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# MATH MATTERS

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Department of Mathematics • Cornell University • Ithaca NY

Winter 1998

## *LETTER FROM THE CHAIR, ROBERT CONNELLY*

This has been an exciting year in our department. A large number of new people, with very impressive accomplishments, have come to join us; we have had some exciting talks from visitors; and we are all anticipating our move in May 1999 to our new home in Malott Hall. My term as Chair is ending in June 1999, and Professor John Smillie has been nominated to be the next Chair. I feel that John is an excellent choice, and I look forward to the department prospering during his term as Chair.

Professor Laurent Saloff-Coste joined us this semester after a year's leave. He came to Ithaca from Toulouse, France, where he held a senior position at CNRS, the research organization at the Université Paul Sabatier. Laurent is an analyst with an interest in probability and geometric group theory. Assistant Professor Irena Peeva comes to us from MIT, where she held a C.L.E. Moore Instructorship. As an undergraduate, she and Vesselin Gasharov solved Eisenbud's conjecture involving the "periodicity of resolutions with bounded Betti numbers." She wrote her thesis under David Eisenbud at Brandeis University. Assistant Professor Ravi Ramakrishna comes to us from Yale University, where he was a J. W. Gibbs Assistant Professor. Ravi wrote his thesis under Andrew Wiles at Princeton. Ravi was also one of our "star" undergraduate Math majors some years earlier. Ravi's field is algebraic number theory and Galois theory.

The department has three new H. C. Wang Assistant Professors this year.

Greg Buzzard comes to us from Indiana University after receiving a Ph.D. at the University of Michigan. Greg's work has centered on the dynamics of maps in several complex variables. Adam Epstein comes to us from SUNY Stony Brook and Cal Tech. He received his degree under the supervision of Dennis Sullivan at CUNY Graduate Center. He works in the field of one-dimensional holomorphic dynamics. Vesselin Gasharov comes to us from MIT, and he got his degree at Brandeis under Ira Gessel. His field is symmetric functions, an area that is at the interface of combinatorics and representation theory. In addition to his solution to the conjecture of Eisenbud mentioned above, he also solved the conjecture of Richard Stanley that the chromatic symmetric function corresponds to a character. You may find more detailed biographical information on page 8 of this newsletter.

On October 22, 1998, we sponsored our first Keival Lecture for undergraduates. The lecture was given by Professor John Milnor from SUNY Stony Brook. Professor Milnor, a former Fields medalist, recipient of the Steele Prize, National Medal of Science and the Wolf Prize, spoke to a packed house in the Hollis E. Cornell auditorium about pasting Julia sets together. We also had several interesting and stimulating talks sponsored by the Oliver Club. Professor John Conway of Princeton University used audience participation to make his presentation, entitled "Tangles, Bangles and Knots," one of the most exciting. He had four mathematicians

join into a circle by holding ropes and trained them to perform elementary moves in response to audience instruction. It was an amusing and vivid illustration of invariants of knots and how certain procedures can unknot a particular sort of knot.

We are anticipating our move to Malott Hall with excitement. We are hoping to commission artwork to be created especially for the Math Department Offices in Malott Hall. Professor Bob Strichartz is heading a committee to look into the possibilities. We feel that art and mathematics go together naturally.

In the past several years our team for the Putnam Mathematics competition for undergraduates has scored quite well. Assistant Professor Ravi Ramakrishna has suggested that we use the interest on the money won by past teams to enable Cornell to provide prizes for our own Freshman Math competition. (This is in the spirit of the Hoover Calculus competition that used to be held some years ago.) We have decided to go ahead with this idea, and Ravi will direct the first exam to be held this spring.

Lastly, we wish to recognize and to show our appreciation to Carly Klivans, who has been an energetic and resourceful president of the undergraduate Math Club. She is graduating at the end of the fall semester and has received the Alice T. Schafer Mathematics Prize to be awarded at the American Mathematical Society meeting in San Antonio, Texas in January 1999. Congratulations Carly!

