



# Math Times

University of Illinois at Urbana-Champaign

Spring 1998

## Letter from the Chair

Dear Colleagues and Friends,

In the LAS News, Winter 1998, there is the following letter from Jesse Delia, dean of LAS, reproduced here with his permission.

From the Dean's Desk

Previous reports on developments in the College have noted that the late 1990s have been a time for adapting programs to assure their continued excellence. These invigorating activities are particularly prominent in the mathematical fields.

Mathematics is a central discipline. The Department of Mathematics alone is home to a tenth of the College's faculty and carried a similar proportion of our overall instruction. The Department of Statistics adds to this density. Developments in fundamental mathematics are foundational to scientific progress, and effective mathematical

education is important to the long-term productivity and health of our society. Every undergraduate on the campus must demonstrate competency in quantitative reasoning, and we are in the process of implementing an extension of this requirement to two courses.

We have placed high emphasis on basic undergraduate education. This includes bolstering our introductory statistics program, developing strong involvement in the campus Discovery Program that enrolls freshman in seminars with senior faculty, and creating a highly successful "merit workshop" program in which students with limited backgrounds in mathematics work together in small groups to support one another in learning.

The Department of Mathematics also has implemented a variety of new

approaches in calculus instruction. In addition to traditional formats involving lecture/discussion coverage of basic concepts, the department has pioneered the development of a substantially self-paced approach in which students work through problems using the analytic and visualization power of Mathematica, the dominant software system for doing mathematics on personal computers. (Mathematica, itself, was in part developed in our Department of Mathematics.) This approach has been adapted to support biological education with our "Biocalc" program. Other calculus sections involve problem solving and collaborative learning in small groups, and there is high use of graphing calculators. There is no place in the country with a richer environment for adapting mathematical education to the needs of

different students and learning styles.

We are also working to protect the foundations of the discipline, and to fill every faculty position in a fashion that enhances mathematics scholarship and education. The Mathematics Department is linking to other fields through a focus on mathematics and its applications, and our Department of Statistics has developed expertise that articulates with specific science and social science disciplines. Illinois has one of the world's most outstanding mathematics libraries with its 80,000 volumes and almost 1,000 serials, and protecting its special character is a high priority of this campus.

By attracting Professor Anand Pillay to a Swanlund Chair in our logic group, we secured that group's world-leading position. We are working to make similar key appointments in other major subfields and to attract the best young scholars through vigorous recruitment of junior faculty and a newly created program of J.L. Doob Research Assistant Professors that will bring young scholars of exceptional talent to the campus to teach and interact with our faculty for three years. Our Statistics Department is being similarly vigorous in positioning itself to sustain and enhance its excellence.

With all this and more in

## Richard Hamming

**Richard W. Hamming**, who in 1988, was the first recipient of the IEEE Medal named in his honor, died January 7, 1998. He received his Ph.D from the University of Illinois in mathematics in 1942, and visited the Urbana- Champaign campus in the fall of 1997 where he gave a series of lectures. He played a central role in the development of computer and computing science and was renowned for his significant contributions in information coding.

Dr. Hamming worked with Bell Telephone Laboratories for 30 years, as a mathematician and later director. There he made discoveries in information coding that are now used in every computer, CD-ROM, and computer network. In addition he developed the Hamming method of integration and the

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progress, we are assuring that Illinois will remain a world center for mathematics scholarship and teaching in the next century.

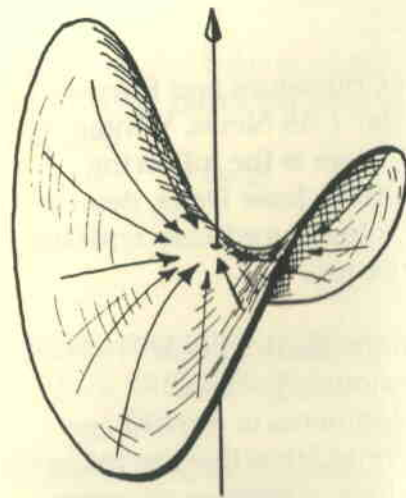
Jesse G. Delia

The Department of Mathematics is grateful for the Dean's support.

