Berkeley
Mathematics
Newsletter

A newsletter of the Department of Mathematics and Center for Pure and Applied Mathematics at the University of California, Berkeley

Fall 2001 Vol. VIII, No. 1

CONTINUED GROWTH IN MATH DEPARTMENT

MESSAGE FROM CHAIR CALVIN MOORE

Greetings to the faculty, students, staff, graduates, and friends of the Department of Mathematics and Center for Pure and Applied Mathematics. This will be my last letter as Chair of the Department as my appointment ends June 30, 2002. I wholeheartedly thank everyone for their support and participation in the activities of the Department these past five and a half years. Through our joint efforts, we have enjoyed many successes.

I want to bring you up to date on our programs and activities over the last year and let you know what the Department will see over this year. Faculty and Staff appointments are growing along with increases in undergraduate majors, graduate student admissions, and enrollment increases in general. With the systemwide movement to regularize Summer Session with regular faculty, we have received additional faculty FTE. Our arrangement with the campus is that any of our faculty who teach during the summer will receive a commensurate period of time off during the regular academic year, at their choosing. With plans for next summer (the second summer) completed, the concept continues to be attractive. Our plan is to use the summer session to accommodate our general enrollment increases and to facilitate a decrease in the time-to-degree for all of our students. With increases in enrollments, we will see increases in faculty FTE. We have 59 FTE this year, up from 50 FTE five years ago.


CALVIN MOORE

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Highlights

What's inside:

FROM SHORTEST PATHS

PROFESSOR JAMES SETHIAN

From Shortest Paths to Optimal Control and Anisotropic Front Propagation

Suppose you are in an environment in which the cost of driving depends both on where you are located and the direction in which you are moving. The "optimal control" problem is to find the cheapest way to drive from one place to another. A related problem comes from anisotropic front propagation; the etching profile of a computer chip can depend on both the angle of incidence of the etching beam as well as the type of material it encounters. Recent techniques developed at UC Berkeley provide efficient algorithms to compute solutions to these "static Hamilton-Jacobi equations".

We can start with a discrete example. Suppose you want to drive across town in a city full of tolls. The toll can differ from intersection to intersection. What is the cheapest path between two points in town? Somewhat more precisely, consider a network made up of a collection of links which connect nodes. Each node carries a cost. From a given starting point, the goal is to find the cheapest path to reach every other node in the network.

Suppose that there are N different nodes (or intersections). Imagine a rectangular two-dimensional grid, indexed by i, j, and let the cost of entering node i, j be $C(i,j)$. Then the total cost $T(i,j)$ of entering this node depends on the cheapest way to get to any neighbor plus the cost of entering the node; this can be expressed through the relationship

$$T(i,j) = \min(T(i\text{-}1,j),\ T(i+1,j),\ T(i,j\text{-}1),\ T(i,j+1)) + C(i,j)$$

From a given starting point, one might try to construct $T(i,j)$ by iterating on this discrete set of values until the solution converges. Since there are N nodes, you might guess that it requires something like N iterations to let each node communicate with all

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CONTINUED GROWTH

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Faculty

We were able to recruit 4 outstanding new members to the faculty beginning July 1, 2001. They are Professor Mark Haiman, Assistant Professor Michael Hutchings, Assistant Professor Lior Pachter, and Professor Daniel Tataru. Haiman was here last year as a Visiting Miller Professor from UCSD. Pachter has been here 2 years as a VIGRE postdoc. Hutchings, this first year of his appointment, is on leave at the Institute for Advanced Studies. Please see the profiles of each under the section on new faculty. In addition, Yuval Peres, a member of the Statistics Department faculty who held a 0% appointment in the Mathematics Department, has become a 25%-time appointee in Mathematics. He will teach one course per year.

We welcome several outstanding new visitors to our ranks this year. Dietmar Bisch from UC Santa Barbara and David Brenner from Columbia University are Visiting Miller Professors for the fall semester. Joseph Bernstein from Tel-Aviv University is this fall semester's Chern Visiting Professor. David Bao from the University of Houston will be spring semester's Visiting Professor. Lisa Goldberg, Director of Global Fixed Income Research and Data at Barra, Inc. is a Visiting Professor this fall semester. Altogether, we have 24 postdoctoral faculty this year; more information can be found in the section welcoming new visitors.

I am delighted to offer congratulations to our faculty that have received numerous awards and honors. They are listed in the Honors and Awards section of the Newsletter. I want to especially note the following achievements. Professor James Demmel was successful in applying for grants to create the Center for Information Technology Research in the Interest of Society (CITRIS). The State of California will provide $100M in funds, while an additional $170M will come from private and corporate donations. Professor David Eisenbud, Director of MSRI, has been elected to the Presidency of the American Mathematical Society. He becomes president-elect on February 1, 2002. Professor Andrei Okounkov was recently announced as recipient of a prestigious Packard Fellowship. Professor Yuval Peres was announced winner of the 2001 Loève Prize in Probability.

In Memoriam

I regret to report that Professor Emeritus Edmund Pinney passed away last December 19, 2000. A faculty member of the Department since 1946, Pinney retired in 1988 after 42 years of teaching. He was an active participant in departmental activities, and is greatly missed.

Graduate Student Honors

We are pleased to welcome 49 new graduate students in this fall's entering class. We had a good year and a higher than usual acceptance of our offers for admission. We invite all students to whom we offer admission to visit the campus and the Department; and we are particularly grateful to our graduate students for hosting the visiting applicants. Our own students play a significant role in selling the Department to our applicants; we heartily thank them for the time, effort, and accommodations they provide. We continue to be able to guarantee 5 years of support for our graduate students, provided they make good progress toward their academic program. We will continue to increase graduate student enrollments modestly as long as we have graduate student support to accommodate such growth, that faculty resources can accommodate it, and there is a good job market. We particularly encourage students interested in applied mathematics to apply to UC Berkeley.

The 2000-2001 Charles B. Morrey, Jr. Prize awardees were Daniel Schepler and David Helm. Megumi Harada received the Nikki Kose Award. Outstanding GSIs not graduating last spring were Michael Burns, Tom Coates, Mark Davis, Elena Drozd, Daniel Markiewicz, and Robert Myers. Eight students were recipients of NSF Postdoctoral Fellowships: Sami Assaf, Nicholas Ericksson, Johanna Franklin (Logic & Methodology), Jaimie Haletky, Chris Hillar, James Kelley, Sarah Koch, and Carl Miller.

Undergraduate Student Honors

We continue to amaze the College and the Campus with our increases in declared undergraduate majors. We topped out at 450 majors last spring and expect to reach 500 this year. Three years ago we had only 170 declared majors. There is a clear increase in interest in Mathematics that has been heightened by effective advising, outreach, and curricular enhancements. We have benefited from the increase in majors by receiving an additional one FTE staff for our undergraduate programs. Student Affairs Officer Dexter Stewart joins Student Services Director Barbara Peavy and Undergraduate Advisor Catherine Pauling to expand the excellent work of our undergraduate programs. In general, the Campus expects to see enrollments expanded by 4,000 students in this first decade, with 1500+ already added.

