

Berkeley

Mathematics

Newsletter

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

Fall 1995, Vol. III, No. 1

LOTTO WINNER DONATES TO ALMA MATER

AN INTERVIEW WITH ROBERT UOMINI

LOU MAULL

Bob Uomini belies his wealth with self-effacing demeanor. Born in Sacramento, he was raised in Palo Alto. He fell in love with mathematics in the third grade. He studied on his own and, in eighth grade, taught himself first-year calculus, and later, second-year calculus. He graduated from Palo Alto High with a C average because he neglected most of his other studies.

With grades not good enough for Berkeley, he went to Foothill Community College. The Mathematics Placement Exam placed him beyond their Mathematics classes. He declared a double major in German and Mathematics, but dropped the German to concentrate on Mathematics when he transferred to Berkeley.

Uomini remembers well Professor Chern's Mathematics 140 upper division differential geometry class his senior year. A few students would meet after class with Chern who would toss out ideas and talk about the related work



Photo by Paul Brown

ROBERT UOMINI

of other mathematicians. Uomini found it exciting and stimulating. After earning his AB in 1969, he applied for the Ph.D. but was initially turned down. Professor Chern suggested he re-apply. He did, and was admitted to the program.

The most edifying result of graduate school was that he learned to learn. Dan Asimov

(Isaac's nephew) was one of the older graduates who encouraged and cautioned the new graduate students at orientation, telling them they were very good but didn't know how to learn. In the course of preparing for the Qualifying Exam he learned how to learn. He found the study group process to be very helpful and encourages all students to take advantage of it.

Uomini turned to algebraic topology in graduate school. For his dissertation topic he chose foliations; it was a very interesting and little-known field at the time. Foliations favored imagination over technique. Uomini formulated and proved a result of two-dimensional fiber bundles over a circle and how the foliations corresponded to the actions of the group. He received his Ph.D. in 1976.

His advice to graduate students is to keep the mind open to all possibilities. After interviewing for jobs in operational research, he accepted an offer in late 1977 from IBM in

(continued on page 2)

MESSAGE FROM THE CHAIR

JACK WAGONER



Greetings and best wishes for the holidays to members of our mathematics community, graduates, and friends. Here are a few highlights since our last newsletter.

Academic Reviews

I am pleased to report that again the Berkeley Mathematics Department received the highest ranking in a national survey. Our Department was ranked number one among mathematics departments by the National Research Council in their recent report, "Research-Doctorate Programs in the United States: Continuity and Change." The study, conducted once every ten years, included

8,000 professors from across the country who assessed programs for academic quality. The report provides statistics based on 30 criteria, and it will be used by students to help them decide where to pursue their doctoral studies.

During the past year, the Math Department's academic program was reviewed by two committees, one external and one university committee, both of which consulted widely with faculty and students. We are currently assessing recommendations in the report from these committees.

The Center for Pure and Applied Mathematics, as a campus Organized Research Unit, will undergo review this year. Vice Chancellor for Research Cherny has called for a review of all the units to

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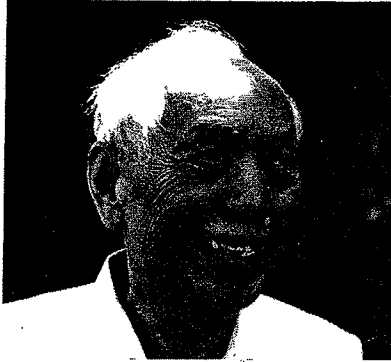
Highlights

What's inside:

Lotto Winner Donates	1
Message from the Chair	1
Shiing-Shen Chern: An Inspiration	2
First Chern Professorship	2
Introducing Bernd Sturmfels	3
Visitors Grace the Department	4
Manager Reports	5
Faculty Awards & Honors	5
Alumni News	6
Press Notes about Undergrads	7
MESA Active	7
Research Article	8
Grateful Thanks	9
Donors Tell Their Stories	10-11
Emeriti Legacies	12-13
Entrepreneurial Staff Create	14
Library UPDATE	14

SHIING-SHEN CHERN: An Inspiration

Professor Chern is regarded as the greatest geometer of his generation. For six decades, he has been a leader in the field of differential geometry. Professor Chern has extremely broad interests and has made seminal contributions to such diverse areas as web geometry, integral geometry, complex manifolds, minimal submanifolds and characteristic classes.



Born in 1911 in Kashing, China, a provincial town about one hundred miles south of Shanghai, his high school math texts were all written in English.

In 1926, when he enrolled in Nankai University in Tientsin, mathematics was at a primitive state in China. Chern began his illustrious career in geometry under the inspired teaching of Dr. L. Chiang.

After finishing his B.Sc. in 1930, he entered

Tsinghua University in Beijing, the only university in China at that time with a graduate program. He began his mathematical career writing papers on projective differential geometry as a student of Dan Sun, a former student of E. P. Lane at Chicago.

He completed his M.Sc. in 1934 and went to Hamburg in high anticipation of working with Blaschke. He received his doctorate in 1936. That was followed by a mathematically decisive year in Paris with Elie Cartan before returning to China in the summer of 1937.

He was to remain in China until late in 1948. Professor Chern is renowned for introducing modern mathematics to China and training a new generation of mathematicians there. Virtually every major Chinese mathematician of his generation developed under his tutelage.

For two years, 1943-45, he visited the Institute for Advanced Study at Princeton where some of his most important work was conducted. During this time he completed his intrinsic proof of the Gauss-Bonnet Theorem as well as his fundamental paper on characteristic classes.

From summer 1949 until 1960, he taught at the University of Chicago until he came to Berkeley. On the occasion of his retirement in 1979, a five-day world symposium was hosted in his honor at Berkeley. Many of the world's most distinguished contributors to geometry attended.

Professor Chern has been an outstanding teacher. Nearly 50 doctoral theses have been

directed by him, first in China, then at the University of Chicago, and from the early 60's here at Berkeley. Many of his students have gone on to become famous mathematicians in their own right, including one Nobel Laureate in physics (C. N. Yang) and two Fields Medalists (W. Thurston and S.-T. Yau).

His honors include the 1970 Chauvenet Prize from the Mathematical Association of America, the 1975 U.S. National Medal of Science awarded by President Gerald Ford, the 1982 Alexander von Humboldt Award from West Germany, the 1983 Steele Prize by the American Mathematical Society, and the 1983-84 Wolf Prize by the Wolf Foundation in Israel.

He holds many memberships including the Academia Sinica of China, Indian Mathematical Society, National Academy of Sciences, American Academy of Arts and Sciences, Royal Society of London, London Mathematical Society, and Academie des Sciences, Paris, to name a few.

Professor Chern's brilliant research and teaching have exerted a deep and lasting influence on mathematics. Ω

First Chern Professorship

Sir Michael Atiyah, OM, FRS

Sir Michael Atiyah, born in 1929, was educated at Manchester Grammar School, Victoria College, and Cairo. After National Service he went to Trinity College, Cambridge, where he obtained his BA and Ph.D. degrees and continued research as a University lecturer and Fellow of Pembroke College. In 1961 he moved to Oxford, was initially appointed to a Readership, and later to the Savilian Professorship of Geometry. From 1969 he was Professor of Mathematics at the Institute for Advanced Study in Princeton until 1972 when he returned to Oxford as a Royal Society Research Professor and Fellow of St. Catherine's College. He held this post until 1990 when he became Master of Trinity College, Cambridge, and Director of the new Isaac Newton Institute for Mathematical Sciences.

Sir Michael has worked in many fields of mathematics, including geometry, topology and differential equations. More recently he has contributed to mathematical aspects of elementary particle physics.

He has received numerous honors, notable among which is the Fields Medal awarded to him in Moscow in 1966. He was knighted in 1983 and made a member of the Order of Merit in 1992.

Lotto Winner *(continued from page 1)*

San Francisco. He started in computers (IBM's Series/1) working on the technical side of marketing, did some teaching, programming, and product development, particularly communications among different computers, and eventually launched his consulting career in data communications in 1983.

