoral fellows. The UC Davis Mathematics Department is one of only 33 departments nationwide to be awarded VIGRE funding.

Another important area of effort occurred in faculty recruitment. In 2001-02, we recruited three excellent young researchers to UC Davis: **Monica Vazirani, Matt West,** and **Hong Xiao**. Monica Vazirani works in combinatorics and representation theory, Matt West in applied mathematics and geometric mechanics, and Hong Xiao in numerical analysis. They will add to the strengths already present in the department and we are excited to have them join us.

An ongoing project is planning for the new Mathematical Sciences Building, which we will share with the Department of Statistics and the new

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Computational Sciences and Engineering initiative. This past year, there were numerous meetings involving the architects, the campus planners, and representatives from the Departments and the Dean's office. As you can imagine, getting all parties to agree was no small feat, but we have finalized the schematic design, and next the architects will prepare detailed working drawings. Construction of the building is scheduled to begin in August, 2003 and be completed in November, 2004.

One of the more laborious parts of the Chair's job is writing department letters for faculty personnel actions. This job is made easier, however, by the outstanding quality of our faculty, and I am happy to report that **all** of our faculty personnel actions were approved. Of the more significant actions, five of our faculty were promoted as follows:

Jesús De Loera	Assistant to Associate Professor
Janko Gravner	Associate to Full Professor
Alexander Mogilner	Associate to Full Professor
Steve Shkoller	Associate to Full Professor
Alexander Soshnikov	Assistant to Associate Professor

The department continues to teach many students each year. Last year, we had over 5,000 students per quarter enrolled in mathematics classes, and provided instruction to a total of 15,691 students over the year. We have 365 undergraduate majors — a number that is steadily increasing, corresponding to the overall enrollment growth at UC Davis of about 1,000 students per year. Our graduate program is also flourishing, with a current total of 87 graduate students in the Mathematics Graduate program, the Graduate Group in Applied Mathematics, and the Masters of Arts in Teaching program.

Our department staff have been extremely busy this past year, and have continued to provide their usual superb service to the faculty and students even while they were reduced in numbers. Although these are challenging times, the staff pulled together and reinforced the concept of teamwork. One change that occurred recently is the return of **Tracy Ligtenberg** as the Management Services Officer for the department, and we all welcome her back.

On a final sad note, just before publication, our esteemed colleague and friend, Professor Emeritus **Henry Alder**, passed away. Henry Alder was highly regarded for his work in number theory. Besides being an outstanding teacher and mentor to students, he served the Department, the University, and national Mathematics organizations for many years in a variety of capacities. He will be greatly missed by all of us. The department will hold a memorial service honoring him on January 16, 2003, 4–6pm in the AGR Room in the Alumni Center.

Craig Tracy wins the Pólya Prize from the SIAM News

Outstanding Research Recognized at SIAM50

Craig A.Tracy (center) and **Harold Widom** (left) shared the 2002 George Pólya Prize "for their remarkable work on random matrix theory , a subject with multiple connections to complex analysis, orthogonal polynominals, probability theory, and integral systems." Tracy, a Professor of Mathematics at the University of California, Davis, and Widom, Professor Emeritus in Applied Sciences at the University of California, Santa Cruz, are shown here with SlAM president Tom Manteuffel in Philadelphia, at the SlAM 50th Anniversary Meeting. Tracy gave the prize lecture, "New Universal Limit Laws: Largest Eigenvalue Distributions of Random Matrices and Their Applications," at the meeting.

Awarded every other year, the Pólya Prize commemorates the breadth of Pólya's mathematical interests by alternately recognizing notable applications of combinatorial theory and, as this year,

notable contributions in other areas in which Pó1ya worked, such as approximation theory , complex analysis, number theory, orthogonal polynomials, probability theory, or mathematical discovery and learning.

Department Awarded a VIGRE Grant from NSF

by Bruno Nachtergaele

The National Science Foundation has awarded a VIGRE (Vertical Integration of Research and Education) grant to the Department of Mathematics. This grant will provide $3,201,784 over five years to support research in all major areas represented in the department. The main focus of the grant is on fellowships for graduate students and postdoctoral researchers, but the budget also includes summer stipends for 20 undergraduate each year to allow them to work on research projects with faculty in the department.

The UCDavis VIGRE project offers a range of activities designed to integrate the excitement of research mathematics into every facet of our programs, undergraduate, graduate and postdoctoral. The main structural components of the project are Research Focus Groups, which will coordinate many of the activities. Each year there will be four Research Focus Groups with themes that will vary from year to year, so as to insure that, over the years, all major research topics are covered. For the academic year 2002-2003 the following four themes for Research Focus Groups have been selected:

- Combinatorics (led by Prof. Jesús De Loera),
- Geometric Topology (led by Prof. Joel Hass),
- Dynamics of Quantum Many-Body Problems (led by Prof. Bruno Nachtergaele), and
- Applied and Computational Harmonic Analysis (led by Prof. Thomas Strohmer).