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## **ALICE T. SHAFER PRIZE AWARDED TO SENIOR**

**By Nora Balfour**

The Association for Women in Mathematics (AWM) awarded the ninth annual Alice T. Shafer Prize to Caroline (Carly) Klivans, a senior graduating in January. The \$1,000 prize will be presented at the Joint Mathematics Meetings in San Antonio, Texas in January 1999. The AWM is a non-profit organization founded in 1971 whose mission is to encourage women in the mathematical sciences. Currently, the AWM has over 4,000 members from around the world. In 1990, the AWM Executive Committee established the Alice T. Shafer Prize, named for its founding member and former president. It is awarded annually to an undergraduate woman for excellence in mathematics. Candidates are evaluated based on the quality of performance in advanced math courses and special programs, a demonstration of real interest in mathematics, the ability for independent work in math, and performance in mathematical competitions at the local or national level.

Carly's interests lie in discrete geometry and algebraic combinatorics. She has been president of the undergraduate Math Club for two years, arranging weekly lectures by faculty and graduate students to introduce undergraduates to a broad range of math topics. Last summer she participated in the Research Experience for Undergraduates program, run by the NSF. She researched computational geometry at Rutgers University's

Center for Discrete Mathematics and Theoretical Computer Science. After graduating in January, she plans to travel to Hungary to attend

the Budapest Semester in Mathematics program for the spring semester. She then intends to pursue a Ph.D. in Mathematics.

## **MALOTT HALL MOVE UPDATE**

**By John Smillie**

In the last issue of Math Matters, we announced that the Mathematics Department will be moving from White Hall, where we have been in residence for 130 years, to Malott Hall, the former location of the Johnson Graduate School of Management. The new building does not have the history attached to it that White Hall does but it will give the department some much needed additional space. This will include more space for our extensive collection of mathematics books and more space for library users. We will have more office space for faculty, visitors and graduate students, an efficient suite of administrative offices and a very

nice department lounge. Since my last report, the budget for the renovation of Malott has been approved, the Johnson School has moved out and renovation work has begun. Two new massive air-handling units are being installed, which replace and upgrade units that were near the end of their useful lifetimes. Walls are being moved in order to create new office and classroom space. We will have new paint and new flooring throughout the building. In the course of renovation it was discovered that the existing computer network was not in good shape. Fortunately, we be installing a state-of-the-art system.

## **DEPARTMENT SPONSORS FRESHMAN MATH PRIZE**

**By Ravi Ramakrishna**

Fifteen years ago, the Math Department sponsored the Hoover exam, a prize exam for freshman. The intent was to foster an interest in mathematics. Unfortunately the funds for this exam were depleted, and the prize was discontinued.

The William Lowell Putnam Exam is a mathematics exam given nationally to undergraduates. From a pool of almost 300 competing colleges, Cornell teams placed 5th, 6th, 2nd and 2nd in 1992, 1993,

1994 and 1995 respectively, earning a total of \$11,000 for the department. The high scoring team members were Jeremy Bem '97, Jon Kleinberg '93, Robert Kleinberg '97, Mark Krosky '96, Demetrio Munoz '94, and Tong Zhang '94. The income generated by these funds will provide the prizes for the new Freshman Prize exam. The first Freshman Mathematics Prize exam will take place in the spring of 1999.

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# OLIVER CLUB NEWS

By Karen Vogtmann

This has been a banner year for the Mathematics Department colloquium, the Oliver Club, with high quality talks and a large and appreciative audience. We began the year with a beautiful lecture on “Exotic Hyperbolic 3-Manifolds” by Curt McMullen of Harvard University, who later received the Fields Medal at the International Congress of Mathematics in Berlin. In October, John Conway, of

Princeton University, had Bob Connelly, the chairman of the math department, and three others doing a square dance with ropes in the front of the room to illustrate arithmetic invariants of “tangles” to a packed audience. Another form of dancing, this time by honeybees, was the subject of a March lecture by Barbara Shipman of the University of Rochester, who related the honeybee’s “waggle dance” to the

geometry of flag manifolds. The full list of distinguished speakers from outside Cornell includes Adrian Lewis from the University of Waterloo, Richard Schoen of Stanford University, Paul Sally from the University of Chicago, Richard Stanley of MIT, Phil Hanlon from the University of Michigan, Daryl Cooper of U.C.S.B., Benson Farb from the University of Chicago, Maxim Braverman of Ohio State University, Ricardo Perez-Marco from U.C.L.A., and F. Thomas Farrell of Binghamton University.