Uomini had been a consultant at Sun Microsystems for four years when he won the multi-million dollar California State Lottery in January, 1995. One of his "if-I-should-win" fantasies was to endow a Chair in Professor Chern's honor. He has since created the Chern Visiting Professorship to

provide support for a pre-eminent geometer to visit the Department each year. Using Chern's teaching enthusiasm as a model, Uomini will contribute significantly to the continuation of the exciting academic atmosphere that this Mathematics Department can provide students and faculty. He feels it is very important for alumni to keep in touch with their alma mater. Uomini says, "Alumni can do a great deal of good in individual ways that show gratefulness

and thanks to help those that follow in their footsteps." He adds, "Alumni should acknowledge their role in the enduring lineage of education passed from teacher to student."

Now that he has time to do what truly interests him, Uomini is focusing on mathematics and investments. He has been studying genetic programming to model currency trading with neural networks. First mentioned in 1975, there doesn't appear to be

programming that works for financial modeling. The idea is to train a network with a certain amount of information so it can come back with

numbers about expected future events. Then, based on what it has told you to do, you make trades. He wants to go further and create a fitness measure that would indicate how well a particular neural network predicts the actual outcome of currency prices. By evaluating the fitness of the neural nets, Uomini hopes to develop the best model. "The first one to develop it successfully will be the one who makes a lot of money", he says. Ω

One of his fantasies was to endow a Chair in Professor Chern's honor

Chair Message (cont. from page 1)

assess whether they are meeting their stated mission and goals. Professor Alexandre Chorin is the new acting CPAM director.

Acknowledgments

We are delighted to receive a number of gifts and endowments in support of Mathematics Department programs and students during this past year. I offer thanks to all individuals who have contributed, for each gift registers a significant impact in strengthening our academic program. We plan to feature articles in our newsletter to acknowledge friends of the Department and to provide interesting historical insights. In this issue, you will find articles about Miss Sarah Hallam, Mrs. Frances Morrey, and the late Professor Raphael Robinson. All generously contributed gifts for our graduate students.

One of our donors, who received considerable media attention, was UC Berkeley Mathematics alumnus and state lottery winner, Robert Uomini, Ph.D., who established an endowment to support Chern Visiting Professorships honoring Professor Emeritus Shiing-Shen Chern. Please see the article in this issue. We are very pleased to announce that the internationally renowned mathematician Sir Michael Atiyah has accepted our invitation to be the first Chern Visiting Professor in Spring 1996. More details will be forthcoming regarding events during his visit.

In addition to gifts already mentioned, we have received notice of significant gifts to establish endowments for graduate student fellowships. These include a bequest from Professor Raphael Robinson in the memory of Julia Robinson; and a fund established in the memory of Dennis Ross Richman, who had earned a Ph.D. here in 1980. Information about these gifts will be in the Spring newsletter. Providing continuity of financial support for graduate students in times of state budget austerity is a high priority for our Department.

In the development area, our department will participate in the campus Campaign 2001. Areas of priority for us will include gifts for visiting professors, undergraduate and graduate student fellowships, and improving our academic computing for faculty and students. We have many needs and ask for help from alumni to ensure that the strength of our academic program is maintained. Following the suggestion of some alumni, at the end of this newsletter is a form that can be used to send with your gifts.

Undergraduate Computing Lab

We have proposed a plan to the campus administration for enhancing our calculus instruction by integrating computers more closely into the smaller discussion sections associated with large lectures. Under the initial leadership of Professor Jerrold Marsden, and now continuing with Professors Calvin Moore and Paul Vojta, we have received endorsement

INTRODUCING BERND STURMFELS

The Department is pleased to introduce our newest member of the faculty, Professor Bernd Sturmfels. Born in Kassel, Germany, he received his M.A. from TH Darmstadt and two Ph.D. degrees, one from TH Darmstadt, Germany and another from the University of Washington at Seattle in 1987.

Sturmfels was a Postdoctoral Fellow at I.M.A. at the University of Minnesota, 1987-88. He was subsequently appointed Assistant Professor at the Research Institute for Symbolic Computation in Linz, Austria. Prior to his Berkeley appointment, he was Associate Professor of Mathematics at Cornell University. In addition, he has held visiting positions in the Department de Mathématiques, Université de Nice, France and the Mathematical Sciences Research Institute in Berkeley, California.

Sturmfels is one of the foremost mathematicians in an emerging field which combines conceptual developments in algebraic geometry with classical computational problems having many concrete applications ranging from robotics to probability to computer algebra. He has a wide body of work that encompasses algebraic combinatorics and discrete and computational geometry. Sturmfels has restored the Hermann Weyl view of the relationship between geometry and algebra.

Three of his major accomplishments include:

1) The connection between Gröbner bases and toric varieties. These varieties were introduced by Mumford in the early 70's and have become important in algebraic geometry as a rich source of examples and as a

new theoretical tool. At the same time, an interest in elaborate computations in algebraic geometry has evolved, along with the use of Gröbner bases for such computations. Sturmfels found an important connection between these two ideas, establishing a correspondence between the (regular) triangulations and the distinct Gröbner bases of the corresponding toric variety.

2) The theory of fiber polytopes. This theory is a vast common generalization of the theory of secondary polytopes of Gelfand,

Kapranov, and Zelevinsky, and the theory of secondary polytopes of tilings. His work with Billera introduced the technique of integrating over the fibers of a morphism of polytopes and laid the foundation for a solution with Kapranov to a conjecture due to Baues on loop spaces. This theory is related to Newton polytopes attached to algebraic varieties and serves as a basis for algorithms in

sparse elimination theory.

3) Initialization of the so-called homotopy method for solving systems of polynomial equations. Sturmfels has developed a technique for finding good initial polynomial equations necessary before beginning the standard technique deforming a given problem to a more tractable one.

He has a powerful, innate mathematical talent, boundless energy, and the ability to collaborate with, and stimulate, a wide range of colleagues.

Among his honors are an Alfred P. Sloan Doctoral Dissertation Fellowship, a Sloan Research Fellowship, an NSF National Young Investigator award, and a David and Lucile Packard Fellowship.



of our plan from key administrators. Our proposal requests space in Evans Hall, start-up and on-going funding by the campus, and a commitment for Mathematics to apply for federal funding to cover development-related costs. There will be continued involvement by Mathematics faculty throughout the development and implementation phases. We hope to see implementation of this new lab by Fall 1996.

Budget Status

I am pleased to report that our budget, although bleak, fared better last year than we originally expected. We were informed by the College of Letters and Science to expect cuts at the beginning of the fiscal year, and to be possibly followed by further mid-year cuts. We were again faced with considering reductions

(continued on page 16)

VISITORS GRACE THE DEPARTMENT

HARUKO BRUCE

The following individuals have been appointed to serve a two year appointment as *Charles B. Morrey Junior Assistant Professors*. These prestigious positions were created in honor of the late Professor Morrey, who was one of America's premiere analysts.

Andre de Carvalho received his Ph.D. from The City University of New York in 1995. His interests lie in the study of dynamical systems, especially two-dimensional ones.



Yves Martin received his Ph.D. from UC Santa Cruz in 1993. Before coming to Berkeley, he was a Postdoctoral Fellow at the Centre de Recherches

Mathematiques and the Department of Mathematics at Concordia University, Montreal. His interests lie in the areas of number theory and group theory.

Ian Grojnowski received his Ph.D. in June 1992 from MIT. Prior to coming to Berkeley, he taught both undergraduate and graduate courses at Yale. His main interests are in the representation theory of algebraic groups, most particularly in the application of geometric techniques (such as perverse sheaves) to the study of such problems.



GROJNOWSKI

We are honored to have two exceptional individuals to hold *visiting teaching positions* this semester. They are Viktor Ginzburg and Radoslav Dimitric:

Viktor Ginzburg received his Ph.D. from UC Berkeley in 1990. He was awarded the NSF Postdoctoral Fellowship in 1993, and prior to arriving at Berkeley, Viktor held an Assistant Professorship position at Stanford. His research concerns Poisson geometry (Poisson Lie groups, Poisson (co)homology) and symplectic geometry.