We had 4 students make noteworthy showings in this year's Putnam competition. Gabriel Carroll scored in the top 5 in the competition. Though a high school student at Oakland Tech, he took courses (both undergraduate and graduate) in our Department. Carroll has decided to pursue an undergraduate degree at Harvard. Ranked in the top 10 in the competition was our own James Merryfield. Maxim Maydanski and Ali Godjali, also our undergraduate majors, were in the top 50. We are very proud of all our students who did so well in the competition this year.

New Unit Added

The Department is pleased to announce the addition of a new unit, the Mathematics Diagnostic Testing Program/School-University Partnership Program(MDTP/SUP). It is headed up by one of our own recent PhD graduates, Emiliano Gomez. Through SUP outreach to partner schools, Emiliano works with teachers and school administrators to improve mathematics performance in high schools. Through MDTP, testing and evaluation of mathematics prepared-

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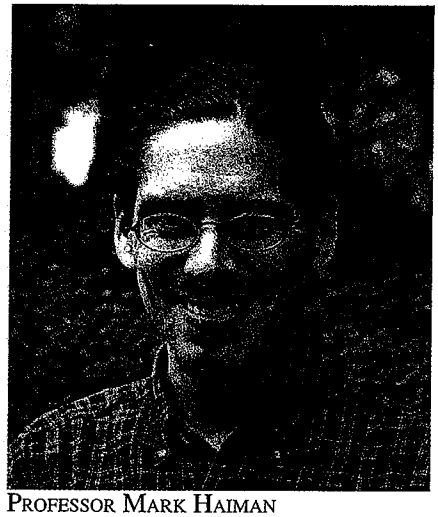
WELCOME NEW FACULTY

LINDA JARVIS

Mark Haiman

After receiving his PhD from MIT in 1984, Professor Mark Haiman taught applied mathematics at MIT until 1991. He then became Assistant Professor of Mathematics at UC San Diego. In 1997 he was promoted to Professor. During the springs of 1997 and 2000 he had a visiting position at the Mathematical Sciences Research Institute in Berkeley. In the fall semester of 2000, Haiman was invited to be a Visiting Miller Professor at UC Berkeley. He was a visiting professor at the Newton Institute, Cambridge, England during spring of 2001. In the fall of 2001 Haiman was invited to become a Professor in the Department. His research interests lie in algebraic combinatorics, algebraic geometry, representation theory, and lattice theory.



PROFESSOR MARK HAIMAN

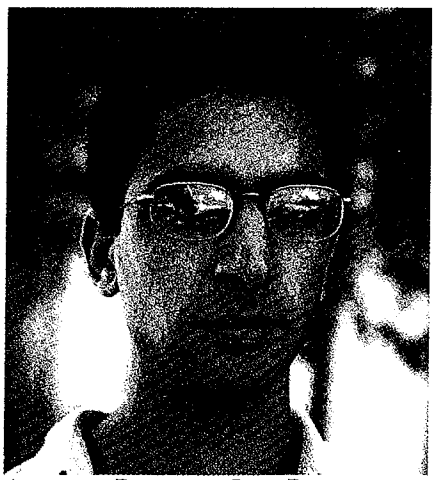
Michael Hutchings

After receiving his PhD from Harvard University in 1998, Assistant Professor Michael Hutchings taught at Stanford University as a Szegö Assistant Professor of Mathematics. Hutchings has received a NSF graduate fellowship (1993-96), a Sloan Dissertation Fellowship (1997-98), NSF summer support (2000-02), and the Harold M. Bacon Memorial Teaching Award from Stanford (2000). In the fall of 2001, Hutchings was invited to join the Department as an Assistant Professor. He is on leave for the 2001-02 academic year to complete earlier commitments to his research. He will join the Department beginning fall 2002. Hutchings' research interests include linear algebra, functional analysis, and differential topology.

ASSISTANT PROFESSOR MICHAEL HUTCHINGS

Lior Pachter

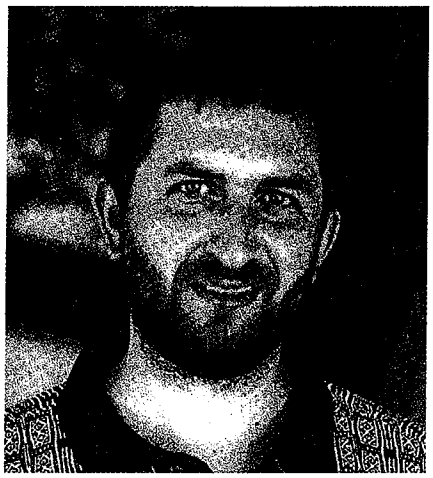
Assistant Professor Lior Pachter received his PhD from MIT in June 1999. He was invited to UC Berkeley where he had a joint appointment as a VIGRE Postdoctoral Fellow and a Visiting Assistant Professor. He also worked at the Lawrence Berkeley National Laboratory in a joint appointment with mathematics and statistics faculty. An applied mathematician working in mathematical biology, Pachter's interests include combinatorics, algorithms, computational molecular biology, and genomics. During the fall of 2001, Pachter taught a new course in the Department for mathematicians interested in application of mathematics to molecular biology (Math 195). He was a Project NEXT (New Experiences in Teaching) Fellow 2000-2001. In the fall of 2001, Pachter became an Assistant Professor in the Department.



ASSISTANT PROFESSOR LIOR PACHTER

Daniel Tataru

Having earned the Diploma in Mathematics in 1990 from the University of Iasi, Romania, Professor Daniel Tataru received his PhD in 1992 from the University of Virginia. He taught at Northwestern University from 1992-2001. At Princeton, Tataru was a visiting member at the Institute for Advanced Study from 1995-96 and taught from 1996-97. In the fall of 2001, he began as Professor in the Department. Tataru has been Principal Investigator for four NSF grants from 1994-2002. He was awarded the G. Titeica prize from the Romanian Academy of Science in 1994 and an Alfred P. Sloan Research Fellow in 1995. Tataru's research interests include nonlinear hyperbolic partial differential equations. Ω



PROFESSOR DANIEL TATARU

WELCOME VISITORS

HARUKO BRUCE

Visiting Faculty

The Department is pleased to welcome these **Visiting Professors** for the fall semester, 2001.

Professor Jørgen Andersen is visiting from Aarhus University in Denmark for the year as a Clay Professor.

JØRGEN ANDERSEN

The Clay Professor is a prestigious appointment presented to young or senior mathematics researchers. The appointment is chosen by the Scientific Advisory Board of the Clay Mathematics Institute, in recognition of the candidate's general achievement in mathematical research. His interests lie in moduli spaces, low dimensional topology, and quantization.

Professor Joseph Bernstein is visiting from Tel-Aviv University for the fall semester as our Chern Visiting Professor. His interests lie in representation theory and automorphic forms.

Professor Dietmar Bisch is visiting from the University of California at Santa Barbara as a Visiting Miller Professor for the fall semester. His mathematical interests are in operator algebras, subfactors and quantum physics, statistical mechanics, and quantum information theory/quantum computing.