A Research Focus Group in Quantitative Biology (led by Prof. Alexander Mogilner) is planned for 2003-2004.

Each Research Focus Groups includes regular faculty members, postdoctoral fellows, graduate students, and undergraduates. The Research Focus Group activities include a research seminar, a reading seminar, research projects, and outreach programs. Among the goals of these Groups are to introduce undergraduates to mathematical research, to provide a mechanism for graduate students to interact closely with faculty and postdoctoral fellows early in their graduate careers, and to give postdoctoral fellows an opportunity to learn leadership skills necessary to a successful mathematical career. The Department will use the VIGRE project as a focus of new initiatives in graduate recruitment. Informed by the student and faculty experiences in the Research Focus Groups, the Department of Mathematics will continue to review and revise its undergraduate and graduate curricula, in order to ensure that the courses offerings introduce students to the most active areas of mathematics research.

The PI's on the VIGRE grant are: **Jesús De Loera, Joel Hass, John Hunter, Bruno Nachtergaele, Naoki Saito,** and **Abigail Thompson.**

Conference Celebrates Krener's 60th Birthday

by Prof. Wei Kang, Naval Postgraduate School

The Symposium on New Trends in Nonlinear Dynamics and Control, and their Applications was held October 18-19, 2002, at the Naval Postgraduate School (NPS) in Monterey, California. The symposium was organized in conjunction with the 60th birthday of Professor **Arthur J. Krener**, a pioneer in nonlinear control theory and its applications for the last three decades. The symposium provided a wonderful opportunity for control theorists to review major developments in nonlinear control theory from the past, to discuss new research trends for the future, to meet with old friends, and to share the success and experience of the community with many young researchers who are just entering the field. Over 50 persons attended the symposium, including colleagues from Italy, France, Germany, Britain, Sweden and the US. It was a distinguished group of mathematicians and engineers including members of the National Academy of Engineering and the Royal Societies of Britain and Sweden. The symposium was

organized by Professors Wei Kang and Carlos Borges of the Naval Postgraduate School and Prof. MingQing Xiao of Southern Illinois University. It was funded by NSF, AFOSR, NPS, and Southern Illinois University (SIU).

New Tenure Track Faculty

Monica Vazirani received her undergraduate degree in Mathematics from Harvard University in 1993, and her Ph.D. in Mathematics from UC Berkeley in 1999. Since then, she has been an NSF post-doc at UC San Diego and UC Berkeley, spent a semester at MSRI, and in 2002-2003 was an Olga-Taussky-John-Todd Instructor at Caltech.

Monica's research focuses on the interactions between representation theory and combinatorics. Her work extracts combinatorial structure from non-semisimple representations of groups and algebras that are related to the symmetric group. In particular, she has studied the representation theory of the affine Hecke algebra, and more recently, the double affine Hecke algebra. The representation theory of Hecke algebras has applications to quantum groups, statistical mechanics, knot theory, and special functions.

Monica's personal interests include hiking, salsa dancing, watching bad sit-coms on TV, and weight lifting.

Matt West received his undergraduate degree in Mathematics from the University of Western Australia in 1996, and his Ph.D. in Control and Dynamical Systems from Caltech in 2002. Matt's research interests involve the intersection between geometry and numerics, particularly leveraging geometric structures in differential equations to improve the performance of numerical approximations to such systems. His work to date has focused on structure preserving discretizations of geometric mechanical systems, with an emphasis on continuum mechanics modeled by PDEs derived from variational principles. In joint work with Marsden, Ortiz and others, Matt has developed discrete versions of variational principles which give a number of innovative numerical integrators for solid and fluid mechanical problems. Such methods have remarkable properties in many situations, and have applications to large scale simulations of complex phenomena such as ocean dynamics and collision and fracture problems.

Matt's personal interests include almost any activity in the outdoors, whether it be messing about in boats or tramping about with a pack and a tent. While California is rather crowded with people compared to his native Australia, Matt nonetheless finds that there is plenty of countryside to get lost in.

Hong Xiao received her Bachelor of Engineering degree in Computer Science from Tsinghua University in 1992, and her Ph.D. degree in Computer Science from Yale University in 2001. She has held a post-doctoral position in numerical computation at Department of Computer Science of Yale University, and a lecturer position at the Mathematics Department of Yale University. Her research interests are in the area of numerical computation, in particular, the construction of numerical techniques based on band-limited functions and solutions to integral equations. She is especially fond of the construction of fast numerical algorithms for solving engineering and physics problems. In her recent work with Rokhlin, she has constructed numerical tools for band-limited functions with Prolate Spheroidal Wave Functions (PSWFs). PSWFs are functions that are jointly localized in space and frequency domains, and are extensively studied in 1960s in relation to signal

processing, statistics, antenna theory, etc. She has constructed a straightforward procedure for the numerical evaluation of these functions and related quantities, and established asymptotic formulae for computing PSWFs at high frequency. With these computational tools, they have built the analogues for band-limited functions of some of the classical numerical techniques for polynomials: Gaussian quadratures and corresponding interpolation formulas (both exact on certain classes of band-limited functions).