Radoslav Dimitric received his Ph.D. from Tulane University in 1983. Since receiving his Ph.D. he has held various visiting teaching positions in the U.S. and abroad. His field of interest lies in Module Theory, Valuation Rings, Abelian Groups and application of set theory in those fields.

New NSF Postdoctoral Fellows visiting the Department for the next academic year have arrived:

Jennifer Schultens obtained her Ph.D. from UC Santa Barbara in 1993. Before coming to Berkeley, she held a position as Assistant Professor at Emory University. In addition to the notable NSF Postdoctoral Fellowship, Jennifer is the recipient of other awards including the UC President's Dissertation Year Fellowship 1992-93, and the University Research Council



SCHULTENS

summer grant, Emory University, 1994 and 1995. Her mathematical interests lie in integrable systems.

James Pommersheim obtained his Ph.D. in 1992 from the University of Chicago. Prior to being awarded the NSF Postdoctoral Fellowship in 1994, James won the Graves Lectureship Award in 1990, and a Physical Sciences Division Teaching Prize in 1991 both from the University of Chicago. Before coming to Berkeley, he held an appointment as a C. L. E. Moore Instructor at MIT. His mathematical interests are algebraic geometry (toric varieties), specifically, operations on the Chow groups of toric varieties. Ω



SADOSKY VISITS MATH

Dr. Cora Sadosky is Professor of Mathematics at Howard University in Washington, DC. Her research interests are in harmonic analysis and operator theory. She has published more than forty papers. Sadosky is the author of an advanced graduate text book, "Interpolation of Operators and Singular Integrals," and the editor of "Analysis and Partial Differential Equations."



CORA SADOSKY

Sadosky is the current Past-President of the Association for Women in Mathematics, and a member-at-large of the Council of the American Mathematical Society.

Born and educated in Buenos Aires, Argentina, she received her Ph.D. in Mathematics from the University of Chicago in 1965 under Professor A.P. Calderon. Her dissertation was on parabolic singular integrals.

Sadosky has taught at Johns Hopkins University, UC Santa Cruz, and the Universities of Buenos Aires, Montevideo, and Central de Venezuela.

She was awarded an NSF Visiting Professorship for Women in 1983 and in 1995. She was the recipient of an NSF Career Award in 1987.

Sadosky has been a member of the Institute for Advanced Study in Princeton (1978-79, 1983-84) and of the Mathematical Sciences Research Institute in Berkeley (1987-88, 1995-96). She has also visited the Mittag-Leffler Institute of the Swedish Royal Academy of Sciences in Stockholm, the Center of Mathematical Research in Barcelona, the Center for Pure and Applied Mathematics in Nice, and the Mathematics Research Institute in Oberwolfach.

She has been the organizer of several mathematical events, including a session on Classical Analysis at the Joint Meeting of the London Mathematical Society and the American Mathematical Society held in Cambridge, England, in 1992. Currently, Sadosky is on the Program Committee for Holomorphic Spaces to be held at MSRI during Fall 1995.

Through the NSF Visiting Professorship for Women program she will be a Research Professor during 1995-96 at both MSRI and Berkeley's Center for Pure and Applied Mathematics. Ω

MANAGER REPORTS ON OUTSTANDING STAFF

By CAROLYN KATZ

We had an especially busy and productive academic year in 1994-95. The challenge to administrative operations was a major change in our computing system, from Sun/Unix to a Macintosh network, made possible by a subsidy from the College of Letters & Science (L&S). The Deans Office and Vice Chancellor Christ agreed that standardization and consolidation of L&S administrative computing are important. Mathematics Department staff have already realized substantial efficiencies by using more standardized programs not available to us previously. Basic training has been completed and we expect significant improvements in departmental databases as time progresses.

I thank all of our staff for their continued outstanding service to the Mathematics Department and Center for Pure and Applied Mathematics (CPAM). Many Mathematics staff and two technical support staff from L&S received recognition from the campus:



FROM LEFT TO RIGHT, STANDING: CAROLYN KATZ, PAULO NEY DE SOUZA, JEANNE COFFEE, STEPHANIE REYNOLDS, JULIANNA LOPEZ, CATALINA CORDOBA, FAYE YEAGER (IN BACK), GAIL YOSHIMOTO (IN FRONT), DAVE HERNES, DEBORAH CRAIG. SEATED, LEFT TO RIGHT: LOU MAULL, RONDI PHILLIPS, BERNICE GANGALE. MISSING: KATHLEEN VALERIO, AND PAUL LEE AND JOY TAN FROM L&S.

Distinguished Service Awards: Fall 1994

This award was given to the Mathematics Communications Outreach Team for extra efforts in one-time contributions producing the Departmental Newsletter, the Berkeley Mathematics Lecture Note Series, the Guidebook to Courses in Mathematics and Related Areas, and our computerized on-line seminar listings. Staff award recipients were **Jeanne Coffee, Deborah Craig, Paulo Ney de Souza, Bernice Gangale, Carolyn Katz, Julianna Lopez, Lou Maull, Rondi Phillips, Faye Yeager, and Gail Yoshimoto.**

Stephanie Reynolds received an individual award for initiation and development of the workshop, "An Introduction to the Undergraduate Majors in Mathematics."

Staff Incentive Awards: Spring 1995

Two staff received awards for their ongoing contributions to the Department: **Melanie Seepol and Faye Yeager.**

Chancellor's Outstanding Staff Awards: Spring 1995

The Mathematics Computing Training Team received recognition for their extra efforts which ensured a smooth transition to the new administrative computing system. Mathematics Department staff recognized were **Dave Hernes, Carolyn Katz, Lou Maull, Kathleen Valerio, and Faye Yeager;** L&S staff were **Paul Lee and Joy Tan.** Ω

FACULTY AWARDS & HONORS

Ole H. Hald, professor of mathematics at UC Berkeley and a previous recipient of the Distinguished Teaching Award, was featured in the August 23-29, 1995 *Berkeleyan* article, "What Good Teachers Say About Teaching." To help students unleash their creativity he sometimes asks, "What is the dumbest way we can solve this problem?"



Robion Kirby, professor of mathematics at UC Berkeley, received the National Academy of Sciences Award for Scientific Reviewing and a prize of \$5,000. The academy cited Kirby for his "list of problems in low dimensional topology and his tireless maintenance of it. Several generations have been greatly influenced by Kirby's list."



Leon A. Henkin, professor emeritus of mathematics, along with Chancellor Tien were among the recipients of honorary degrees from the University of Illinois at Chicago, conferred by University of Illinois Chancellor James Stikel at a recent dinner hosted by Stikel and the University of Illinois Alumni Association.



James A. Sethian, professor of mathematics at UC Berkeley, was awarded by the College of Letters and Science the 1994-95 Donald Sterling Noyce Prize. It is given annually to a tenured or tenure-track faculty member in the physical sciences who has demonstrated excellence in undergraduate teaching, including curriculum development. Ω



ALUMNI NEWS

Charles J. Albert, after completing a double major in mathematics and physics in 1984 at UC Berkeley, was a professional jazz trombonist in the Bay Area and a machinist in San Jose, CA before moving on to Texas A&M to earn his Ph.D. in Nuclear Physics in 1991. Charles stayed in Texas for several years working as an atmospheric scientist and then as legal advisor. He is currently an unemployed playwright and has moved back to San Jose.

Steven M. Arnaudo (AB 1966) works as a programmer for IBM in San Francisco. He also does Zen meditation five mornings a week at the Berkeley Zen Center.

Charles K. Bergman (MA 1978) is currently a teacher of history and Chinese language at a high school in Carpinteria, California. He has two children, a boy and girl, aged 4 and 2 years old.

David Bernier (Ph.D. 1991) has changed universities but is still in Thailand (over 2 years now!). Currently David is working in the Mathematics Department at Naresuan University in Phitsanulok, Thailand.

Phillip A. Bricker (AB 1975) is an associate professor of philosophy at the University of Massachusetts.

Geoffrey B. Dreyer (AB 1977) works as a chemist with Onyx Pharmaceuticals in Richmond, California.

Daniel Drucker (MA/Ph.D. 1973) is a professor of mathematics at Wayne State University in Detroit, Michigan.