Yours,  
Philippe Tondeur

Hamming filters that are central to a variety of signal-processing techniques.

He was well known for his aphorisms: "The purpose of computing is insight, not numbers," and "Methods, not results." His view of education was that "the most important thing to teach is how to learn."



*"Beauty of a proof or machine...is a happy marriage of simplicity and power—power meaning the ability to accomplish a wide range of tasks, get a lot done."*

David Gelernter

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# Gene Golub establishes Hohn-Nash Awards

The first presentation of the **Franz Hohn** and J. P. Nash award to honor Professors Franz Hohn and John Purcell Nash, pioneers in the field of applied and computational mathematics and also dedicated teachers, was made on March 3 in the Grainger Library at the UIUC campus. The award was established in 1997 by UIUC alumnus **Gene Golub**, with additional support from friends of Professors Hohn and Nash and their families.

Gene Golub, who is the Fletcher Jones Professor of Computer Science at Stanford University where he has been a faculty member since 1962, received his bachelor's, master's, and Ph.D. degrees (1959, Taub) from the University of Illinois. In 1991 the university awarded him an honorary degree. He is a member of both the National Academy of Engineering and the National Academy of Science, and is a Fellow of the AAAS.

Professor Golub presented the awards to three students who were recognized for their outstanding scholarship and promise in applied mathematics, computational science, and scientific computing.

They are **Darrin Doud**, a fifth



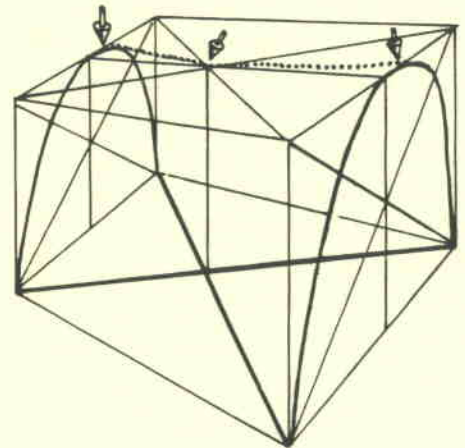
*Gene Golub*

year graduate student in mathematics, whose interests include algebraic and computational number theory; Aaron Hartman, a senior in computer science with a mathematics minor and a strong interest in numerical analysis; and Karla Miller, also a computer science senior who is interested in applications of computation to medical imaging.

Franz Hohn received his Ph.D. from the University in 1940 and joined the Illinois faculty in 1948. He was a valued member of the department until his death in 1977. A specialist in applied mathematics and automata theory and the author of a widely used textbook on

elementary matrix algebra, Professor Hohn served as graduate supervisor for mathematics from 1968-70 and was associate dean of the Graduate College from 1970-72. He is famed for his many innovations in the field of numerical algorithms and is especially noted for developing algorithms for solving linear systems with special structure, for computing eigenvalues of sequences of matrices, and estimating functions of matrices. He co-authored the widely-used book *Matrix Computations*.

John P. Nash was a professor of applied mathematics at UIUC from 1950 to 1957 and helped to develop the Illiac 1 computer. After leaving Illinois he became vice president of Lockheed Missile Space Corp. and assistant general manager of its Space Systems Division.



## Faculty News

**Bruce Berndt** has been awarded a fellowship from the John Simon Guggenheim Memorial Foundation for twelve months beginning August 1998 to work on the lost notebooks of Ramanujan.

January 25 to 31 **Richard Laugesen** attended the meeting on "Geometric Questions in partial Differential Equations" in Oberwolfach. His talk was on "Eigenvalues of Inhomogeneous Membranes." Professor Laugesen reported that there was lots of snow, and the Black Forest, where Oberwolfach is located, was very pretty under its white blanket.

**Sergei Ivanov** has been asked to deliver an invited lecture at the International Congress of Mathematicians (ICM-98) in Berlin this August. This is the most prestigious lecture invitation a mathematician can receive. Several members of our department have been invited lecturers at the ICM in recent years. Among them are Professors **Jean Bourgain** (1994 Fields Medalist), **Donald Burkholder**, **Wolfgang Haken**, **Zoltan Furedi**, **Michio Suzuki** and **Lou van den Dries**.