Hong's personal interests include biking, hiking, jogging. She also enjoys good games of table tennis, badminton, volleyball. In her spare time, she likes traveling and photography.

New VIGRE Visiting Research Assistant Professors and Postdocs

Lewis Bowen is a new VIGRE Visiting Research Assistant Professor. His work is in probabilistic methods in geometry. He received his Ph.D. in 2002 working with Charles Radin at the University of Texas. Among other results, he proved that every bounded domain can be packed in infinite space in a completely saturated way, meaning that there is no way to replace finitely many copies by more and still have a packing. This settled a conjecture of W. Kuperberg. Bowen is now considering other problems in hyperbolic geometry together with the geometry group at UC Davis. His faculty mentor is Greg Kuperberg.

Robin Endelman joins the department as a VIGRE Visiting Research Assistant Professor with a recent PhD from the University of Cincinnati. She wrote a thesis on degenerations of elliptic solutions to the quantum Yang-Baxter equation. Her primary research area is quantum groups. While at Davis, Robin plans to collaborate with Mikhail Khovanov and other faculty specializing in that area. Robin's husband, Manash Mukherjee, has a PhD in mathematical physics from Lancaster University, UK. His research is on general relativity and differential geometry. Manash joins our department as a Lecturer. In her free time Robin likes to watch foreign movies and cook Indian dishes. Before the busy years of graduate school, a lot of Robin's spare-time was taken by photography. She would like to return to her passion and start capturing the beautiful landscape of Northern California.

Jared Tanner received his B.S. in physics in 1997 from the University of Utah and his Ph.D. in applied mathematics in 2002 from UCLA under the thesis supervision of Professor Eitan Tadmor. Dr. Tanner has been working on resolution of Gibbs' phenomena associated with Fourier expansions on piecewise smooth functions. Since Gibbs' original discovery in 1899 of the non-vanishing spurious oscillations many approaches have been taken to overcome the complications inherent in piecewise smooth functions. His primary work has involved recovering the rapid convergence associated with the Fourier approximations of smooth functions through mollification and filtering. This has resulted in some new tools for manipulating piecewise smooth functions. One application of his work involves the construction and analysis of a new numerical algorithm for approximate solutions of time dependent problems. He is collaborating with Thomas Strohmer (his faculty mentor) on the numerical analysis of pseudodifferential operators using methods from time-frequency analysis. Jared's hobbies include sailing, chess, and billiards.

Boumediene Hamzi received his Master and Ph.D. in control theory (Ph.D. in 2001) from the Universite de Paris XI-Orsay and the Laboratoire des Signaux et Systemes (LSS/CNRS), Paris, France. After being a Attache Temporaire dÌEnseignement et de

Cheer's Research Cited in the New York Times

Angela Cheer and her co-author, Laurie Sanderson of the College of William and Mary, have recently published articles in Nature and the Journal of Theoretical Biology on how fish feed. They developed a mathematical and computational model to explain the filtering of food from water. The work has been widely noticed including citations in the New York Times and Photonics.

Recherches (Visiting Research Professor) at LSS-Universite de Paris XI, he received a grant from INRIA (the French Institute for Computer Science and Control) for a postdoc at UCDavis with Arthur Krener. His research concerns are in the analysis and control of systems with bifurcations, and Lyapunov techniques for the stabilization of nonlinear systems.

News from Graduate Program

by Vice Chair Joel Hass

The atmosphere in the graduate programs at Davis is one of high activity. As can be seen by a glance at our seminar page http://www.math.ucdavis.edu/research/seminars, there are often two or three research seminars each day. In addition, our four Research Focus Groups run reading seminars and other activities. In the geometry/topology Research Focus Group with which I am involved, the students are running a seminar of their own in addition to the official reading seminar that I organize and a weekly research seminar that has speakers from around the country. We welcomed seventeen new students this fall to the Mathematics program. This is a marked increase from the ten new students coming in a year ago, and with the addition of the VIGRE program we expect this growth to continue. One new student came to the MAT program, which is undergoing a reorganization directed by Prof. Evelyn Silvia. Our combined Mathematics and Applied Mathematics Programs now have 81 students, compared to 54 in 1996-97; I think it is safe to say that the level of research activity and opportunity available to the graduate students in the department has never been higher.

The 2001-2002 academic year saw two students completing Ph.D. degrees in Mathematics and two receiving MA degrees. **Lan Hong** wrote a thesis on "A Numerical and Analytical Study of the Prandtl Equations" with Prof. John Hunter, and is working this year as a Lecturer at UCD. **Michael Scott** wrote his thesis on "General Relativistic Shock-Waves Propagating at the Speed of Light" under Prof. Blake Temple, and is now in a postdoc position at Kansas State University. Receiving MA degrees were Jerry De Groot, who now has a position as a Lecturer at Purdue University, North Central, and **Andrew Pitcher**, who is an Adjunct Faculty member at Cosumnes River College. Congratulations to them all!