Farhad Farzad (AB 1993) teaches mathematics at Logan High School in Union City, CA. While preparing to go to graduate school, Farhad is translating a math book into Persian. He continues to write poetry.

Dianne M. (Schwartz) Finkelstein (AB 1970; MS Wayne State Univ., Detroit; Ph.D. in Biostatistics Univ. of Michigan, 1981) took a position in the Statistics Department at Rutgers University until 1982. She is currently an Associate Professor in the Department of Biostatistics at Harvard School of Public Health and Harvard Medical School at Massachusetts General Hospital. This year she was awarded the honor of Fellow of the American Statistical Association. She works primarily in projects related to research in cancer and AIDS.

Eugenia (Jeanne) E. Fitzgerald (AB 1947; MAT Rhode Island College, 1973; Ph.D. Arizona State University, 1984) has been teaching mathematics at Phoenix College in Arizona

since January 1980. She recently won the 1994-95 Phoenix College Distinguished Teacher of the Year Award.

Neal J. Fowler (Ph.D. 1993) is currently an associate lecturer at the University of Newcastle, New South Wales, Australia. Neal was married to Karin Duval, a 1991 AB mathematics alumna, last August, 1994.

Walden Freedman (AB 1987; Ph.D. UC Santa Barbara, 1995) is an assistant professor of mathematics at Eastern Mediterranean University in North Cyprus.

Frederick N. Fritsch received a Ph.D. in applied mathematics from UC Berkeley in March 1969 and has been employed as a mathematician at the Lawrence Livermore National Laboratory ever since.

Cole A. Giller (Ph.D. 1980) went to medical school at UCLA after Berkeley, then completed a neurosurgery residency at Parkland Hospital in Dallas, Texas. Cole is currently a neurosurgeon and assistant professor in the Neurosurgery Department at Southwestern Medical School with clinical interests in surgery for epilepsy, movement disorder, and pain. He also keeps a research interest in hemodynamics and applications of engineering mathematics to clinical vascular problems.

R. Bonnie Thompson Glaser (AB 1960) obtained a Ph.D. at UC Berkeley in Psychology in 1976. Currently a resident of Berkeley, California, Bonnie has co-edited a book with Ann Martin Worster entitled, "Ruby: An Ordinary Woman", published by Faber and Faber, Inc. Though the subject of the book, Ruby Alice Side Thompson, lived in the early 20th century, she is a powerful reminder of the long history of women's struggles.

Martha Brown Gould (AB 1972) taught mathematics in Zaire, Africa as a Peace Corps Volunteer after graduating from UC Berkeley. Martha re-entered teaching in 1989 and is currently a high school teacher in mathematics and computers at Abraham Lincoln High School in San Francisco. She writes, "It is challenging, but very rewarding."

Claude A. Greengard (Ph.D. 1984) is a manager of IBM's research division in Yorktown Heights, New York, using applied mathematics.

Robert Hubata (AB 1967) continued his studies in statistics and econometrics at Arizona State University leading to a MA. Currently Robert is working on his doctoral degree at Arizona State Univ. in the area of time series

analysis while working as senior econometrician for American Express in Phoenix, Arizona.

Thomas J.R. Hughes (MS 1974; Ph.D. Engineering Science, 1977), currently a professor in the Department of Mechanical Engineering at Stanford University, received the Computational Mechanics Award of Japan Society of Mechanical Engineers in 1993 and was elected to the National Academy of Engineering in 1995. He writes, "I am still very proud of the award I received when I graduated: The Bernard Friedman Memorial Prize in Applied Mathematics."

Edward M. Isaacs (AB 1965) is a mathematics teacher at Los Alamitos High School in California. He is currently piloting, along with three colleagues, a new mathematics course, Integrated Mathematics, which implements the California Mathematics Framework, replacing Algebra I. Edward is also piloting a new calculus course incorporating graphing calculators which uses a new text by Thomas, Finney, Demana and Waits.

Steven A. Jacobson (AB 1966; MA 1971) is teaching Yup'ik Eskimo language at the University of Alaska in Fairbanks and is the author of a number of dictionaries and grammar books.

Jeffrey N. Kidder (Ph.D. 1993) works for Intel Corporation in Oregon as a senior software engineer.

Leonardo Legorreta (AB 1982) is an assistant professor of mathematics at Weber State University in Ogden, Utah.

Irving Lubliner (AB 1974; MAT, UC Davis, 1988) describes himself as a Consulting Educator and Mathematics Enthusiast. He works at Bentley School in Oakland, California as a mathematics teacher for seventh and eighth graders. As Consulting Educator, Irving works for the Bureau of Education and Research with school districts, conducting all-day seminars for mathematics educators throughout the U.S. and Canada. Last year Irving spoke at the California Mathematics Council's Conference in Palm Springs. He has published articles for mathematics educators in *ComMunicator*. In 1994, Irving was one of fifteen recipients of a fellowship from John Hopkins University's Center for Talented Youth. In between his work as teacher and his consulting practice, Irving likes playing the Blues on his harmonica.

Michael Maiman (AB 1972) got into medical school after UC Berkeley and is currently a radiologist living in Belmont,
(continued on page 7)

California. Michael writes, "I remember little college mathematics but hope to instill in my children (ages 6 and 9) the love of math that I had in high school and college." Michael is also the president of the San Mateo Astronomical Society.

Carol A. (Tscherner) Marshall (AB 1972) has been teaching for sixteen years and is a mathematics instructor at Sherwood High School in Oregon. Carol teaches general mathematics through calculus. She is married and has four grown children.

Vikram B. Mehta (Ph.D. 1976) is an associate professor at Tata Institute of Fundamental Research, School of Mathematics, in Bombay, India.

Severino T.R. Melo (Ph.D. 1988) is a professor at the Universidade de Sao Paulo, Brazil.

Michael J. Morris (AB 1969) is an attorney in Portland, Oregon.

Alden F. Pixley (AB 1949; MA 1950; Ph.D. 1961) is now in "phased retirement" (voluntary) at Harvey Mudd College in Claremont, California where he is a professor of mathematics. [Editor's NOTE: Professor Pixley, you asked for recollections of earlier years. I hope you enjoy this issue!]

Jeff A. Rosoff (Ph.D. 1978) is an associate professor at Gustavus Adolphus College in St. Peter, Minnesota. Jeff was widowed in 1988 and has a nine-year-old son, David. Jeff came to UC Berkeley as a visiting scholar, 1990-91, and writes, "Nice to be there."

Lori Phyllis Silver (AB 1977) started a law firm practicing taxation and estate planning in Carmel, California. Lori writes, "Although I traveled a different road from other mathematicians, I love to revisit my past valuable education." [Editor's NOTE: Lori, meet Michael Morris, another attorney(above)]

Charles A. Sismondo (AB 1963) is the Dean of Instruction at Diamond Bar High School, California. His son, Charles L., is now a senior at CAL majoring in both computer and political sciences.

Pat N. Stewart (MA 1966) is a professor in the Department of Mathematics, Statistics, and Computing Science at Dalhousie University in Halifax, Nova Scotia, Canada.

Ulf Wostner (MA 1972; Ph.D. 1978) now teaches in the Mathematics Department at City College of San Francisco. Ω

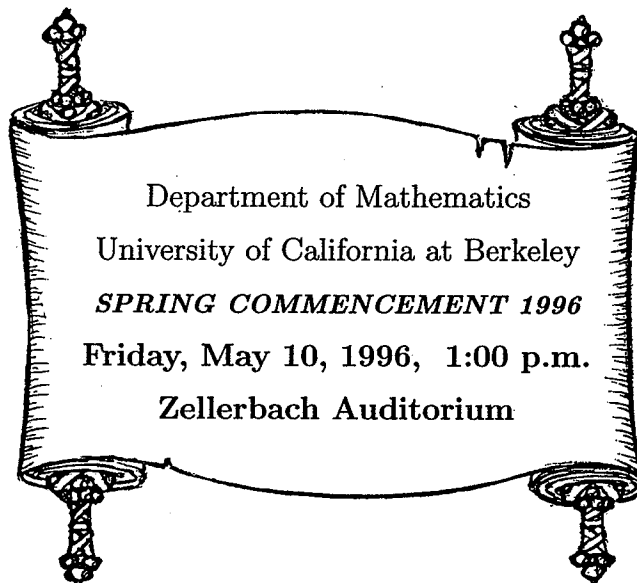
PRESS NOTES ABOUT UNDERGRADS...