DIETMAR BISCH

Professor David Brenner is visiting from Columbia University as a Visiting Miller Professor for the fall semester. His interests lie in the area of mathematical models which investigates the effects of ionizing radiation on living systems.

Professor Lisa Goldberg, Director for Global Fixed Income Research and Data at Barra, Inc., is a visiting professor of math finance. Ω

LISA GOLDBERG

Postdoctoral Faculty and Fellows

Dr. Matthias Aschenbrenner, a Charles B. Morrey, Jr. Assistant Professor, received his PhD from the University of Illinois in May of this year. He is a logician working in the model theory of fields, especially Hardy fields.

Dr. Laurent Bartholdi, a Charles B. Morrey, Jr. Assistant Professor, received his PhD from the University of Geneva in March 2000. He is a group theorist with strong interests in many other areas of mathematics, including topology and the theory of finite fields.

LAURENT BARTHOLDI

Dr. Alina Chertock, Visiting Assistant Professor, received her PhD in 1999 from Tel-Aviv University. She taught at the Hebrew University as a graduate student and then as an instructor from 1999-2000. Chertock is one of our LBNL Fellows selected in a national and international search in the Applied Mathematics Department at LBNL. Her mathematical interests lie in the area of numerical analysis.

ALINA CHERTOCK

Dr. Marius Crainic, a visiting Miller fellow, received his PhD from Utrecht this year. His research area is non-commutative geometry and differential geometry.

MARIUS CRAINIC

Dr. James (Jed) Mihalisin, a NSF Postdoctoral Fellow, received his PhD this year from the University of Washington, Seattle. His research interests lie in the area of combinatorics, combinatorial game theory, algebraic geometry, and mathematical physics.

JED MIHALISIN

RAHIM MOOSA

Dr. Rahim Moosa, Visiting Assistant Professor, received his PhD from the University of Illinois, Urbana-Champaign this year. He has

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WELCOME VISITORS

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been awarded a fellowship from the National Science and Engineering Research Council of Canada. His research area is model theory.

Dr. Jun Song, a Charles B. Morrey, Jr. Assistant Professor, received his PhD from MIT in June 2001. He works in enumerative geometry, Gromov-Witten theory and mathematical physics.

JUN SONG

Dr. Mayya Tokman, this year's recipient of the NSF VIGRE Grant fellowship, received her PhD from the California Institute of Technology in October 2000. Her interests lie in the areas of applied and computational mathematics, as well as solar plasma physics, and combustion.

MAYYA TOKMAN

Dr. Monica Vazirani, a NSF Postdoctoral Fellow, was one of our graduate students who received her PhD last year. She works in representation theory, Hecke algebras, and algebraic combinatorics. Before going to UC San Diego as a Visiting Assistant Professor, Monica visited us last year as a NSF Postdoc for the fall semester. She has returned this fall to continue her fellowship. Ω

MONICA VAZIRANI

FROM SHORTEST PATHS

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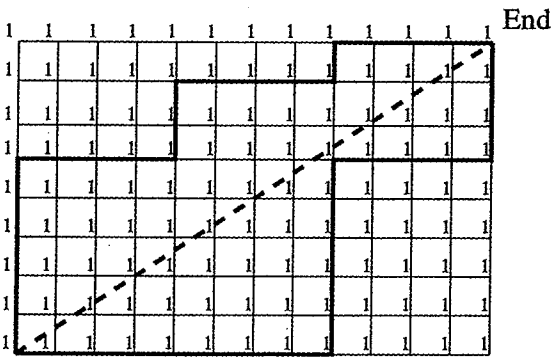
others. A classic algorithm, developed by Dijkstra [1] in 1959, reduces the number of required calculations by a great deal and computes the cheapest path to all N nodes in $N \log N$ steps. The algorithm is quite clever and introduced an entire collection of efficient algorithms for network paths.

How does it work? First, find the cost of entering the neighbors to the start point. This determines a set of "frontier" points. Now, accept the frontier point that has been reached with the least cost; it must have the correct value. Focus all your energy on that point and find the total cost of entering the unaccepted neighbors of that new point. This determines a new set of frontier points. Now refocus your attention on the cheapest of these new frontier points, which again must be correct, and repeat. One can picture a small ribbon of frontier points that move outwards, until they sweep over all points. The total cost of this algorithm is N steps to visit the points, plus a factor of $\log N$ to find the smallest of the frontier points. This can be viewed as a "single-pass" algorithm, since it recomputes the solution at each point at most four times (representing the four possible directions from which information can come).

Dijkstra's original algorithm is at the core of many efficient network algorithms, having found its way into circuit design, robotic navigation, geophysical simulations, and elevator efficiency. Nonetheless, there is not an insignificant drawback to this method. A highly boiled-down version reveals its limitation. Suppose you are on a regular grid with the same cost $C(i,j) = 1$ of entering each node. The shortest path between two diagonally opposed points is not uniquely defined; the two solid paths have the same cost to go from Start to End.



What we really want is an algorithm with the same computational complexity that finds the shortest path for the underlying continuous problem, given by the dashed diagonal line. One algorithm is the Fast Marching Method [2], which comes from digging a little deeper into Dijkstra's method. Start by rewriting the update recipe in a slightly different form: the solution $T(i,j)$ must satisfy the equation

$$\max(T(i,j) - T(i\text{-}1,j),\ T(i,j) - T(i\text{+}1,j),\ T(i,j) - T(i,j\text{-}1),\ T(i,j) - T(i,j\text{+}1)) = C(i,j)$$

The Fast Marching Method replaces the above left-hand side with a continuous approximation to the gradient $|\nabla T|$, so that with h as the uniform length of each link, we have

$$\max((T(i,j) - T(i\text{-}1,j),\ T(i,j) - T(i\text{+}1,j),\ 0)^2 + (T(i,j) - T(i,j\text{-}1),\ T(i,j) - T(i,j\text{+}1),0)^2) = h*h*C(i,j)*C(i,j).$$

A Dijkstra-like procedure applied to this update recipe has the same single-pass computational complexity, gives the shortest path diagonal solution to the problem, and in fact solves the Eikonal equation

$$|\nabla T\,(x,y)| = C\,(x,y).$$

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HONORS AND AWARDS

Professor David Aldous received an Honorary Doctorate from the University of Chicago in November 2000.


DAVID ALDOUS

Professor Elwyn R. Berlekamp received an appointment to the Editorial Board of the Proceedings, National Academy of Sciences for the term January 2001 through end of December 2002.


ELWYN BERLEKAMP

The Visiting Miller Research Professors for 2001-02 are **Professor Dietmar Bisch** of the University of California, Santa Barbara and **Professor David Brenner** of Columbia University.

Professor Richard Borcherds received an Honorary degree from Birmingham University, England.


RICHARD BORCHERDS

Professor Alexander Chorin was a distinguished lecturer at Princeton University and was the Keynote Speaker at the Taiwan National Fluid Mechanics Meeting.