## GRADUATE STUDENT ATTENDS CONFERENCE IN SPAIN

By Suzanne Lynch

Suzanne Lynch, a second year graduate student, traveled to Barcelona, Spain, this past September to participate in a mini-course on Dynamical Systems. The trip was made possible by funding from several Cornell sources as well from the CRM in Barcelona. The program featured lectures by world-class mathematicians and contributed talks by the students. Suzanne gave her first international talk, entitled “The Medusa Algorithm in Polynomial Matings,” to an audience of 35 students and professors, representing seven countries.

Suzanne says of the experience, “Yes, I learned lovely mathematics, but I particularly enjoyed the friendships I made with the other students. We are all in dynamics, and hope to meet again at conferences and watch each others mathematical careers grow. I particularly enjoyed learning about the different cultures of my new friends, and their different mathematical and educational backgrounds.” Suzanne also enjoyed the sunshine and seafood in the beautiful Mediterranean city, and she hopes to return someday.

The Oliver Club meets weekly in White Hall. Speakers in the Oliver Club are asked to aim their talks at a general audience of mathematicians, including graduate students and faculty in diverse fields, and in particular to provide history, background and motivation for the problems they discuss. All members of the mathematical community are warmly encouraged to attend. Tea is served before the lectures in the Math lounge, and there is often a dinner held afterwards in honor of the speaker.

### CONTRIBUTE TO MATH MATTERS!

We are always looking for interesting articles for future issues. If you have any information relevant to the mathematics community, we want to hear from you.

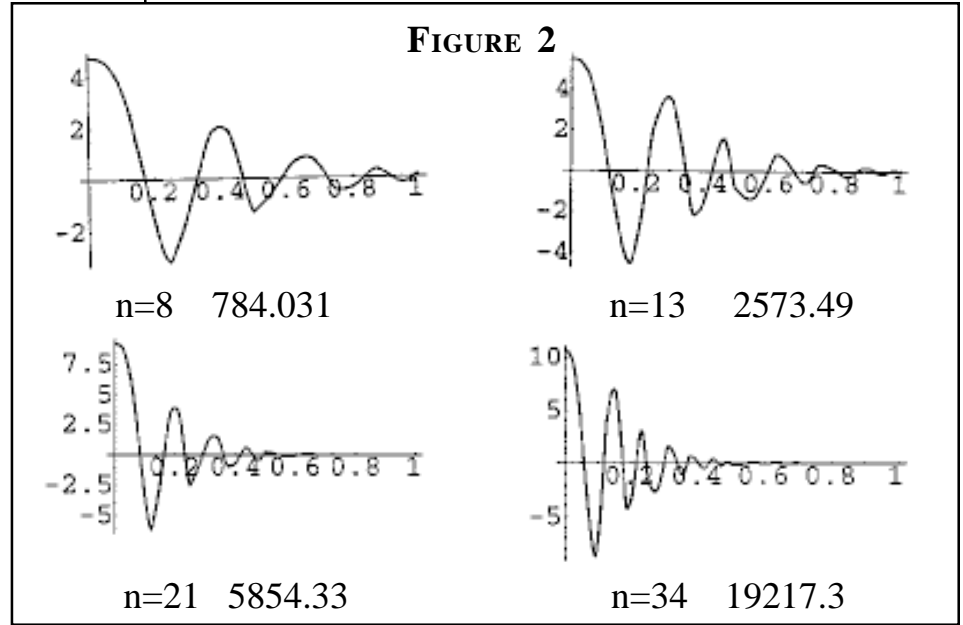
Nora Balfour  
Department of Mathematics  
129 White Hall  
Cornell University  
Ithaca, NY 14853-7901  
[nlb11@cornell.edu](mailto:nlb11@cornell.edu)

The Mathematics Department is very grateful to those who have contributed to the department fund for the Oliver Club. This year, all contributors will receive a copy of one of the posters advertising a recent Oliver Club. The posters contain mathematical graphics and an abstract of the talk and are published weekly on the Web at <http://math.cornell.edu/~oliver>.