Stephan R. Garcia, a junior majoring in math, was awarded the **1995 National Science Foundation Incentives in Excellence Scholarship Prize**. This award of \$1000, given to an undergraduate under-represented minority student other than a current senior, recognizes a student's scholastic excellence and encourages advanced studies in mathematics.

Wung-Kum Fong was one of the three runner-ups for the **Alice T. Schafer Prize**. A junior majoring in math, she is described as an "exceptional student", "stronger than many graduate students" at Berkeley. Since its inception in 1990 by the executive committee of the AWM (Association for Women in Mathematics), the Alice T. Schafer Prize commends outstanding undergraduate women for their excellence in mathematics.

Jason M. Starr received an Honorable Mention for the **1994 William Lowell Putnam Mathematical Competition** for placing in the top 50 out of 2,314 participants.

David Widemann was one of five mathematics majors awarded a **CSC Consulting Scholarship** for undergraduate minority students. CSC Consulting, Inc. of Falls Church, Virginia awarded scholarships of \$950 to mathematics majors who met their criteria. Ω



MGSA ACTIVE: Organizes Colloquiums

We exist, we are active, we care about life in the Berkeley Mathematics Department and we wanted to tell you what we are up to this year.

To complement the departmental colloquia with a more informal forum, we have organized a weekly graduate student colloquium with the express purpose of presenting short topics at a level accessible to first- and second-year graduate students. The talks run about half-hour with another half-hour for discussion and refreshments. We need speakers to volunteer (students, postdocs, or faculty welcome). We held a Fall picnic early in the semester to welcome new students, an event which was enjoyed by all attending. We are collecting and organizing support material for students preparing for their qualifying exams, including lists of previous questions.

One very important issue is graduate student funding. We are working closely and productively with faculty and administration to safeguard the needs of the students. Undoubtedly many other issues will come up, these are just the things on our minds at the moment. Two things should be emphasized: this work is not being done just by the MGSA officers, and ideas did not originate solely with us. Many people have been helping, and we continue to need lots of help. Your ideas, suggestions, and help are welcome!

We now have official MGSA office hours, subtly designed to coincide in space and time with free food at TEA: 3-4 every Thursday in 1015 Evans Hall. Our email address is mgsa@math.berkeley.edu. Our names are Mike Pierce, David Gay, Vinay Kathotia, David Jones (and Monica Vazirani and Michael Kleber who run the allocation of offices). Please be in touch. Ω

RESEARCH ARTICLE

RECONSTRUCTION OF FUNCTIONS FROM PARTIAL DATA

F. ALBERTO GRUNBAUM AND CALVIN C. MOORE

A common problem in many fields of science and engineering is to reconstruct or recover a function f from seemingly partial knowledge about it. Specifically we are concerned with a *real* valued function f on an abelian group A (usually the real line \mathbb{R} , or two- or three-dimensional space, \mathbb{R}^2 and \mathbb{R}^3 , or periodic versions of these — the circle T or two- or three-dimensional tori T^2 or T^3 , or finally discrete versions of these — a finite cyclic group or products of such). An essential aspect of the reconstruction problem to be considered is that the only data we have about the function are data that are the same for the given function f and all of its group translates f_a where $f_a(x) = f(x + a)$, and we are asked to reconstruct not f itself, but f up to a translation.

Typical data of this kind are autocorrelation coefficients (of order $n + 1$) of f

$$A_{n+1}^f(a_1, \dots, a_n) = \int_A f(x)f(x+a_1)f(x+a_2)\dots f(x+a_n)dx.$$

It is an easy exercise to see that f and any translate have the same autocorrelation coefficients of all orders. The first order coefficient is simply the integral of f , while knowing the second order one is equivalent to knowing the absolute value of the Fourier transform of f . It has been known for some time [1] that knowledge of autocorrelation coefficients of all orders allows one to reconstruct f up to a translation, and that in general it is impossible to reconstruct if one knows autocorrelation coefficients only through some finite order. The problem we pose is whether if one has some additional information about f , can one can reconstruct f (up to a translation) knowing only autocorrelation coefficients up to a certain order. This kind of problem arises in laser optics, in imaging problems in astronomy, and in crystallography (where it is in fact the celebrated phase reconstruction problem).

Let us illustrate with a very simple example motivated by crystallography (in one dimension). The group A is a finite cyclic group of order N , and the function f is restricted to take only two values, 0 and 1 (a so-called Patterson function) or, alternately, is restricted to take non-negative integer values (a so-called generalized Patterson function). If one extends f to a periodic function the integers with period N , this models a one-dimensional crystal where an atom of atomic number $f(m) \neq 0$ is located at the m -th site and where $f(m) = 0$ means the m -th site is vacant. Data obtained from x-ray crystallography will never distinguish between f and translates of f .

Crystallographers had hoped for years that third order autocorrelation coefficients would allow one to reconstruct such an f (Patterson or generalized Patterson) up to a translation. We show [2] that this is not the case and in fact display two functions on the cyclic group of order six that have the same autocorrelation coefficients up through order 5. Specifically, in tabular form, they are (11, 25, 42, 45, 31, 14) and (10, 21, 39, 46, 35, 17). We establish an affirmative result, which is best possible in light of the example above, to the effect that for generalized Patterson functions, one can reconstruct the function up to a translate if one knows all autocorrelation coefficients through order six. We also show that this requirement can be lowered to order four if the cyclic group has odd order.

- [1] D. Chazin and B. Weiss, Higher order autocorrelation functions as translation invariants, *Information and Control* 16 (1970), pp. 378–383.
- [2] F. A. Grünbaum and C. C. Moore, The use of higher order invariants in the determination of generalized Patterson's cyclotomic sets, *Acta Crystallographica (A)* 51 (1995), pp. 310–323.



F. ALBERTO GRUNBAUM



CALVIN C. MOORE

GRATEFUL THANKS TO OUR FRIENDS

The Department of Mathematics extends heartfelt thanks to all our donors over the past years for their generous support. Our donors have contributed to the strength and vitality of our students and the Department. The following is by no means all-inclusive, but is a list of our donors since 1987. We apologize if we have omitted anyone. Please do let us know if that is the case. A special thanks to all our donors who wish to remain anonymous.

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DONORS TELL THEIR STORIES

CHARLES B. MORREY, JR.

LOU MAULL

Charles B. Morrey, Jr. was born in 1907 in Columbus, Ohio. He had a lifelong love of piano, though his overriding interest since childhood was mathematics. After receiving his AB in '27 and MA in '28 from Ohio State, he attended Harvard from 1928-31 when he received his Ph.D. in mathematics. After completion of his doctorate, he was a National Research Council Fellow at Princeton, the Rice Institute (now Rice University) and the University of Chicago.

In 1933, he accepted a position in the Department of Mathematics at Berkeley where he remained until he retired in 1973. At various times he was Chairman of the Department, Acting Chairman, Vice Chairman, and Director of the Center for Pure and Applied Mathematics.

Morrey was a member of the Institute for Advanced Study at Princeton during 1937-38 and 1954-55. During World War II, he was a mathematician at the U.S. Ballistic Research Laboratory in Maryland. Also, he was variously Visiting Assistant Professor at Northwestern University, Visiting Professor at Chicago, and a Miller Research Professor at Berkeley.

Among his honors were Member, National Academy of Sciences; Fellow, American Academy of Arts and Sciences; President of the American Mathematical Society in 1967-68. He received the prestigious Berkeley Citation in 1973.

Morrey's research led to the solution of many important problems. He has been one of the strongest workers in mathematical analysis. His first scientific contribution was probably his master's thesis, which contained a short proof of the measurability of the Dini derivatives of a measurable function.