ALEXANDER CHORIN

Professor James Demmel will be Chief Scientist and Associate Director of the Center for Information Technology Research in the Interest of Society (CITRIS). Demmel authored the proposal to create the Center which was funded $100M by the State of California. An additional $170M was received from private and corporate donations. CITRIS involves over 90 faculty from 4 campuses: UC Berkeley, UC Davis, UC Santa Cruz, and UC Merced.


JAMES DEMMEL

Demmel has also been elected an IEEE Fellow, effective January 1, 2002 for contributions to the field of computational mathematics and the development of mathematical software.

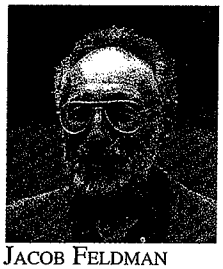
Demmel has been invited to give a 45 minute address at the 2002 ICM (International Congress of Mathematicians), and another talk at the 2003 ICIAM (International Congress on Industrial and Applied Mathematics.)

David Eisenbud has been elected to the Presidency of the American Mathematical Society. Eisenbud becomes the President-Elect on Febraury 1, 2002 and begins the two year term of President on February 1, 2003. Eisenbud will also continue as Director of the Mathematical Sciences Research Institute (MSRI.)


DAVID EISENBUD

On an historical note, Eisenbud is not the first MSRI director to also serve as President of the AMS. Irving Kaplansky served as President of the AMS in 1985 and 1986 during his 1984-1992 tenure as Director of MSRI.

Professor Jacob Feldman was the honored guest at the Conference on Topics in Ergodic Theory, Probability, and Analysis April 20-22, 2001 at the Center for Dynamical Systems, PennState University.


JACOB FELDMAN

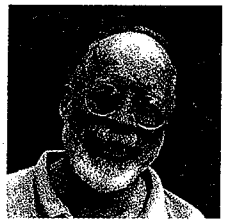
Professor Craig Evans has been awarded the Miller Research Professorship for Fall 2001 and Fall 2002.


CRAIG EVANS


EDWARD FRENKEL

Professor Edward Frenkel was selected as the Aisenstadt Chair at Centre de Recherches Mathematiques (CRM) of Université de Montreal for the academic year 2001-02.

Professor Rob Kirby was elected to the National Academy of Sciences.


ROB KIRBY


ALLEN KNUTSON

Professor Allen Knutson was awarded an Alfred P. Sloan Fellowship for 2001.

Professor Ai-ko Liu received an Alfred P. Sloan Fellowship for 2001.


AI-KO LIU

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HONORS AND AWARDS

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ANDREI OKOUNKOV

Professor Andrei Okounkov was awarded a prestigious Packard Fellowship. It is for 5 years and its purpose is to support research. Okounkov's research will be mostly focused on the interplay between combinatorics and geometry of moduli spaces of curves.

Professor Yuval Peres won the 2001 Line and Michel Loève Prize in Probability. This prize is awarded every 2 years to a probabilist mathematician under age 45. A ceremony and reception in his honor were held in Berkeley on October 5, 2001.


YUVAL PERES

Professor Theodore Slaman was the Gödel Lecturer at the annual 2001 meeting of the Association of Symbolic Logic held during March in Philadelphia, Pennsylvania. Ω


THEODORE SLAMAN

VIGRE Grant Awards

The VIGRE grants are entering a third year of providing fellowship support for first-year domestic graduate students, postdoctorates, and undergraduate students participating in departmental research seminars. The grants are designed to facilitate the opportunity for research experience and interaction between undergrads, graduates, and postdocs. In each of the last 3 years, 11 graduate students were provided with full payment of fees and a monthly stipend for a year.

Professor Bernd Sturmfels pioneered Math 191 in spring 1999 with stipends for the participants' use for research education. Sturmfels started this pilot program with 8 students, 3 of whom continued in the summer 1999. Travel support was provided as part of the grant for summer conferences in different areas of the US and the world.

This fall 2001 Nicolas Crisosto, an undergraduate student, was chosen to present a poster at the Universidad Metropolitana Conference in Puerto Rico. His poster, entitled "Cooperative Learning & Subverting Educational Landscape," won second place. Ω

FACULTY PROMOTIONS

Andrei Okounkov

Andrei Okounkov was promoted to full Professor this year.

Bjorn Poonen

Bjorn Poonen was promoted to Associate Professor effective July 1, 2001.

Undergradate Student Awardees

Alice T. Schafer Prize for 2001


GRACE WANG

Grace Wang, undergraduate senior in mathematics, received honorable mention in this national competition for excellence in scholarship.

Four UCB Winners in 61st Annual William Lowell Putnam Competition December 2000


G. CARROLL

Gabrial Carroll, an Oakland Tech High School student, enrolled in UCB graduate courses, scored in the top five. UCB freshman, James Merryfield, scored in the top 10; and Ali Godjali and Maksim Maydanskiy scored in the top 40. Go undergrads!


J. MERRYFIELD


ALI GODJALI


M. MAYDANSKIY

Poster Contest Winner

Math undergraduate, Nicolas Crisosto, sent to the Universidad Metropolitana Conference in Puerto Rico with VIGRE grant monies October 19th, won second place for his poster and presentation. (He was in competition with graduate students for the award!) His poster and presentation were for a theoretical model of cooperative learning used to examine the survivability of communities of learners.

Mathematical Contest in Modeling

Undergraduate teams (coached by Professor Rainer Sachs) are forming for the February competition. Please check with Professor Sachs (sach@math, 642-4384, room 918 Evans Hall) if you are interested. Math senior, Rory Solomon is assisting. Our 1999 teams won first and second place. Our 2000 team received honorable mention. Ω

The Graduates

KEN RIBET, VICE CHAIR FOR GRADUATE AFFAIRS

As Vice Chair for Graduate Affairs, I have the pleasure of welcoming our new graduates each August. This year, for the first time, I photographed each student who came for an interview. The resulting Web page, http://socrates.berkeley.edu/~ribet/, invites reflection about the size and composition of our entering class. My Web page shows 50 faces, three of which belong to exchange students who are here only for the current year. The remaining 47 students are either PhD students or "pre-PhD" students who have entered as master's degree candidates but expect to transfer into the PhD program once they complete some background courses.

Why is this class so much larger?

Our two previous classes had 38 members each. Why is this class so much larger? The single most important reason is that we increased our admissions target to 43 two years ago. The Department decided to increase our graduate student population to keep it in step with the size of our undergraduate program, which has increased dramatically in recent years, and the size of our faculty, which has returned to full strength after a series of retirements in the 1980s and 1990s. Because of the continuing availability of fellowship money from the National Science Foundation, the Department of Education, and other sources, we have been able to continue our policy of offering fellowships to all first-year domestic students even as our program has grown.