**Renming Song** is at the Mathematical Sciences Research Institute in Berkeley this semester. He joined the faculty last year, coming from

Michigan

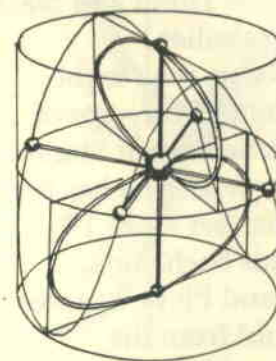
**Tibor Szabo** is spending the spring semester at the Institute for Advanced Study in Princeton, where he spent the last academic year, 1996-97, before coming to UIUC in August as a J.L. Doob Assistant Professor.

**John Sullivan** will be studying the "Fluid Physics of Foam Evolution and Flow" under a new research grant from NASA. He will be working with Professors Hassan Araf and Sigurdur Thoroddsen, from Theoretical and Applied Mechanics. The research program will do both computer simulations and physical experiments. The computer work will use Brakke's Surface Evolver and other code to simulate the evolution of foam (under coarsening due to diffusion between bubbles with different pressure) in two and three dimensions, with and without gravity. They hope to extend the code to deal with ideal gases in the bubbles and with finite liquid fraction. The physical experiments will use a video camera with thin depth-of-field to monitor different layers in a slowly evolving foam; they will use image processing techniques and computational geometry to reconstruct the foam geometry from these images.

In January **Robert Jerrard**

went to Japan to attend and to give a lecture at the seventh annual Tokyo Nonlinear Partial Differential Equations meeting at Tokyo Metropolitan

*I'm very well acquainted, too,  
with matters mathematical,  
I understand equations, both the  
simple and quadratical;  
About binomial theorem I'm  
teeming with a lot o'news,  
With interesting facts about the  
square of the hypotenuse.*  
W. S. Gilbert



## LAS Awards

**Joann Hower**, assistant to the chair, has been selected as one of the recipients of the LAS Academic Professional Award. She was honored at the LAS Awards Ceremony February 17.

Graduate student **Christopher Hill** has won the LAS Teaching award for the excellence of his teaching. The award was presented to Chris at a banquet at the Illini Union April 5.

## New Faculty

**Alexandru Buium**, a number theorist and algebraic geometer, will join the department this coming fall as a full professor. A native of Bucharest, Romania, he received his master's and, in 1983, his Ph.D. at the University of Bucharest. His thesis title was "Algebraic surfaces embedded in projective space".

Recently he has been a professor at the University of New Mexico in Albuquerque. He has also been a visiting professor at the Max Planck Institute of Mathematics in Bonn, Germany, a visitor at the Institute for Advanced Study in Princeton where he was funded by the National Science Foundation, and a research fellow at the University of Paris VII. He is the author of 39 research papers and of 3 research monographs and has given over 40 invited addresses at universities and conferences in the United States, Canada, and Europe.

**Jared C. Bronski**, the Gabor Szego Assistant Professor of mathematics at Stanford University, will come to the UIUC mathematics department this fall as an assistant professor. He received his bachelor's degree with honors from the California Institute of Technology and his Ph.D. in applied and computational

mathematics in 1994 from Princeton, where his advisor was D.W. McLaughlin. Since then he has held an NSF Postdoctoral Fellowship.

Professor Bronski's research interests include nonlinear PDE's and fiber optics, randomness and nonlinear wave propagation, solitons and integrable systems, perturbation and asymptotic methods, and passive scalar transport.

He was the organizer of an applied mathematics seminar at Stanford and has been an invited visitor at numerous seminars and universities, including UCLA, NYU's Courant Institute, and Brown University.

Two young mathematicians, **Maria Bastera** and **Nadya Shirokova**, have been named J.H. Doob Research Assistant

Professors and will start these three-year visiting positions in August. Both of them are currently graduate students at the University of Chicago and are receiving their Ph.D.s in 1998.