One of his early proofs described the nature of the most general surface of finite Lebesgue area. Morrey worked on multiple integral problems in the calculus of variations. With his invention of the new class of function spaces, later called "Sobolev spaces," he was able to prove the existence of functions minimizing certain integrals. His proof which satisfied Euler's equation was decisive in the solution of two (the 19th and 20th) of the 23 famous key problems with which Hilbert challenged generations of mathematicians at the beginning of the 20th century. The methods invented by Morrey in this work are among the most powerful tools in non-linear analysis.

Morrey made contributions to applied mathematics working on the solution of the important problem of Plateau (problem of least area). He also worked on harmonic integrals using variational methods; proved the analyticity of the solutions of analytic elliptic equations; proved his theory of analytic embedding; published results on the parametric variational problem for double integrals; solved some DeGiorgi-Nash extensions.

In 1962, his first book, "University Calculus with Analytic Geometry," was released. This was the forerunner of the Protter-Morrey textbooks of Calculus and Analytic Geometry which have had much influence on the teaching of mathematics in high schools and colleges.

In 1964, his lectures for the prestigious AMS Colloquium series were included in his book "Multiple Integral Problems in the Calculus of Variations" in the Springer Grundlehren series. This is now a classical basic treatise that has had a broad impact on subsequent developments in the calculus of variations and partial differential equations.

In the 1979 issues of *Manuscripta Mathematica*, the dedication written by Stefan Hildebrandt read, "Please accept these papers as a token of our highest esteem and admiration for your scientific contributions. You have founded the modern calculus of variations, and you have become the teacher of all of us working in this field. Mathematics has dramatically been changed by your work, and I am sure that many more great discoveries will grow out of it."

In 1985, to honor Professor Charles Morrey, the Department created the Charles B. Morrey, Jr. Visiting Assistant Professorship. These two-year appointments are extremely competitive and go to especially promising Ph.D's. Ω



CHARLES B. MORREY, JR.

AN INTERVIEW WITH FRANCES ELEANOR (MOSS) MORREY

LOU MAULL

A second generation Californian, Frances Eleanor Moss was born and raised in Oakland, her parents coming from Stockton and San Jose. She always knew she wanted to be a teacher. Her schooling and teaching reflect the changes that have occurred in education in the East Bay over the decades from the 1920s through the 1970s.

Her odyssey in education began at Claremont Elementary School (built in 1913) which originally taught grades K-6. It would be razed and rebuilt as a junior high school in 1926, but not in time for Frances.

Her junior high and high school years were completed at University High which had moved to new facilities in 1923 on Old Grove Street. It was created as a scholastic experimental link with UC and reached a maximum enrollment of 2,000 students in 1939. As a teacher training center for UC Berkeley, it became a renowned public college-prep high school and drew enrollment from all over the Bay Area. After attending as a student, Frances returned as a student teacher, then as a teacher after receiving her AB (1933) and her MA (1935) degrees in Mathematics from UC Berkeley.

Frances met Charles Morrey late in 1933 when the department hired him as an instructor after he had finished a two-year National Research Council Fellowship at Rice Institute. She had just begun her MA and was a reader for the department at the time. Both were active members of the Math Honor Society. They were married in 1937.

Despite the great difficulty of finding permanent teaching positions in the post-Depression era, Frances taught at different schools in the Oakland School District during the two years after receiving her MA and the first four years of their marriage. With the impending arrival of their firstborn in 1941, Frances took an 18-year hiatus from teaching to raise their three children.

With summers off, the Morreys enjoyed their travels immensely and looked forward to the AMS meetings each August. Taking their children, they crossed the United States by car 20 or more times and visited many national natural wonders. Their sabbaticals were usually taken abroad, visiting nearly every European country, one sabbatical year was spent in France. They witnessed many changes that overtook Europe during the post-war decades of the 50s through the 80s.

In 1959, at the urging of Andrew Noble, who was then the sole mathematics teacher

(continued on page 11)

Alumna & Former Staff Establishes Fellowship

An Interview with MISS SARAH HALLAM

LOU MAULL

It is a rare occurrence for a staff employee to have the opportunity to meet a previous staff employee who has had great longevity in the



Photo by Paul Brown

MISS SARAH HALLAM

same workplace. I had that opportunity when I met Sarah Hallam recently and we talked about the Mathematics Department of many years gone by.

I could not discern the faintest hint of her southern roots (Macon, Georgia) as she spoke. Raised in Portland, Hallam completed her AB in Mathematics while at Reed College during the Depression.

Hallam came to the Mathematics Department at UC Berkeley in August 1936 to begin work as a graduate student and half-time as the first Department Secretary. Her predecessor was someone from the WPA (Works Progress Administration, a work program established by FDR to get the country through the Depression). She recalled with a chuckle that the campus didn't even have hiring documents in those days. When the retirement system was established, all she had to provide was a notarized statement as to the length of her employment (a big difference from today's paper-driven bureaucracy).

Hallam completed her MA in Mathematics in 1938. Soon after, she began her full-time career as Department Secretary which continued uninterrupted for nearly 40 years. She has one of the longest records of service on campus according to the Personnel Office.

Hallam remembers clearly the years from 1936-49 when Griffith Evans worked to begin building the Department of Mathematics into the premiere department it is today. He had been recruited in 1933 from Rice Institute at the urging of Chemistry, Physics, and Engineering. They had already made

considerable progress towards building first-rate departments and the continued strengths of their departments depended heavily on the quality of the mathematics program.

Evans brought in Charles Morrey and Alfred Foster in 1933, Hans Lewy arrived in 1935, Raphael Robinson in 1937, Jerzy Neyman in 1938, A. P. Morse in 1939, D. N. Lehmer in 1940, Alfred Tarski in 1942, Ed Pinney and Abe Seidenburg in 1946, and John Kelley in 1947. When Sarah arrived in 1936, some of the long-

time members of the Department were B. A. Bernstein, Charles Noble, Frank Irwin, John McDonald, William Putnam, Bing Wong, Sophia Levy, Raymond Scioberetti, Lee Swinford, Pauline Sperry, Colin Goldsworthy, and Arthur Williams.

The Department had 24 full-time faculty for many years. Then, the student body increased so dramatically after the war that some Teachers Aides were teaching classes of 70-80 stu-

(continued on page 16)

Francis E. (Moss) Morrey

(continued from page 10)

at Mills College and a close friend, Frances returned to teaching mathematics (analytic geometry and trigonometry) part-time at Mills. Two years later she took a full-time position at Oakland City College (formerly University High and Merritt Business College) where she taught for 18 years until her retirement in 1979.

Her old high school, University, suffered a nearly 75% decline in student enrollments from 1939 to the mid-1940s and in 1946, after much student and parent protest, it became Merritt Business School with the primary purpose of providing training and skills for veterans returning from the war. Over the years, Merritt would endure a long series of name changes until finally



Photo by Paul Brown

MRS. FRANCIS E. (MOSS) MORREY WITH (LEFT TO RIGHT) MARIE CHRISTINE CONCORDEL, JESSICA POLITO, AND YASUNORI NAKAJIMA.

emerging as Merritt College, which, in 1970, moved to its new campus in the Oakland hills. The old University High campus structures still remain, but with an uncertain future.

The Charles B. Morrey, Jr. Award was established in 1985 by Mrs. Frances Morrey to honor the memory of her husband. Cash prizes of \$1,000 each are awarded each year to graduate students of promise to encourage pursuit of doctoral research in mathematics. The 1994-95 recipients were Yasunori Nakajima and Jessica Polito. Marie Christine Concorde was honored with the 1993-94 award. Ω

Raphael M. Robinson 1911-1995 Professor of Mathematics, Emeritus

Raphael M. Robinson contributed to astonishingly diverse areas of mathematics. Born on November 2, 1911 in National City, California, he was the youngest of four children. His father, Bertram H. Robinson, an atypical lawyer who wrote poetry, gave his sons romantic names, but ultimately left. His mother, Bessie Stevenson Robinson, supported the family as an elementary school teacher.