# UNDERGRADUATES GAIN RESEARCH EXPERIENCE AT CORNELL

by Robert Strichartz

The Cornell Mathematics Department has a grant from the National Science Foundation to run a summer program for undergraduates to participate in research projects. We are one of about 20 such Research Experiences for Undergraduates (REU) programs. The summer of 1998 marks the fifth year of participation. Our grant lasts until 2001. In addition, we received some funding from Cornell to enhance the program. We had 10 students who participated from schools across the country, from Harvard to the University of Northern Iowa to Berkeley. Karl Papadontonakis represented Cornell. The research areas were Dynamical Systems, supervised by Professor John Hubbard of Cornell, and Analysis on Fractals supervised by Professors Robert Strichartz from Cornell and John Kigami from Kyoto University. Graduate student Christian Henriksen and postdocs



Sze-Man Ngai and Alexander Teplyaev, a fresh Ph.D. from Cornell, assisted them.

### Analysis on Fractals

By now, everyone has seen pictures of fractals and has heard that fractals are used to model many objects in the real world, such as ferns, snowflakes and clouds. But in order to make these models

really useful, it is necessary to be able to do analysis of functions defined on fractals – to find the analog of the processes of calculus, and to solve “fractal differential equations.” Kigami has been one of the leaders in creating such a theory, and the REU students were able to contribute to the development of the subject. One project involved setting up the basis for a spline theory to do explicit numerical analysis. Another was devoted to the properties of the Green’s function, which allows one to invert the Laplacian on fractals. Several students were involved in an ambitious project to try to extend the class of fractals that can be dealt with. One new fractal now included in the theory is the fractal diamond shown in Figure 1.