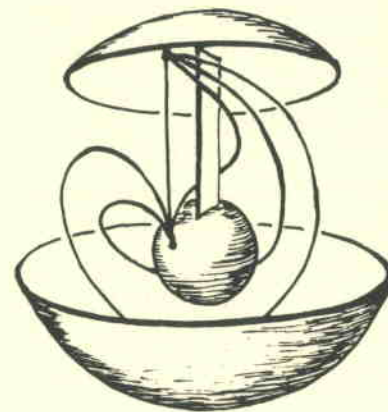
Maria Bastera's advisor is J. Peter May, and her research interests are algebraic topology and homological algebra. Nadya Shirokova's major mathematical interests are low-dimensional topology, singularity theory and group actions on manifolds.

The first Doob Research Assistant Professors, **Tibor Szabo** and **Tadashi Tokieda**, joined the department in the fall 1997 semester. Two more will be selected to start in the fall of 1998. There will then be six such positions permanently funded in the mathematics department.

## Greenwood - Trjitzinsky Prize

Two of the entries this year in the Greenwood-Trjitzinsky undergraduate competition were of such high quality that the committee judged both of them to be worthy of winning the prize. For the first time ever it was decided to award a joint first prize of \$200 to the two students. The winners are **Christopher R. Francisco** for "On the Generation of Groups by Conjugate Elements" and **Matthew J. Rodriguez** for his entry, entitled "Efficient

Adopted Frames for Curves in Euclidean Spaces."



# Retirements Announced

Five long term faculty members, who are retiring this spring, are being honored at a reception at Levis Faculty Center from 2:00 to 4:00 on May 3.

They are Professors **Donald L. Burkholder, Wolfgang Haken, Hiram Paley, Horacio Porta, and Michio Suzuki.**

Donald Burkholder joined the faculty in 1955, the same year he received his Ph.D. in mathematical statistics from the University of North Carolina, Chapel Hill. He became a professor in the department in 1964, and in 1978 was named Professor in the Center for Advanced Study. A member of the National Academy of Science, he has been on the Council of the American Mathematical Society and on the board of trustees of the Mathematical Sciences Research Institute, Berkeley.

Professor Burkholder has been invited to many universities in the United States and abroad. The institutions where he had temporary positions include the University of New South Wales, Tel Aviv University, and the Institut des Hautes Etudes Scientifiques. He has given approximately 300 invited lectures and lecture series in the United States, Europe, Asia and

Australia. Among these are lectures at the International Congress of Mathematicians, the Mordell Lecture at Cambridge University, and the Zygmund Lectures at the University of Chicago.

Wolfgang Haken was born in Berlin, Germany, and received his Ph.D. from the University of Kiel in Germany in 1953 in mathematics, with physics and philosophy as minor subjects. After receiving his doctorate, he worked as a development engineer at Siemens and Halske A.G. in Munich. During this time he published seven papers on microwave techniques and three on the topology of 3-manifolds. He received his Habilitation in mathematics in 1962 at the University of Frankfurt am Main, Germany.

In 1962 he came to the University of Illinois as a visiting professor. The following two years Professor Haken was a member of the Institute for Advanced Study in Princeton and then in 1965 he returned to the University of Illinois as a professor. He was named a University Scholar in 1985, received a Senior Distinguished U.S. Scientist Award of the Alexander von Humboldt Foundation, and in April 1990 was elected to a professorship in the Center for

Advanced Study.

Hiram Paley received his undergraduate degree from the University of Rochester and, in 1959, his doctorate from the University of Wisconsin. He joined the University of Illinois that year and in the year 1965-65 was a visiting lecturer at the University of Chicago. He has also been a visiting faculty member in Malaysia.

His interests are algebra and ring theory, and he has co-authored two books on abstract and linear algebra. In addition to his mathematics and his work for the department, for six years he was an alderman and was elected and served as mayor of the city of Urbana for four years.