News from the Undergraduate Program

by Vice Chair Janko Gravner

The Undergraduate Program Committee (UPC) debated several issues this year. The most contentious item by far was the role of Math 108 (Introduction to Abstract Mathematics) in our curriculum. After a long and arduous debate the UPC was not able to reach a long-term solution; instead, a compromise decision was reached. Math 108 is no longer a requirement for those math majors who can complete with at least grade B one of the following three courses: Math 115A (Number Theory), Math 145 (Combinatorics), or Math 141 (Euclidean Geometry).

Among other issues, the UPC decided to relax the textbook selection for upper division courses (which for most courses is now at the instructors' prerogative), and concluded that the Emerging Scholars Program (a demanding calculus lab for better students) is of substantial value to the department and recommended that it be properly supported. The UPC also initiated a comprehensive review of the department's syllabi.

The COSMOS Program

by Director Abigail Thompson

The UC Davis Cosmos program had a very successful summer in 2002, with 120 high school students living on-campus for four weeks in July. Cosmos is a state-funded program for talented students in math and science, administered by the University of California at three sites, UC Irvine, UC Santa Cruz, and UC Davis. The students are divided into "clusters" of 15-20 students for their course work. Each cluster takes a set of math and/or science courses designed to bring the ideas and excitement of university research to the high school level. Among others this year we had clusters in Biotechnology and Environmental Science, Computers in Physics and Robotics, Optical Science, and, of course, Mathematics. We expect to expand to 150 students next summer. For more information on UC Davis Cosmos, as well as links to the other sites, please see our website at: www.cosmos.ucdavis.edu

Department Awards

by Vice Chair Janko Gravner

The Department's Annual Awards Ceremony was held on June 6, 2002. At this occasion the Department honors its best undergraduate students, as well as faculty and graduate students who have made outstanding contributions to our teaching. Here is the list of this year's recipients:

The William Karl Schwarze Scholarship in Mathematics

This scholarship is made possible by a bequest in the amount of $10,000 annually made to the Department by William Karl Schwarze who received his bachelor's degree in our Department and subsequently became a high school teacher of mathematics in San Francisco. Mr. Schwarze remembered his studies in the Department with such fondness that he decided to leave funds for students in our Department who demonstrate outstanding mathematical scholarship and exceptional promise of making a strong professional contribution as a mathematics teacher at the pre-college or undergraduate college level.

The recipients of this year's award, presented by Dean Peter Rock, were Justin Abbott and Shawna Bynum.

Justin Abbott has been a graduate student at our Department since 1997. He began his teaching as a TA, and later as an Associate Instructor. As a TA, he has greatly impressed his supervisors. In his teaching of 10 lower division courses as an Associate Instructor, his ability as a teacher comes through in the enthusiastic written responses and impressive ratings by the students. As a faculty member states, "Justin has already proved to be a professional teacher."

Shawna Bynum has been an MAT student since 2001. She also works as a Math Specialist at Markham Elementary School in Vacaville, where she had done, in words of Prof. Silvia, "a masterful job." Shawna receives high praise on her teaching from her supervisors, particularly for her dedication to math education and her leadership among peers.

The Alice Leung Prize

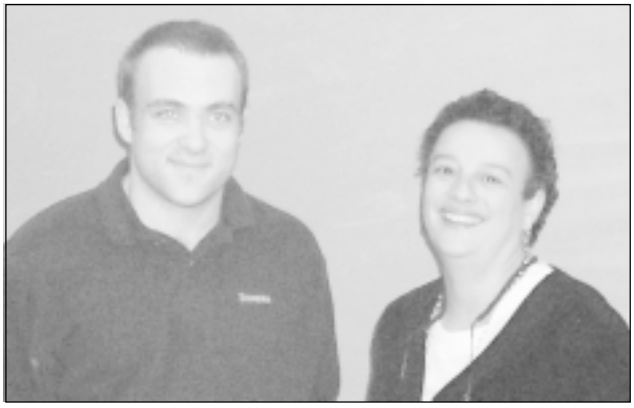
Alice Siu-Fun Leung received a Masters degree in Mathematics in 1975 from UC Davis and worked as an accountant in Hong Kong. In her will, Ms. Leung generously provided an endowment to award annual scholarships to graduate students in Mathematics. This award is given to students who have shown exceptional promise in all aspects of mathematics, including research, scholarship and teaching.

This year the award was presented by Dean Peter Rock and made to Carmeliza Navasca, who received a certificate and a cash prize of $2,000.

Carmeliza Navasca is an outstanding graduate student, described as best in class in a number of advanced graduate classes. In her work on control theory under the guidance of Prof. Krener, she has already produced publishable results on numerical solutions of Hamilton Jacobi Bellman PDE. In addition, she demonstrated excellent organizational and leadership skills in running the applied math graduate seminar, as well as other

activities in the GGAM. To quote the prize committee, “Carmeliza has all the makings of an excellent research mathematician.’’