Robinson attended the University of California at Berkeley, where he received his B.A. in 1932, his M.A. in 1933, and his Ph.D. in 1934. His dissertation was in the field of complex analysis.

During the Depression he considered himself lucky to obtain a half-time instructorship at Brown University, but his stay there was plagued by poverty and tuberculosis. In 1937 he happily returned to Berkeley as an instructor, becoming a full professor in 1949 until emeritus in 1973. He was an excellent teacher with a thorough knowledge of classical and modern mathematics that enabled him to organize and explain with exceptional clarity the material in a wide variety of courses. He fulfilled his modest departmental and university duties without exhibiting special interest or enthusiasm. However, during the Loyalty Oath controversy, when five members of the Department

were fired for refusing to sign, he joined a group of colleagues in creating a "math fund" to

which they pledged 10% of their salaries to support the rebels, and he served as treasurer.

In a number theory class in 1939 he had among his students Julia Bowman. Their courtship took place on long walks during which he educated her in modern mathematics. They were married in December 1941. Julia eventually became the first woman mathematician elected to the National Academy of Sciences and the first woman president of the American Mathematical Society. She doubted that she would have become a mathematician if it had not been for Rafael; he taught, encouraged and supported her in so many ways.

Even among world renowned mathematicians Robinson was exceptional. In an age of specialization he contributed significantly to six fields: logic, set theory, geometry, complex analysis, number theory, and combinatorics; and in a subject often considered "a young man's game" he continued to produce

significant mathematics into his eighties.

He anticipated most of the mathematical community by a good twenty years in making use of computers to obtain results in pure mathematics. In 1951, never having seen one of the new machines and working only from a manual, he coded the first successful program to test very large numbers for primality. "That the code was without error was (and still is) a remarkable feat," according to the recently published history of the Institute for Numerical Analysis on the UCLA campus. An unexpected result of the work was that it sparked the interest of his nonmathematical sister-in-law, Constance Reid, who became a popular biographer of mathematicians.

One number theorist has written, "... it is refreshing and stimulating to encounter one of Robinson's papers. In each of them he takes a problem, old or new, which can be stated in simple and intelligible terms, and either solves it, or at least adds much that is new. His scholarship is impeccable; it is plain that he never writes until

he has thought deeply, and until he has sought out every relevant piece of existing knowledge."

Approximately a quarter of Robinson's publications are distributed among seven different topics in logic and the foundations of mathematics. The

one to which he gave most attention was that of undecidable theories. To illustrate, the mathematical structure consisting of the integers with their operation of addition is said to have a decidable theory. This means that it is possible to program a computer so that, given any sentence about the structure in a logically defined language, the computer will make a finite computation that determines whether the sentence is true or false.

Another mathematical structure with a decidable theory is that of all real numbers with their operations of addition and multiplication, as was shown in a celebrated work by Alfred Tarski, the father of Berkeley's world-famous program in Logic and the Methodology of Science. But a major mathematical discovery of this century was the fact that the structure of integers with both operations of addition and multiplication

has an undecidable theory, because there is no computer program that can decide the truth or falsity of every sentence of its language. In several papers Robinson was able to show that

a number of other mathematical theories are also undecidable. His most valuable contribution was devising a theory with a finite number of axioms that is "essentially undecidable" --- a concept introduced by Tarski. Their book "Undecidable Theories" (Mostowski, Robinson, and Tarski) has provided

a tool for researchers to identify undecidable theories in all parts of mathematics.

In an area that combines logic, geometry and combinatorics, Robinson did early work on tilings of the plane by tiles of such a shape that they can cover the plane but not in the familiar "periodic" manner of squares and hexagons. The general subject has turned out to have unexpected applications in crystallography, where the tiles correspond to so-called "quasi-crystals".

A famous result of Robinson's in set theory is related to the so-called Banach-Tarski Paradox, a surprising theorem that the set of points making up a solid sphere can be decomposed into a finite number of parts that can be reassembled into two solid spheres, each having the same radius as the original sphere! Robinson was able to show that the number of parts required for such an operation is five, and that decomposition with less than five is impossible. He also showed that the surface of a sphere can be decomposed into four parts and reassembled

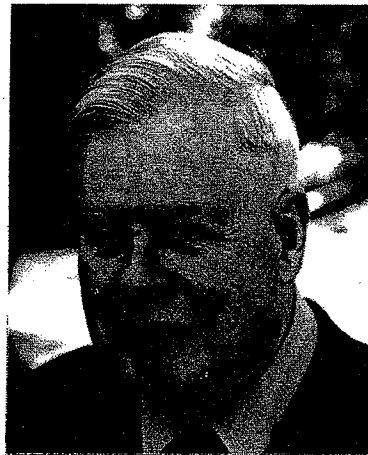
into two spherical surfaces of the same radius, and that four is the minimum number.

At the age of 61, when "early retirement" was not

yet a popular option, Robinson chose to retire—at considerable financial sacrifice—so that he could devote more time to mathematics.

His pleasures were sedentary. He enjoyed challenging table games, novels as well as

(continued on page 13)



RAPHAEL M. ROBINSON

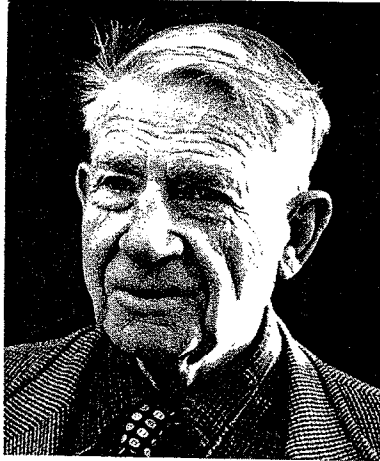
Robinson contributed significantly to six fields and seven topics in logic

Even among world renowned mathematicians Robinson was exceptional

Alfred L. Foster 1904-1994

Professor of Mathematics, Emeritus

The novelist E. M. Forster in his essay *What I believe*, says "The people I admire the most are those who are sensitive and want to create something or discover something and do not see life in terms of power." Using this criterion it would be difficult indeed to find a more admirable man than Alfred Foster, professor emeritus of mathematics at UC Berkeley, who died on December 24, 1994 at the age of 90 of complications following surgery the previous Spring. Up to the last year of his life he continued to work intensely, as he had all of his life,



ALFRED L. FOSTER

on mathematical problems which he found personally fascinating, motivated solely by his deep desire to create and to understand, quite independent of whether or not his interests coincided with what was in contemporary fashion. Following his independent quest, he initiated and vitalized an area of modern algebra which subsequently flourished.

Foster was born in New York City on July 13, 1904. He earned his B.S. degree at CalTech in 1926 as well as an M.S. the following year. Further graduate work at Princeton earned him his Ph.D. in 1931. His dissertation director was Alonzo Church who was only one year older than Foster. In 1930 Foster married Else Wagner. Together they spent a postdoctoral year in Göttingen and then traveled across the United States by automobile to Berkeley for more study and part-time teaching. In 1934 he

accepted a regular position at UC Berkeley. At that time Griffith Evans was Head of the Mathematics Department and was charged by President Sproul with building a first class mathematics center, which he did. Alfred Foster and Charles Morrey (who became the first department chairman after Evans' retirement) were Evans' first two appointments. Except for subsequent sabbatical leaves, spent most notably in Freiburg and Tübingen, Foster served continuously at UC Berkeley until his retirement in 1971 at the mandatory age of 67.

Foster's Ph.D. dissertation and his first few papers were in the area of mathematical logic. He soon focused his interest on the related theory of Boolean algebras and Boolean rings, and was thus led from logic to algebra. He extensively studied the role of duality in Boolean theory and subsequently developed a theory of n -ality for certain rings which played for n -valued logics the role of Boolean rings *vis-à-vis* Boolean algebras. Benjamin Bernstein of the Berkeley mathematics faculty was his collaborator in some of this research. This work culminated in his seminal paper *The theory of Boolean-like rings* which appeared in 1946.