A second explanation for the larger-than-usual size of our class this year is that an unusually high fraction of the students whom we admitted decided to enroll in Berkeley. As you can easily imagine, most of the students whom we admit end up with offers of admission from several top schools. Every spring, our current graduate students host several dozen prospective graduate students who are in the midst of choosing their graduate schools. Quite a few of these prospective students come to town having heard rumors to the effect that Berkeley, with its large size, is an unfriendly place for graduate students to work. Fortunately, the rumors evaporate each year as the prospective students see what daily life is like in the Department. For their decisions, a pivotal factor is the advice that they get from our first-year students, some of who are already friends from summer programs or undergraduate classes. I am quite proud to report that our students who were first- and second-year students last year have been an especially cohesive, happy group. The assessment of our department that they communicated to prospective students was an important factor that led significantly more students than usual to accept our offer of admission. Ω

MGSA Cheerful Facts

Many Cheerful Facts is the math graduate student colloquium in which graduate students present fun and interesting material to their peers. The seminar is intended to be a forum for students in all areas of mathematics to get a taste of each other's interests. We particularly encourage first year students to attend; the talks are generally very friendly (as the name suggests) and provide a good opportunity to meet and discuss mathematics with some of the older students in the Department. During the past year we featured talks on such diverse topics as quantum computing, algebraic K-theory, and surgery on manifolds, all aimed at a non-specialist audience. Refreshments are also served each week. Titles of previous talks and announcements of current ones can be found on the MGSA webpage: http://www.math.berkeley.edu/~mgsa/ Ω

MGSA Math/ Music Night

The Mathematics Graduate Association sponsored the third Math/Music Night on November 8, 2001. This is an opportunity for members of the Department, including faculty, staff, students, and their friends and family, to share in a musical evening with hopes of fostering a sense of sociality and community within the Department outside the usual mathematical framework. Acknowledging the strong correlation between mathematical and musical ability within the Department, Shahed Sharif created the first Math/Music Night in the spring of 1999. In the past, we have heard poetry readings, solo and accompanied voice, violin and piano, and impromptu composition. This year we featured a solo violin piece by Ysaye, a series of dramatic dialogues, and several piano performances including pieces by Liszt and Ravel. Ω

Soccer Champions

The inter-departmental soccer team whose several team members are a part of this Department won the All University Intramural Soccer Championship in spring, 2001. The team consists of students playing soccer together for 4 years from Mathematics, IEOR, Mechanical Engineering, and Philosophy. The Math students were: Aaron Greicius, Henrique Bursztyn, Nick Meyer, Alf Onshuus, Manuel Portilheiro, and Oscar Villareal. Over 40 teams participated in the Championship. Ω

MUSA

NOREEN HAROUN, PRESIDENT

The Mathematics Undergraduate Student Association has many projects planned for the 2001-02 academic year. We will have a T-shirt competition, open to all professors and students, for a new design for this year's math T-shirts. The competition will take place fall semester; look for the new Tees shortly afterwards. In addition, we will have a book sale sometime this fall semester.

Math Career Day is being planned for Spring 2002. We are inviting people of different math-related professions to speak about their jobs, what they do, and how mathematics has served them in their careers so that students can get a sense of what they can do with a math major!

We also want to start a "math battle" game in which we put together a team and have math competitions with neighboring schools. Two students are particularly interested in organizing that to begin in spring 2002.

"Problem of the Month" will start soon in which we will post a difficult problem on one of the bulletin boards in Evans Hall. Students can attempt to solve it for a reward such as a gift certificate to the Student Store or perhaps to a local restaurant.

We should be continuing soon with the MUSA Lecture Series. We will ask different math professors if they'd be willing to give a mini-lecture on a topic of their choice, prepared for an undergraduate audience.

As you can see, we have lots of ideas. Our dedicated officers are Noreen Haroun, President; David Matters, Webmaster and MUSA Lecture Series Liaison; Jane Sherman, Advertising; and Nicholas Stahl, Katherine So, and Michelle Wong, Fundraising/General Activities.

Feel free to contact MUSA at musa@math.berkeley.edu or check out our webpage with suggestions or financial support at www.math.berkeley.edu/~musa/ Ω

MATH DIAGNOSTIC TESTING PROJECT

EMILIANO GOMEZ

Hi everyone, and thank you for the opportunity to say a few words about MDTP, the Math Diagnostic Testing Project. Our offices are 985 and 987 Evans Hall. MDTP is a state-wide program with sites at several UC and CSU campuses. Its goal is to provide teachers with a diagnostic tool in order to better prepare their students for further study in mathematics. Our tests identify students' strengths and weaknesses in several mathematical concepts and skills. They measure readiness for courses at five levels: Algebra, Geometry, Second Year Algebra, Math Analysis (pre-Calculus) and Calculus. We also have some tests addressing integrated curricula, as well as written response materials.

There are several differences between our tests and the many standardized tests that high schools and middle schools are required to administer. The first is that ours are not mandatory. Teachers use them throughout the year at their discretion. Also, there are no stakes attached to our tests, and we do not report results to anyone unless we have the consent of the teachers. Consequently, we do not need high security, and we can circulate tests for a long time. This results in very well designed tests. We field-test them for years before releasing them.

Our services are free for teachers. We score the tests and send back a very detailed report to the teacher, as well as a letter to each student. We also offer to provide help with the interpretation of the results and to suggest possible courses of action for the classes.

If you want to know more about us, feel free to drop by our offices (Dave Mina in 987, Emiliano Gomez in 985) or check out the web page at http://mdtp.ucsd.edu. Ω

FROM SHORTEST PATHS

(continued from page 5)

The method works because of a property of the Eikonal equation, namely that the characteristic direction is the same as the gradient. This means that looking upstream in the direction of largest change in T gives the optimal path and hence the flow of information used to systematically update the values.

Now, let's return to the original problem and try to extend these Dijkstra-like methods to problems in which the cost depends both on position and direction. Producing a single-pass algorithm in this case is not straightforward because the characteristic direction is not the same as the gradient. Thus, we can't simply assume that optimal path comes from the gradient direction given by $T(x,y)$.

The new work at Berkeley [3] uses Bellman's optimality principle to figure out how to proceed. The key idea is that, starting at (x,y), the range of frontier points through which the optimal path must pass is limited by the local range of speed values. The set of possible contributors is limited to those points on the expanding front inside a circle around (x,y); the radius of this circle is proportional to the ratio of the biggest to smallest speeds. The bigger this ratio, the larger a subset is needed to find the optimal direction; nonetheless, the method retains the single-pass flavor central to Dijkstra's method.

The work is quite new, with many possible applications. Current areas include semiconductor manufacturing, geophysics, optimal control in continuous-discrete systems, and dynamical systems.

[1] Dijkstra, E.W., *A Note on Two Problems in Connection with Graphs*, Numerische Mathematik, 1959.

[2] Sethian, J.A., *A Fast Marching Level Set Method for Monotonically Advancing Fronts,* Proc. Nat. Acad. Sci., Feb. 1996.

[3] Sethian, J.A., and Vladimirsky, A., *Ordered Upwind Methods for Static Hamilton-Jacobi Equations*, Proc. Nat. Acad. Sci., Sept. 2001. Ω

MATHEMATICAL SCIENCES RESEARCH INSTITUTE

DAVID EISENBUD, DIRECTOR

On September 24 I had the pleasure to attend the official (finally) announcement of the funding and founding of the Banff International Research Station (BIRS, rhymes with "Brrrrrs", in honor of the climate) for the mathematical sciences in Washington DC. In fact, the NSF asked MSRI to organize a "mini-symposium" to precede the announcement, and Dianne O'Leary, Michael Callahan, Keith Promislow, and Joyce McLaughlin all gave very accessible talks on the role that mathematics plays in science and engineering for a largely non-mathematical group at NSF. After the Symposium, it was time for the announcement. Rita Colwell (Director, NSF), Tom Brzustowski (President, NSERC), Robert Church (Chair of the Board, Alberta Science and Research Agency), as well as Phillipe Tondeur (DMS director) all spoke. The interesting twist was that some spoke while (physically) in Banff, others from Washington, and all were mixed together by video link that worked flawlessly. A new experience for me!