Prize for the Outstanding Teacher of Lower Division Mathematics.



This yearly recognition of exceptional lower division teaching in our Department was presented by Vice Provost Pat Turner to Tyler Evans.

Tyler Evans, who graduated with his Ph. D. last year, was always regarded as one of the best teachers in the Department. Last year, he taught a section of Math 21C with 150 students and received an extremely high evaluation (4.8 out of 5). As always, the student comments were uniformly positive and confirm his reputation as a “fantastic teacher.’’

Henry L. Alder Prize for Excellence in Teaching

Prof. Henry Alder was a member of our Department from 1948 to 1994, which includes his service as a Chair from 1992 to 1994. Even after his retirement, Prof. Alder continued to teach and to be a strong advocate for quality teaching. In 1999, he gave a gift to the UC Davis Foundation to establish an endowment to be known as The Henry L. Alder Graduate Fellowship in Mathematics. The Fund is to be used to provide support to mathematics graduate students at UC Davis through the Henry L. Alder Prize for Excellence in Teaching. This award is given each year as a prize to the graduate student who is deemed to be the top teacher among all graduate students in mathematics. In view of the exceptional teaching performance by several candidates, the selection committee decided to confer two awards this year, each with a prize of $2,000. The awards were presented by Henry Alder and Vice Provost Pat Turner.

This year’s recipients were Bradley Ballinger and Lan Hong.

Bradley Ballinger has achieved an enviable teaching record since he started teaching in our Department. One measure of his reputation is that he was selected to make a presentation to all graduate students on how to conduct discussion sessions. His enthusiasm for teaching, clarity of his lectures, and his willingness to help is recognized in his students’ evaluations, which range from 4.4 to 4.7 (out of 5) and feature written comments on which the phrase “great teacher’’ appears over and over again.

Lan Hong has also achieved a remarkable teaching record since she started teaching and was also selected to describe to other graduate students how to deal with different aspects of running a discussion session. She distinguished herself by very high student evaluations, which range from 4.2 to 4.6, while her students’ comments give her high praise for clarity of her lectures, and her willingness to spend extra time with students and to prepare helpful handouts. Her students’ enthusiasm demonstrates that Lan is an excellent teacher.

Robert Lewis Wasser Prize

The Robert Lewis Wasser Memorial Fund is named in honor of Robert Lewis Wasser, a very promising young mathematician, who tragically died in an automobile accident in 1993 just before the

beginning of his junior year at UC Davis. The endowment's goal is to benefit promising mathematics students at UC Davis. Thus it is fitting that the endowment is used to conduct the annual Robert Lewis Wasser Memorial Mathematics Contest for freshmen and sophomore students at Davis.

Vice Provost Pat Turner and Robert's grandmother Vera May Wasser presented this year's award, which, in the amount of $500, went to **Chung-Kwan Pong**.

Award of prizes in the Spring Mathematics Contest

Each year some very talented students participate in the Spring Mathematics contest, which is open to all undergraduates. This year's first prize, in the amount of $500, went to **Josephine Yu**, while **Konstantin Chudnovskiy** and **John Hamilton** each received the second prize in the amount of $250.

Departmental Citations

These citations recognize undergraduate students of exceptional ability who have taken a very strong selection of mathematics courses and distinguished themselves with exceptionally high grade point averages. In addition, they received very strong recommendations from the faculty.

Benjamin Bunting has an upper division math GPA 3.81. Last summer, he was working with Prof. Craig Tracy, on a very hard research problem on eigenvalues of Hecke operators. This year, Ben began his graduate studies in mathematics at Rutgers University.

Nessy Tania has an upper division math GPA 3.81. She has been selected a McNair scholar, a MURALS undergraduate research student, and completed a very successful senior thesis under the direction of Prof. Angela Cheer on the role of fluid dynamics in the genesis of atherosclerosis. Nessy is attending graduate school at Cornell University studying applied mathematics.

Natasha Slepoy has an upper division math GPA 3.81(she graduated in three years). She completed a very successful honors thesis under the direction of Prof. Jesús De Loera, on some research problems in graph theory. Several people who know her praise her maturity, so it is quite a revelation that she is not yet 17 years old. Natasha will spend a year working for Sandia National Lab in Albuquerque, NM, doing economic modeling. After that, she plans to go to graduate school to continue studying mathematics and economics.

CONGRATULATIONS
TO ALL DEPARTMENTAL AWARD RECIPIENTS IN 2001-02

News from the Graduate Group in Applied Mathematics

by Chair Bruno Nachtergaele

The Graduate Group in Applied Mathematics had eight new graduates to celebrate this past year — six new PhD's and two Masters. A quick look at the list below with the affiliations of their advisors and the titles of their dissertations, reveals the strong interdisciplinary character of Applied Mathematics at Davis. This year's graduates have worked on applications of modern mathematics in areas ranging from biology and plant science, to image analysis, materials science, control theory, and fluid dynamics. The new jobs of our graduates represent an equally wide range of professional careers: college teaching, research at an academic institution, a national laboratory, and a private company, or an independent software business, these are all possibilities realized by this year's graduates.