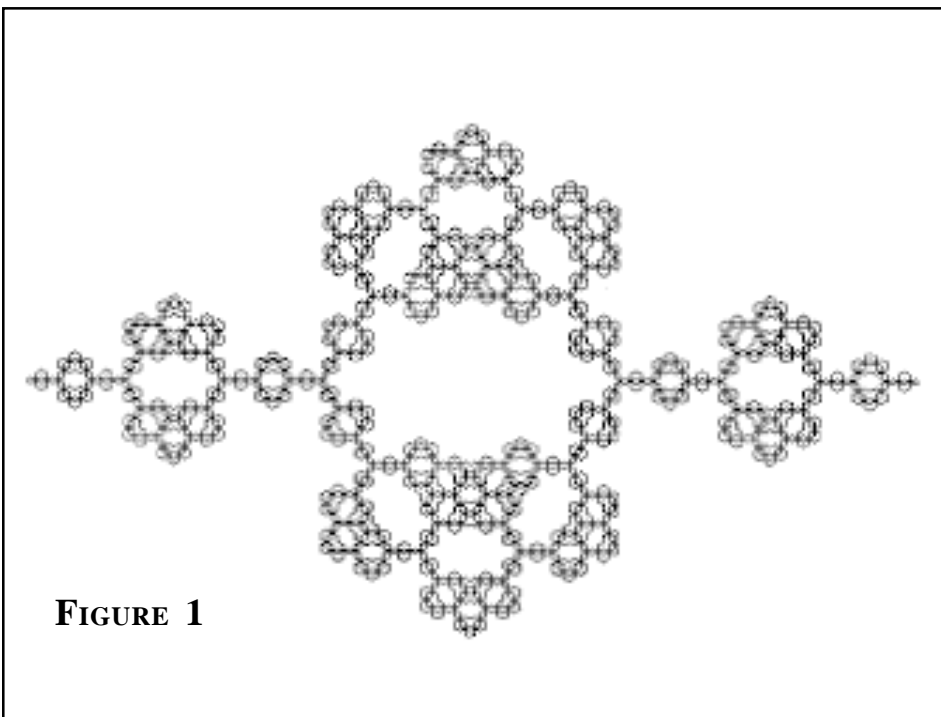
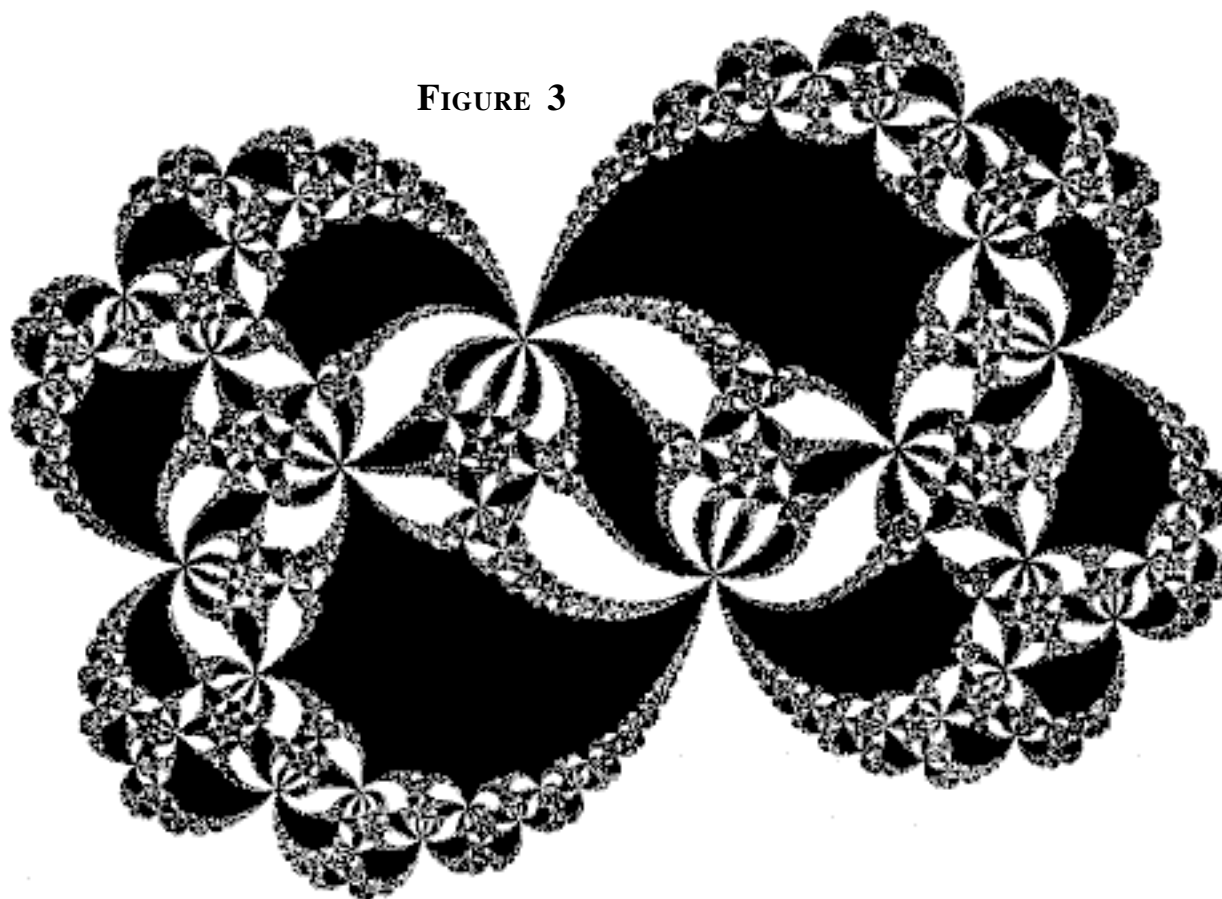


FIGURE 1

Not all fractal analysis involves fractal sets. One project dealt with an analog Fourier series for the ordinary unit interval, but based on a fractal measure. The analog of the usual sines and cosines are oscillating functions that have one

FIGURE 3



derivative (but not two,) but do not appear to follow a predictable pattern. However, a remarkable fact uncovered in this research is that if we index the functions  $f_n$  in a natural way ( $f_n$  has exactly  $n$  zeroes) then the ones associated with  $n=1,2,3,5,8,13\dots$  (the Fibonacci sequence) do exhibit a regular pattern. You can see this in Figure 2.

#### **Dynamical Systems:**

One project dealt with matings of polynomials, resulting in a program called Medusa, which finds rational functions with special combinatorial properties. The underlying mathematical result is a theorem of Thurston's, but implementing this theorem was a major challenge. An example of a mating is shown in Figure 3.