The upshot is that the money the Canadians and MSRI applied for has been committed, and the Station will open its doors to 40 weeks/year of conferences and workshops in March of 2003. In the meantime our partner, the Pacific Institute for the Mathematical Sciences (PIMS), and MSRI will run four or five workshops to warm the place up. We are leading off with "Automorphic Forms and Representations of p-adic groups," November 27 to December 1, 2001 (organized by: W. T. Gan, J. S. Li, D. Ramakrishnan, G. Savin (chair), and J. K. Yu). I look forward to many years of attending good meetings in this beautiful spot, and I hope to meet lots of you there!

This new collaboration with PIMS complements the sponsor relationships that MSRI has established with 62 academic institutions around the world. The Banff activity does not, of course, in any way replace what's going on at MSRI here in Berkeley (though it may allow us to move some of the workshops out of our always-active building). As many of you know, there are two very lively programs in place this semester, on Integral Geometry and Inverse Problems.

Next year we will host a year-long program in Commutative Algebra, a semester-long program in Quantum Computing in the fall and a semester-long program in Semi-Classical Analysis in the spring.

Recently MSRI's Scientific Advisory Board approved a year-long program in Differential geometry (2003-4) and a semester program in Discrete and Computational Geometry (fall 2003). In November the Scientific Advisory Committee will consider the programs starting in spring 2004. The Committee also makes a host of other decisions at that meeting, such as choosing a "hot" topic for a workshop this spring. Stay tuned!Ω

From the Astronomy/Mathematics/Statistics Library

ANN JENSEN, LIBRARIAN

Technology continues to expand the number of library functions you can perform without ever walking into the library! The latest enhancement is notification by e-mail for many of the notices that the circulation system issues to library borrowers.

If you've ever checked out a book from any of the libraries at UC Berkeley, then you are familiar with the postcards sent out for overdue or recalled books, or when items that you have requested are being held for you. This year the Library has improved its functions with the addition of email circulation notices! Beginning October 29, all library borrowers will begin receiving these library notices via email, except those who have no email address on record with the Library and those who indicate their preference to continue receiving postcard notification. Library notices for material that needs to be searched will continue to be sent out by postcard.

Borrowers will begin receiving library notices via email

This new email service is exciting because it is faster than by US Mail. Patrons can receive these notices overnight via email. In addition, the environmentally conscious like email notices because they save paper.

A secondary advantage is saving the library budget the postage costs on hundreds to thousands of postcards that are mailed out each day.

Email notification is only for those patrons who check their email daily. If you do not check your email often, then receiving postcards would probably be the best option. If you plan to be away from your email for an extended period of time, you can change your preference back to postcard, and reactivate email notices whenever you wish.

The Library's patron database, in most cases, is the information received from the campus' student and faculty/staff databases. You were automatically signed up for Library email notification on October 29, with the exception of those patrons who have already set their preference for postcard notification. We encourage you to visit the Library's signup form: http://sunsite2.berkeley.edu/patronupdate to verify your email address and/or to let us know if you prefer to continue to receive Library notices via postcards rather than via email.

This website also allows you to change the email address at which you receive circulation notices. If you are having problems, please contact the Library Privileges Desk in the Doe Library at (510) 642-3403.

There are a few situations in which your email notices will be discontinued. For example, if the email notices the library sends you are returned, your account will be automatically reverted to postcard notification. This will happen if your email address is invalid or mistyped, or if your email box has reached its limit.

Let me know how this works out for you or if you have suggestions about how to improve other services. You can contact me at (510) 642-5729. Ω

MANAGER'S REPORT

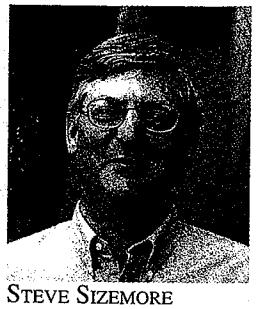
LOU MAULL

A FOND FAREWELL

The spring 2001 semester closed with the retirement of Gail Yoshimoto from the Department's Front Office. Gail had been with the Department 39 years having begun her UC Berkeley career in the Mathematics Department in 1962 as a Senior Typist/Clerk. Over the course of her tenure, she progressed through the secretarial and senior word processing specialist ranks and provided secretarial support for many nationally and internationally distinguished mathematicians. She became an Administrative Assistant II in 1994 when she assumed responsibility for the Berkeley Lecture Notes Series. She managed the Series until it was transferred to the AMS in 1996. In August 1996, due to the changing needs of the Department and a significant increase in service demands, Gail began working half-time in Student Services and half-time in Faculty Services. A year later Gail joined Student Services full-time and provided a courteous and congenial atmosphere in the Front Office. Gail was the point of first contact for our undergraduates, their parents, and other visitors to the Department and worked closely with faculty and graduate student instructors. Her consistently even temperament in dealing with the full range of faculty, staff, students, and visitors was highly valued in the Front Office and will be sorely missed. Her colleague faculty, staff, and students wish her well and she is missed in the Department.

CHANGING PLACES AND NEW FACES

On February 1, 2001 we welcomed Steve Sizemore as the Department's new Information Technology Manager. He manages all phases of the Department's computing system and supervises Paulo de Souza, Akop Pogosian, and Nicolai Rosen (our student employee). He came to us from UCSF where he had been in systems administration for about 20 years. Steve's appointment is shared with Letters & Science Computing Resource where he serves as their chief UNIX technician. We are pleased Steve has joined Mathematics.



STEVE SIZEMORE

Dexter Stewart joined the Department as Student Affairs Officer I in Undergraduate Services on March 19th. She works with Catherine Pauling to provide services for our undergraduates. Dexter has worked on campus since 1984 in Athletics, Office of the Registrar, and the Department of Chemistry. Our Student Services staff worked closely with Dexter for many years when she worked in the Registrar's Scheduling Office. This SAO I position is the result of 1 new staff FTE assigned to the Department because of our increases in undergraduates majors. Only 3 years ago we had about 170 declared majors. We reached 475 this past spring and expect to top 500 by the end of this coming spring. We attribute this increase in majors to several factors: the current perception that a Mathematics degree increases employability, that our Undergraduate Advisors nurture our majors better than other disciplines, and that the general increase in enrollments is yielding an increase in majors.

DEXTER STEWART

Alison Thompson was hired into the Department on October 1 as Gail Yoshimoto's replacement. She takes on the duties of Coordinator of the Undergraduate Office, Room 970. Alison's previous experience on campus was with the Undergraduate Program of the Haas School of Business where she worked for a year doing many of the things she will do for us. A Berkeley alum, she also worked at the Lawrence Hall of Science and the Physics Department while an undergraduate. She received her AB in History in May, 2000.