In the framework of the Davis VIGRE project (see page 5), we are setting up an internship program with the specific aim to make the wide spectrum of career opportunities for our students better known and more accessible. Applied Mathematics knows no boundaries!

1. David Brown, PhD.

Advisor:	Prof. Alan Hastings (Department of Environmental Science and Policy).
Dissertation:	Stochastic Spatial Models of Plant Disease.
Current position:	Postdoc and Lecturer, UC Davis.

2. Youn-Sha Chan, PhD.

Advisor:	Prof. Albert Fannjiang (Department of Mathematics).
Dissertation:	Hypersingular Integrodifferential Equations and Applications to Fracture Mechanics of Homogeneous and Functionally Graded Materials with Strain-Gradient Effects.
Current position:	Postdoc, Oakridge National Lab, TN.

3. Tommy Kim, PhD.

Advisor:	Prof. Wolfgang Kollman (Department of Mechanical & Aeronautical Engineering).
Dissertation:	A Modified Smagorinsky Subgrid Scale Model for the Large Eddy Simulation of Turbulent Flow.
Current position:	Postdoc, UC Davis.

3. Brons Larson, PhD.

Advisor:	Prof. Naoki Saito (Department of Mathematics).
Dissertation:	The Continuous Boundary Local Trigonometric Transform.
Current position:	Senior Scientist, Science Applications International Corp, CA.

4. Bori Mazzag, PhD.

Advisor: Prof.	Alexander Mogilner (Department of Mathematics).
Dissertation:	Mathematical Models in Biology.
Current position:	Lecturer, Humboldt State University.

5. Carmeliza Navasca, PhD.

Advisor:	Prof. Arthur Krener (Department of Mathematics).
Dissertation:	Local Solutions of the Dynamic Programming Equations and the Hamilton Jacobi Bellman PDE.
Current position:	Postdoc, University of Waterloo, Canada.

6. Darryl Whitlow, PhD.

Advisor:	Prof. Jean-Jacques Chattot (Department of of Mechanical & Aeronautical Engineering).
Dissertation:	Finite Volume Methods for Incompressible Flow.
Current position:	Software contractor, CA.

7. Sean Mullen, MS.

Advisor:	Prof. Thomas Strohmer (Department of Mathematics).
Dissertation:	Quantification of Forest Biomass from Hyperspectral Data Using the Local Regression Basis Model.

8. Hanan Souki, MS.

Advisor:	Prof. Alexander Mogilner (Department of Mathematics).
Dissertation:	Mathematical Model of Cytoskeleton Alignment in Endothelial Cells.
Current position:	Mathematics Instructor, Sacramento City College.

News from the MAT Program

by Director Evelyn Silvia

Our MAT Program in mathematics continues to offer students the opportunity to combine the study of advanced mathematics with intensive professional level work in mathematics-education. One of the goals of this program is to foster reflective teachers of mathematics who have a deep, cross-grade-level, appreciation of the challenges of teaching mathematics. For descriptions of various parts of our program, see http://www.math.ucdavis.edu/students/grad/mat.

The professional development courses, MAT302 (Curriculum Development in Mathematics) and MAT303 (Pedagogical Issues) are offered every other week, on Monday evenings, for two hours and may be taken through UCDavis' Open Campus program. Anyone in the area who would like to join us for reflective and hopefully lively discussions is welcome. This can be a nice way to renew and/or enhance personal levels of enthusiasm for striving to meet the challenge of successful teaching.

Robert Wirtz said, "One of the frailest of human faculties is the ability to remember isolated bits of information such as rules without understanding." At all levels of teaching, we frequently encounter students' inability to access what we should be able to assume as prior knowledge. With this in mind, it is essential that a major part of our teaching seeks to enable students to connect what they learn to "the why" that is the basis for the concepts we want them to learn. Our field practicum course (MAT301) supports our conceptually-oriented mathematics teaching at the elementary level. During the 2002-2003 year we will be teaching large group Socratic classes at Markham Elementary School in Vacaville. This is teacher-directed instruction that makes careful use of questioning strategies and pattern building; an alternative description is teaching by guided-inquiry. In addition to teaching 5-7 classes, we offer assistance to teachers who have been struggling to implement new text adoptions. Anyone wanting to observe some of our classes is welcome; times for observations can be set-up by contacting Evelyn Silvia (emsilvia@math.ucdavis.edu)

Of the six students who entered our program in the fall of 2000, two have graduated and four are in various stages of completing their final projects that focus on mathematics-education topics or issues of interest. In addition, seven of our eight second year students have completed preliminary work on their projects. There is a wide range of emphases including aspects of the use of technology in mathematics instruction, the use of history of mathematics to motivate and/or inform instruction, assessment, curriculum development projects, etc. Keep in mind that "Math is not a spectator sport." Renew and rejuvenate your mathematical ways of thinking on a regular basis. You may come to need them when you least expect it.