In the course of this work Foster realized that the more general setting of the new area of *universal algebra* was more appropriate for continued development of his ideas, and in this context he developed the theory of *primal algebras*. In 1953 he showed that the variety generated by a primal algebra has the same essential structure as the variety

of Boolean algebras. Professor Bjarni Jonsson in a recent paper dedicated to the memory of Alfred Foster states: "The result is an acorn from which a mighty oak has grown." Foster devoted the rest of his life to the development of this important work. This mission continues through his students and other mathematicians throughout the world.

Alfred Foster, though somewhat formal and socially shy, is remembered as warm-hearted, good humored, and unconditionally generous by all who knew him. Several of his former students have pointedly used the word "gentleman" in describing his character. His teaching style was rather old fashioned, in a good sense, and was probably influenced by his admiration for the universities of Germany during his visits there. His former students were often surprised and flattered that he remembered them years after classroom contact and that he had a continuing interest in their lives.

Music and politics were of particular interest to Foster, and in the latter he held deep and morally grounded convictions. Along with mathematics, Alfred Foster took the current great issues of science and human culture very seriously indeed. An important key to his character was that he never took himself nearly so seriously.

Together with his work the great love of Alfred Foster's life was his family. He and Else Foster were deeply devoted

to each other and to their two sons and two daughters, their eight grandchildren, and three great-granddaughters.

Following his express wish his ashes were scattered over the ocean on January 5, 1995. Ω

Foster's mission continues through his students

Robinson (continued from page 12)

nonfiction, old movies, and the verse of Ogden Nash (occasionally turning out efforts of his own in that genre). He was a generous donor to many causes. He was also a faithful contributor to the Problems Section of the American Mathematical Monthly. What the Section Editor described as "a beautiful short paper" of his was accepted for publication just days before his death. In the ten years following his wife's death, he continued to live in their modest home, taking care of himself and never speaking of his loneliness. In 1986, in honor of his wife, he

established the Julia Bowman Robinson Fund for fellowships for graduate students in mathematics at Berkeley and has left the bulk of his substantial estate to it.

Robinson suffered a stroke on December 4 and died on January 27, 1995. Although unable to speak, he was able to indicate by yes and no motions that his fine mind and memory were still operating. Contrary to his doctors' expectations, he did not become depressed by his new situation but continued to be the remarkably self-contained individual he had always been. Ω



Entrepreneurial Staff Create Business from Hobbies

Marsha Snow's Comforters

Expanding a hobby into the world of business has often been the next step for people dedicated to their particular interests. For **Marsha Snow**, the object of her passion is sewing. She has established **COMFORTING THOUGHTS**, a home sewing business, to accommodate the recent baby boom. Marsha can make anything but lately she specializes in baby comforters which can be beautifully personalized upon request. Any inquiries please write to: **COMFORTING THOUGHTS**, P.O. Box 16178, Oakland, CA 94610.



Photo by Rondi Phillips

MARSHA SNOW



ALEXIS HILL AND COMFORTERS

Dave & Poppy Hernes' Personalized Gifts

Looking for the ultimate, personalized gift for any occasion? **Poppy and Dave Hernes** have combined Dave's love of photography and Poppy's business sense to create **YOUR COMPUTER PORTRAITS**. For four years Poppy and Dave have been traveling to local fairs and festivals promoting their business. Your photographs or sketches, or even your favorite (or most detested!) math theorem, is scanned into a computer and then heat-set onto T-shirts, sweatshirts, mugs, key chains, or buttons. The prints are machine washable on the clothing and dishwasher safe

on the mugs. Photographs can be cropped (like cutting out your ex-significant other so only you are showing) or

e n l a r g e d without damaging or changing the original.

Or, you can arrange to come out to Dave's home and he will take a picture there at no extra charge. The whole process takes less than fifteen minutes.

If interested, contact Dave



DAVE AND POPPY HERNES

at: **YOUR COMPUTER PORTRAITS**, P.O. Box 5385, Hercules, CA 94547, or on the World Wide Web at <http://www.maestro.com/ing/mall/poppy.htm>. Ω



PERSONALIZED MUGS

Astronomy/Mathematics/Statistics Library UPDATE

Exciting developments in electronic resources are upon us. Access to various electronic forms of Math Reviews—as well as to the growing list of e-journals and e-preprints—is about to take a giant leap. MathSciNet (the Internet version of MathSci) is slated to come up on the AMS library server January 1, 1996 and, as of this writing, UC is negotiating with Michigan for access to their tape-loaded version of MathSci via Melvyl. It is not settled yet which form of access Berkeley will purchase, but it will be one or the other, if not both.

The new public PC in the library is bring-

ing many other electronic resources within easy reach of our patrons. The Windowed PC allows easy access to Berkeley information systems, GLADIS and Melvyl, the campus-wide CD-ROM network (Did you know that you can search Science Citation Index on CD from the Math Library?), and the wealth of resources on the Internet, and allows downloading of searches and files which can be saved to disk or mailed to e-mail accounts. If you haven't yet, check it out the next time you're in the library. While you're at it, visit our Web page at <http://library.berkeley.edu/AMS/>.

Hard Times/Generous Gifts

The Astr/Math/Stat Library withstood another round of budget cuts this year to both operations and collections. With the able guidance of faculty on the Library Committee we were able to minimize the damage to library collections and services. The difficult financial situation makes us all the more appreciative of gifts to the library. In this past year, in addition to many cash gifts, more than \$18,000 worth of books were donated to the library. Thanks to everyone for your input and concern and for your patience in these difficult times. Ω

Alumni News & Update Form (please type or print, using a separate sheet if necessary)

Name:

Last _____ First _____ MI _____

Degree & Year graduated: _____

Address Correction:

Work - Position:

Institution or Company:

Location:

Personal and Professional News:

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?

Other Comments:

Thank you for taking the time to help us plan for our next issue.

Please return this form to:

Rondi Phillips, Editor

Department of Mathematics #3840

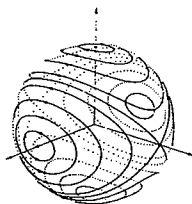
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THE DEPARTMENT OF MATHEMATICS



UNIVERSITY OF CALIFORNIA AT
BERKELEY

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all alumni, parents, students,
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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.

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I prefer to designate my gift for (other) _____

Send me information on charitable estate and gift planning or on establishing an endowment.

Chair Message *(cont. from page 3)*

to our visiting faculty program, to staff and operational expenses, and to the graduate teaching support program which we had been able to protect in prior years. While we did reduce our visiting faculty budget with the initial cuts, the subsequent cuts were small enough to be absorbed into the operating budget, at least for the next two years. One top priority is to maintain our financial commitments to graduate students, and our goal is to provide a stable financial environment for them. Private endowments will help the Department greatly in this endeavor.

Funding for Readers has been cut drastically over the past years, with only minimal funding remaining for upper division courses. We regret the adverse impact this has had on our students and thank the Faculty and Graduate Student Instructors for their help in bridging this gap.

New Chair

This will be my last year as Chair of the Department. The process of selecting a new Chair for 1996-99 will begin later this semester, or early in the spring semester.

Recruitments 95-96

We welcome to our department this year Professor Bernd Sturmfels, formerly from Cornell University. He is featured elsewhere in this newsletter. At present, we have 53 regular faculty. Our goal is to rebuild to 60 in the next five years. We have received approval to recruit for two faculty positions in 95-96. Ω

Miss Sarah Hallam

(continued from page 11)

dents. The lecture system was not practiced in those days. It was an exciting time because things were changing so rapidly.



STEVE HILLION

Hallam would be joined gradually after the war by other staff members. In the early 1960s, the department's first business person, Helen Lasota, was hired. Prior to Hallam's retirement in December 1975 she had moved the department from its eight offices on the fourth floor of Wheeler Hall, to Dwinelle Hall in the early 1950's, to Campbell Hall around 1960, and finally to Evans Hall in 1970.

In 1989, Sarah Hallam funded a fellowship to benefit Mathematics graduate students who have demonstrated academic excellence and promise. An award of \$4,000 was given to Steven Hillion in 1994-95. The 1995-96 award



EUGENE STERN

was increased to a full fellowship of \$14,000 and was awarded to Eugene Stern. Ω

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Printing done by PRINT MINT PRESS

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Mathematics

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