ALISON THOMPSON

A new program has been incorporated into the Department. With the retirement of Robert Mattison, after 25 years as Academic Coordinator for the Mathematics Diagnostic Testing Program, an opportunity arose to formally transfer the MDTP from the Office of the President to the Berkeley Campus, and specifically to the Mathematics Department. The OP MDTP office, in fact, has been resident on the 9th floor of Evans Hall all the years of Mattison's leadership. Emiliano Gomez, (Math PhD '01) was successfully recruited to replace Robert Mattison. The program brought Dave Mina and Jayme Scott permanently onto the Department's staff rolls. We welcome all three to the Berkeley Mathematics family.

EMILIANO GOMEZ

DAVE MINA

JAYME SCOTT

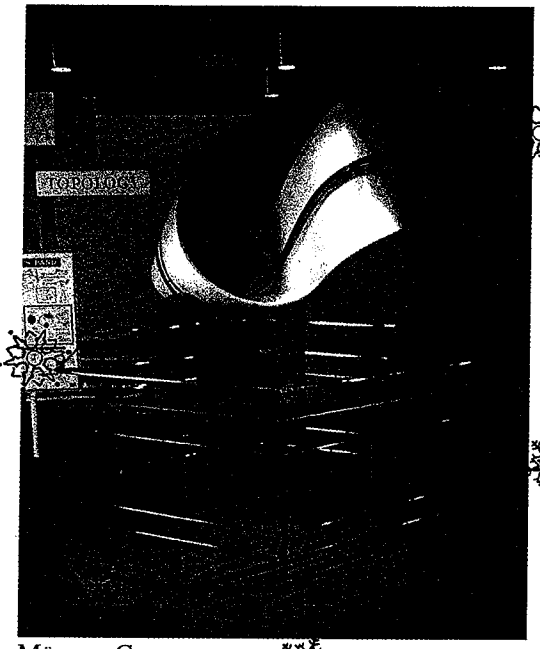
OUTSTANDING STAFF IN MATH

No awards were made for distinguished service for 2000-01 because of the current budget reductions. The campus is taking this opportunity to evaluate and re-tool the distinguished service process.

(continued on page 12)

MATHEMATICA EXPOSITION

Mathematica: A World of Numbers . . . and Beyond, on view from October 6 to May 5, 2002 at the Exploratorium, is a mid-20th century, classic exhibition designed by the world renown designers Charles and Ray Eames. Their purpose, during era of Sputnik, was to let the fun of math and science out of the bag. Imagine light bulbs performing multiplication and 30,000 randomly cascading plastic balls forming a bell curve. This sensory overload is just one small part of **Mathematica: A World of Numbers . . . and Beyond,** created in 1961. Its showing at Exploratorium comes on the heels of the first, major posthumous retrospective of the lifework of Charles and Ray Eames, which toured major art museums in the year 2000. Mathematica is the centerpiece of a larger look at both mathematics and design at the Exploratorium during the run of the exhibition. **Mathematica** is included in the price of admission to the museum.

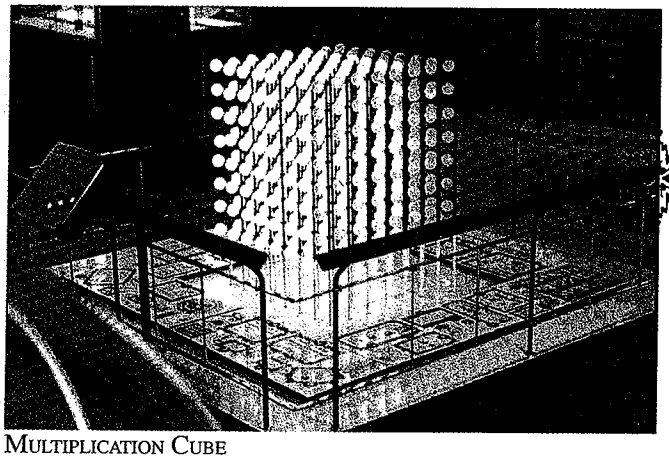


MÖEBIUS CURVE

Mathematica explores mathematics as a tool, a science, and a work of art. Touching on the theory, imagery and history of mathematics, it approaches mathematics first as a language, one used daily, that touches and affects almost every area of human work and play. Mathematics began with the invention of numbers to count by. Its first tool was the human body. Visitors to the exhibition move from such basic activities as counting on their right hand to more sophisticated concepts, just as simply constructed mechanical devices extended the human capacity to add, subtract, multiply, divide, and measure.

For math lovers, or better yet, for those confounded by math and science; for those with an architectural and design perspective; and for those with a sense of history, **Mathematica** is a rare opportunity to walk through a Charles and Ray Eames designed exhibition, their only one still extant. Experience the elegance and marvelous fun inherent in the Eameses' style of communicating the wonder of the world around them.

The Exploratorium is located inside the Palace of Fine Arts in San Francisco's Marina District. For information, call (415) EXP-LORE or check their website at www.exploratorium.edu/ Ω



MULTIPLICATION CUBE

MANAGER'S REPORT

(continued from page 11)

BUSINESS AS UN-USUAL

On the administrative side, we are in year 3 of the "new" financial system. The reporting modules were rolled out last year with mixed results. The primary difficulty revolved around developing workarounds that allowed Macintosh users to access the reporting system. After 8 months of waiting, we, like many departments, installed a PC to gain access to reporting. It's been a bumpy ride.

Because of the problems encountered with the launch of the Accounts Payable and Purchasing and Reporting modules of the financial system, implementation of the on-line human resources system has been put off a year to July 1, 2002. This system has been greatly anticipated for years and it continues to be yet one more year away.

As enrollments rise and resources lose ground, the years to come will test the mettle of staff and faculty to provide the best education possible for our students.

Regards to all. Ω

Happy Holidays from the Math Department!

IN MEMORIAM

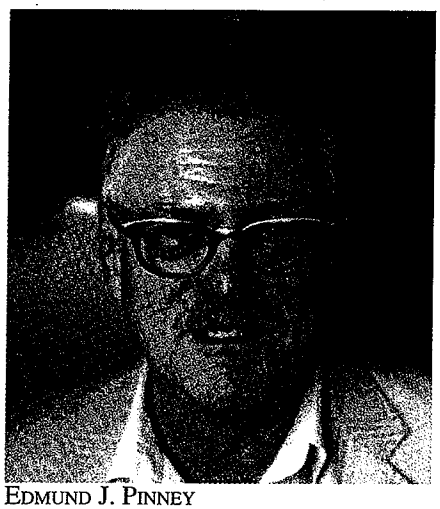
Edmund J. Pinney, Professor of Mathematics 1917-2000

P. CHAMBRÉ, O. HALD, K. MILLER

Edmund Joy Pinney was an applied mathematician of great versatility and wide research interests. Much of his early work was focused on electromagnetics, such as radar and waveguides, and was inspired by problems of national security interest. Other work involved analysis of forced aerodynamic oscillations such as those that destroyed the Tacoma Narrows Bridge. In the 1950s Pinney was the director of a Berkeley project sponsored by the Office of Naval Research. In this connection he investigated the propagation of large amplitude elastic and plastic waves through soils and other geophysical media, prompted in part by the need to better understand the effects of Bikini bomb tests. In the 1960s he undertook studies of theories of ionized plasmas which have application to radar detection of rocket plumes.