Staff News

by Linda Potoski, Business Manager

As has been the case in the past, this year has once again brought about changes for the staff. This year, our long-time staff member, **John Gehrmann** retired as of June 24, 2002. We wish John well in his retirement endeavors. To help out with some of John's duties, **Marianne Waage** agreed to increase her time in the department to 75%. We're grateful for this additional help.

At the Departments Award Ceremony held on June 6, 2002, **Celia Davis** was presented with the Galois Award by the graduate students. This award was given in recognition of her helpfulness and the service she provides to them on a daily basis. Great job Celia!

Life After Davis

Natasha Slepoy (BS 2002). I will always remember my college experience with great joy. As a student, I was able to take a wide variety of math courses, among other courses, which allowed me to see what options I had available and thus, help me to figure out what I would enjoy doing later, an important decision in any student's life. Another great aspect of this time was the general education courses. These classes are always so interesting and I was able to learn things in them that I would otherwise have no opportunity to learn. The general education classes really added spice to my serious schedule. But the greatest part of the experience was the changes I went through, not only in terms of gaining knowledge, but in my development as a person. Different classes, students, instructors, and circumstances have all given me so many new perspectives on the world. This year, I am working for Sandia National Lab using two new methods of modeling to simulate the US economy, the stock market, current problems such as the shipping and port crisis, and even electricity outages. Next year, I will be going to graduate school in economics, and continuing to develop a realistic model of the economy. After graduate school, I hope to work in the financial sector, either for the Federal Reserve, or in the banking industry.

Tom Kropp (MS 1971). My interest in mathematics was really kindled by two women who taught me Advanced Algebra and Trigonometry/Analytical Geometry in High School. This was in the dark ages, when Calculus was a University Freshman course. My first Algebra and Geometry courses were alright, but my last two High School courses were great: they were taught by people who truly loved mathematics and imparted that love to their students. One was retired (mandatorily) from the public school system and the other was a Franciscan Nun.

I pursued a degree in mathematics at the University of Santa Clara where a small department had strong expertise in Finite Mathematics and a strong interest in Computer Science, both of which stood me well in later life. I was fortunate to work for two summers at NASA/Ames in a fledgling Computational Fluid Dynamics research group while still an undergraduate.

I came to Davis interested in mathematics in general, but two more summers of working at NASA/Ames convinced me that I was really interested in applications more than theory. After completing the required core sequence, I focused on Numerical Methods and Mathematical Physics and left Davis with a Masters Degree to work as an applied mathematician for a company named Informatics: we provided scientific modeling and programming support at NASA/Ames. Hence I was able to fulfill two desires: remain in the Bay Area and apply my skills to real world problems.

I remained with Informatics (subsequently acquired by Sterling Software) for over two decades. I was able to work in the areas of Meteorology, Electronic Circuit Simulation, Signal Analysis, Wind Tunnel and Flight Data Acquisition and Reduction, and Computational Fluid Dynamics. I was fortunate to keep my hand in technical work as I moved from technical ranks through technical management to project and departmental management. Along the way, I worked in local and wide area networking to compliment my mathematics application areas.

When Sterling Software decided to drop their work with NASA, I moved into mainstream Silicon Valley industry. I worked for IBM as Project Manager for their OLAP Product and then for Intel to start up Intel Online Services' "Data Center 1." I moved into the Internet security arena when I joined RSA Security (and worked with both Public Key Infrastructure and Symmetric Key Infrastructure); this is where my finite mathematics finally became useful. I then worked for ActivCard, Inc. (Smart Card technology).

Then came the recession and the end of the fat times. ActivCard downsized many people, including me, and I decided that my experience with Silicon Valley companies was adequate for my needs. I recently joined EPRI (Electric Power Research Institute) and am now planning and managing research into ways to better secure our critical electric infrastructure. EPRI is a non-profit, research institute (as you might guess from the name). It has staff who are truly dedicated to making a difference by doing good science and engineering. I can honestly say that it is the best environment in which I have worked.

I'm not really using my mathematics much any longer, but I have great experience because my education at Davis opened the right doors. I was given a great mathematics experience which was accompanied by a solid grounding in other essential skills (e.g., writing, negotiating, dealing with people) from the faculty with whom I worked. It's been a long, strange trip, but it's been a good one.

Michael Penkava (PhD 1995) has received a promotion to the rank of tenured associate professor in the University of Wisconsin, Eau Claire, in 2002. He conducts research in algebra and has been working on deformation quantization and homology theory of graph complexes. Dr. Penkava is the PI of three active NSF grants; two are his own research grants and one from DUE supports his efforts in improving undergraduate education in his home institution. He is spending the academic year 2002-03 here in Davis for his sabbatical to work with his former advisor, Motohico Mulase. Dr. Penkava is one of ten or so international speakers at a conference on A-infinity algebras that is held in Kyoto in December 2002.