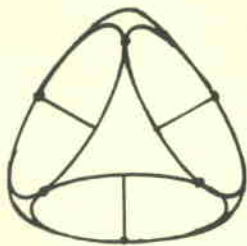
Horacio Porta, a native of Argentina where he received his undergraduate degree, earned his Ph.D. in mathematics from New York University in 1966 and came to Illinois the same year. In 1980 he was promoted to professor. He has been awarded a Guggenheim fellowship as well as one from the National Science Foundation. In addition to being named an Albert Einstein Fellow in Argentina, he was also named to the National Research Council of Argentina, Venezuela and

Brazil.

Among the universities at which he has held visiting positions are the University of La Plata, the University of Buenos Aires, the Istituto Ulisse Dini, Florence, Italy and the University Simon Bolivar, Caracas, Venezuela.

Michio Suzuki was born in Chiba, Japan, was educated at the University of Tokyo and received his Ph.D. there in 1952. He came to the University of Illinois in 1952 as a postdoctoral fellow and, except for the years he held visiting appointments at other universities, has been a member of our faculty since then. He has been a professor in the Center for Advanced Study here since 1968.

He has been a visiting professor at the Institute for Advanced Study in Princeton, at the University of Tokyo, at the universities of Hokkaido and Osaka, and at the University of Padua in Italy. In 1974 he received the Academy Prize from the Japan Academy for his work in group theory, and in 1991 an honorary doctorate from the University of Kiel, Germany.



## Into the CAVE

Tickets to go into the virtual reality CAVE at the 1998 Engineering Open House in March were gone within half an hour. Busloads of people who could not get tickets had to be turned away.

Developed by **George Francis** and a number of students, CAVE, one of the most popular attractions of the Open House, was demonstrated at the Beckman Institute for Science and Technology.

The hundreds of people who were lucky enough to get tickets found themselves in a highly realistic 3-dimensional graphics demonstration, observing a sphere turning itself inside out, or participating in a high-tech video game, called *Gladiators*.

Math graduate students and members of the Math 490 seminar on "Computational Mathematics", **Alison Miller**, **Ben Schaeffer**, **John Estabrook**, **Matt Hall**, **Mike Pelsmajer**, and **Ulises Cervantes-Pimentel** presented their own, real-time interactive CAVE animation. Old favorites by previous students in Math 428, "Geometrical Graphics", and Math 198 "Hypergraphics", were also presented.

One of the new pieces was "illiNarnia", which has been developed by Alison Miller, Stuart Levy of the NCSA and

Ken Brakke of Susquehanna University. This simulates 3-dimensional manifolds which are branched covers of Euclidean space. Another new piece is the "Optiverse" developed by George Francis and **John Sullivan**.

### The partnerBall game

Professor Francis announces that they have been invited to present partnerBall at the Alliance Partner's meeting of the NCSA at the end of April. **Ulises Cervantes-Pimentel**, **John Estabrook**, **Mike Pelsmajer**, in collaboration with the Electronic Visualization Lab (EVL) at UIC, are preparing "partnerBall", a mathematical virtual reality game in which two players see the same scene but each from their own point of view. The ball is an invisible gravitational lens which distorts the background according to an approximation of Einstein's equations worked out by **Birgit Bluemer**, who was a visiting Fulbright graduate student in the department last year. As both players see the distortion from their own point of view, they must collaborate to triangulate the position of the ball.

*A point is a curious thing and I do not believe that its nature is appreciated even by mathematicians.*

Percy W. Bridgman

## Tolman Wins Sloan Award

**Susan Tolman** has been awarded a Sloan Research Fellowship. The aim of this program is to stimulate research by young scholars of outstanding promise to contribute significantly to the advancement of knowledge. Each fellowship is designed to allow the greatest possible freedom and flexibility in its use to enable the Sloan fellow to pursue his or her research.

Candidates for Sloan Research Fellowships are

nominated by their department heads or other senior scientists familiar with their work. In mathematics a committee composed of three distinguished mathematicians reviews all nomination documents and recommends the final selection.

## UIUC Reception

Department Chair **Philippe Tondeur** has announced a reception for friends of Illinois from 5 to 7 p.m. on Friday, January 15, 1999, at next year's AMS winter meeting in San Antonio, Texas. All UIUC alumni, present and former faculty and friends of the department are invited.

*They say that habit is second nature. Who knows but nature is first habit.*

Pascal

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