Pinney received his BS in 1939 and the PhD in 1942, both from California Institute of Technology. He was a student of A. D. Michal and also did a large part of his graduate studies with H. Bateman. Before coming to Berkeley in 1946, Pinney was research associate at MIT from 1942-43. He worked as a research analyst at Consolidated Vultee Aircraft Corporation in San Diego from 1943-45 and was instructor at Oregon State College for one year. At Berkeley, he advanced through the academic ranks to become full professor in 1959. He retired in 1988.

Throughout his career Pinney's work involved extensive analysis of linear and nonlinear ordinary and partial differential equations and integral equations. His book, *Ordinary Difference-Differential Equations*, University of California Press (1958) deals with a type of equations which occur in control theory, engineering, and in time-lag problems in economics. The book fulfilled a vital need and was quickly translated into Russian. He also contributed significantly to the theory of the Schwinger Variation Method for solving Fredholm integral equations. Much of his research in his later years was focused on the difficult "angle problem" for Rayleigh waves. This concerns the propagation and reflection of seismic wave at corners such as at the continental shelf. He continued this work after retirement and achieved partial results using asymptotic methods before finally turning to numeral techniques.



EDMUND J. PINNEY

Pinney taught a wide variety of courses in the Department of Mathematics at UC Berkeley. He was particularly identified with and loved teaching Math 120 and Math 220, Mathematics for the Physical Science, which he designed in consultation with the interested departments and for which he, in collaboration with one of the authors, developed extensive lecture notes over the years. He served as liaison with the engineering departments and was for many years advisor for the Engineering-Math-Statistics program of the College of Engineering. He also served as a Panel Member of the NSF Program for the Improvement of School Teachers of Science and Mathematics.

Born in Seattle, Washington on August 19, 1917, Edmund Pinney passed away in Orinda, CA on December 19, 2000 after an extended illness. His wife, Eleanor and their two children, Gail and Henry survive him. Ω

HERBERT ALEXANDER 1940-1999

DON SARASON

It saddens us to report that Herb Alexander, a graduate student from the 1960s, died of lymphoma in August, 1999. Herb came to Berkeley after doing his undergraduate work at Harvard. He wrote his dissertation under Hans Bremermann, graduated in 1968, and went on to become a leading contributor in the areas of several complex variables and function algebras. To his credit are over 60 research papers and the book *Several Complex Variables and Banach Algebras,* co-authored with John Wermer. At the time of his death, Herb was Professor of Mathematics at the University of Illinois in Chicago.

HERBERT ALEXANDER

Those who knew Herb in Berkeley will recall his modest demeanor and quiet intelligence. He was a second-year student when I arrived, and we quickly hooked up because of common mathematical interests and compatible personalities. Although I was faculty and he a student, I am sure he taught me more than I taught him.

With the aid of Herb's widow, Susan, the Department of Mathematics has established a prize fund in Herb's memory, to be used to award prizes to outstanding Berkeley mathematics students. Contributions in any amount will be greatly appreciated. Checks to the UC Berkeley Foundation, with a designation "Herb Alexander Prize Fund," can be mailed to Calvin C. Moore, Chair, Department of Mathematics, University of California, Berkeley, CA 94720-3840. Ω

GRATEFUL THANKS TO OUR FRIENDS

DONORS 1995-Nov. 2001

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Mr. Ugammadu Albanefo
Mrs. Susan Alexander
Meredith F. Alexander
Mr. Eugene R. Alward
Mr. Richard Armstrong
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Mrs. Carla Zingarelli-Rosenlicht

(continued on page 16)

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Last _____ First _____ MI _____
Degree & Year graduated: _____
Address Correction:

Email address: _____
Work - Position:
Institution or Company:
Location:
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Ideas for our Newsletter:
What items in this issue were of particular interest to you?

What other types of articles or information would you like to read in future issues?

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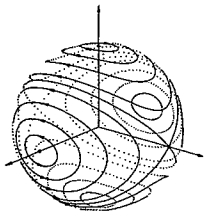
Fax # (510) 642-8204
Email: rondi@math.berkeley.edu

THE DEPARTMENT OF MATHEMATICS



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You may return this form to:
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Department of Mathematics
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Berkeley, CA 94720-3840

Your Gift is Welcome!

☐ **Enclosed is my gift of $** _____
Please make your tax deductible gift for the Department of Mathematics payable to UC Berkeley Foundation.

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In addition, *(company name)* _____
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☐ **Please direct my gift to the Department of Mathematics Annual Fund, where it can be used for the Department's greatest need at the Chair's discretion.**

☐ **I prefer to designate my gift for scholarships (undergrads) or fellowships (grads).**
Please circle either scholarships or fellowships.

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Print Name *Signature* **Date**

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CONTINUED GROWTH

(continued from page 2)

ness is available to high schools in northern California. Both programs advance the need to ensure that students can be competitive in mathematics in four-year universities and colleges.

The VIGRE Grant

We are entering the third year of the VIGRE grant. It has provided fellowship support for 33 first-year domestic graduate students (11 each year), 5 half-time postdoctoral faculty, and undergraduate research seminars. The 5 postdoctoral faculty also received half-time teaching appointments bringing to the Department the best new PhDs for 3-year terms of teaching and research under the mentorship of senior departmental faculty. The grant pays stipends to undergraduate students enrolled in undergraduate research seminars during the academic year, in the summer when they work on research projects that come out of the seminars, and travel funds to those presenting the results of their research at mathematical conferences. On October 22 we hosted a site visit by NSF to review our progress on the grant and look forward to hearing the results of the review in the New Year.

Computing

Last February we successfully recruited a new information/computer systems manager, Steve Sizemore. He had nearly 20 years experience at UC San Francisco and we were fortunate to be able to attract him to Berkeley. He has overseen the installation last March of our new primary server and the rollout of an improved systems architecture. The system has performed splendidly over the last 8 months. We continue to upgrade our network and replace aging computers. We hope to experiment with wireless technology over the next months. With a coordinated strategy to improve technical staff and upgrade network and hardware, we look forward to a robust and reliable computing environment.

Staff

I want to thank the staff particularly for their dedicated hard work during the five and a half years I have been Chair. They stuck it out when the building was undergoing construction. They stuck it out with the general mayhem of a new financial system. They stuck it out while our enrollments increased and staff FTE didn't, until minimally this year. They stuck it out while the campus increasingly continued to distribute work from central offices to departments. They are sticking it out now as we face a year, maybe two, of budget cuts in dismaying repetition of the early 1990s. They have been steadfast through thick and thin. Notably, there has been more thin than thick. I salute their faithfulness and devotion and thank them for all the support they gave me as Chair. Ω

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