Alumni News

Michael Harrington (BA 1992), recently completed actuarial exams and was admitted as a Fellow of the Casualty Actuarial Society. He is currently an actuary for Allied Insurance, a member of Nationwide Insurance, and has six children (4 girls and 2 boys).

Emeriti Update

by Professor Emeritus Kurt Kreith

Is there life after retirement? The following responses from department emeriti suggest the answer to be an emphatic "yes".

David Barnette has just completed the first draft of a novel. He is also putting finishing touches on the second edition of a philatelic monograph, the first edition of which was published in 1998.

Donald Benson is completing work on a second book entitled "A Smoother Pebble" which he expects will be published by Oxford University Press early next year. The highlights include Egyptian fractions, the Greek theory of proportion, mathematics of musical harmony, Cardano et al., Galileo and the inclined plane, concepts of calculus, and the brachistochrone problem (with proof).

Don Chakerian lectured on "Cantor Dust Under a Binary Tree" at the March, 2002 meeting of the Northern California Section of the MAA. In October he presented a Mathematics Colloquium at Sacramento State University on some unsolved problems in discrete geometry. His 1999 lecture for the Bay Area Mathematical Adventures will be included in a forthcoming collection of BAMA lectures to be published by the MAA.

Kurt Kreith continued his work with the California Mathematics Project and taught in the 2002 Cosmos program at UC Davis. At the University of Botswana he worked with teachers of talented high school students from southern Africa. Together with Don Chakerian, he published "Teaching Mathematics Using Technology" (McDougal Littell, 2002).

Sherman Stein has continued his study of transversals in rectangular arrays. In addition to refereeing, he has been working on a book that shows why the world of decisions cannot be as orderly as mathematics. His essay on Archimedes' investigation of the equilibrium of floating bodies will appear in the BAMA lectures mentioned above.

Takayuki Tamura continues his research in semigroups and his service as reviewer for Mathematical Reviews and the Zentralblatt f¸r Mathematik. He recently learned that his book "Semigroups" (in Japanese), first published in 1972, was revived in 2001. He serves as a monitor of NHK World Radio Japan and continues to publish poetry in Tanka journals, both in the United States and Japan. He also publishes short essays and free verse in the Davis based Covell Gardens Monthly.

OBITUARY:
HENRY ALDER

Henry Alder, professor emeritus of mathematics who worked to improve math education in California's schools, died November 6, 2002. He was 80.

"He was enormously active throughout his career in serving the Department, the University, and state and national organizations," said department chair John Hunter.

Alder was born in Duisburg, Germany. The family later moved back to Switzerland, where he studied at the Zurich Polytechnic Institute before moving to the U.S. in 1941. He studied chemistry and mathematics at UC Berkeley and served in the U.S. Army Air Corps before returning to Berkeley to complete his Ph.D. in 1947.

Alder joined UC Davis in 1948. He taught number theory and statistics courses, winning the Academic Senate's Distinguished Teaching Award in 1976. He formally retired in 1992 but returned to serve as chair of the mathematics department from 1992 to 1994.

His research was in number theory, where he studied the relationships between polynomials — the different ways to write a number as a sum of smaller numbers. But his major contributions were in teaching and public service, said mathematics professor emeritus Sherman Stein.

Alder served on numerous university committees, including committees on teaching, culturally disadvantaged students, and minority undergraduate representation in mathematical and physical sciences. At the systemwide level, he chaired the board of admissions and relations with schools (BOARS) and was a member of the UC's Academic Council.

"He had a genius for committee work, he made it rational, like mathematics," said Stein.

In 1982, he was appointed to the state Board of Education by Governor Jerry Brown for a three year term. He later served on many committees appointed by the board, including the California Mathematics Framework Committee for grades K-12 from 1996 to 1997.

Alder wanted to make sure that schools taught a solid core of math and not simply the latest fad, Stein said. He insisted on quality and kept his cool during the "math wars" of the 1990s, as educators, politicians and parents argued, often heatedly, over new math standards for California's schools.

"He believed there was a core of math that students could and should learn," Stein said.

Alder was national secretary of the Mathematical Association of America from 1960 to 1975, and president from 1977 to 1978. In 1980, he was awarded the association's award for distinguished service to mathematics.

He is survived by his wife, Benne; two brothers; his son and daughter-in-law, and two grandchildren. The family requests that memorial donations be made to the Henry L. Alder Graduate Fellowship in Mathematics Fund, c/o UC Davis Foundation.

The Department of Mathematics Newsletter

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As always, we would like to hear from former Davis mathematics students about what they are presently doing and how they are applying their mathematical skills.

Return the completed Alumni News Update Form to:

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or access the form on the Department's Home Page at: **http://www.math.ucdavis.edu**

Alumni News Update Form

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