For the second project, Cornell's Karl Papadantonakis wrote programs to investigate the parameter space for Henon mappings; this has been a challenge in dynamical systems for many years. He tried a 3-pronged attack with all three prongs inspired by a result of Bedford and Smillie. One of these approaches requires solving polynomials of degree  $2^k$  for values like  $k=12$ , and finding all the roots. The third project resulted in a program to find homoclinic bifurcations of maps  $f : R^2 \rightarrow R^2$ . This again is a long-standing challenge, which was addressed by using carefully adapted splines to approximate stable and unstable manifolds.

The REU program will continue in the summer of 1999. There will be more Analysis on Fractals directed

by Strichartz, Complex Dynamics directed by Adam Epstein, and a project on the Kepler Conjecture directed by Karoly Bezdek of the Eötvös University, Hungary. The Kepler Conjecture concerns the optimal packing of spheres of radius one in 3-space. Recently, Thomas Hales of the University of Michigan has announced an affirmative solution. The project will be devoted to checking out the proof, to see if it is correct, to see if it can be improved or simplified, and to see if the ideas of the proof can be used to tackle other questions.

A new feature of the REU program for 1999 will be the inclusion of high school teachers, who will be working alongside the undergraduates on the research projects.

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## RECENTLY PUBLISHED BOOKS

**Yulij Ilyashenko** and Weiu Li, *Nonlocal Bifurcations*, AMS, Providence, RI, 1998.

Nonlocal bifurcations describe sudden changes in global topological properties of parameter depending dynamical systems that occur when the parameter passes through so called critical value. The book studies the bifurcations that occur on the boundary of the set of Morse-Smale systems. For these bifurcations the precritical values of the parameter correspond to rather simple dynamical systems. The solutions of these systems tend either to equilibrium points or to periodic orbits. The number of equilibrium points and periodic orbits is finite. The postcritical values correspond, in general, to much more complicated systems. The latter may have countable number of periodic orbits, hyperbolic and partially hyperbolic invariant sets or even strange attractors. The limit behavior of solutions to such systems is chaotic. Different scenarios of this kind are described in the book. Most part of them is discovered by Shilnikov and his students; Newhouse, Palis, Takens; some results are new. The study is proceeded from the uniform point of view. It is based on the theory of normal forms for local families of vector fields and diffeomorphisms, as it was accomplished by Ilyashenko and Yakovenko in early 90s. The other ingredient is the theory of hyperbolic dynamical systems. Necessary facts from both theories are presented in the book from the very

beginning. A discussion of the fractal dimension of attractors including some recent achievements is presented as a preliminary material. The book is addressed to students, graduate students and scholars in pure and applied mathematics, computer sciences and engineering.

John Meier and **Thomas Rishel**, *Writing in the Teaching and Learning of Mathematics*, MAA Math Notes #48, 1998.

Tom Rishel began teaching courses that required writing assignments over a decade ago. He was interested in involving his students in the narrative history of mathematics, and emphasizing active learning. He experimented with assignments, and honed the phrasing and content until he was successfully engaging the students in what was for many a new way of learning math.

John Meier, while a graduate student at Cornell, experimented with writing assignments in his calculus classes. He came to Tom for advice, and the two began comparing notes and ideas. As they developed their writing assignments, they also found a market for

their ideas, publishing articles in journals and attending invited talks. Tom's ideas about writing assignments in the teaching of math were included in a book about writing across the disciplines. Mary Ann Malinchak Rishel, an Associate Professor of writing at Ithaca College, became involved, and together with Tom and John began teaching workshops. Tom and John presented their ideas at the national Math Association meeting in Cincinnati, and began this text over coffee afterwards. The book was written in two years, but it took an additional two years for the publication process to work itself out. There are a handful of other professors at Cornell who also integrate writing assignments into their teaching of math, with generally positive reactions from the students. Students are forced to think about math differently than they traditionally have, and it puts the impetus on the student to learn.

The response to the book has been strong. Meier and Rishel will be giving another workshop at the MAA winter meetings in San Antonio. It is selling well, and information requests are coming in from around the country.

### VISIT THE MATH DEPARTMENT WEB SITE:

*<http://math.cornell.edu/>*

Our home page offers links to the Annual Report, faculty and graduate student home pages, information on the graduate and undergraduate programs, seminars and courses.

New links are added all the time.

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# UNDERGRADUATE FACULTY ENHANCEMENT WORKSHOPS

## “TEACHING UNDERGRADUATE GEOMETRY”

By **David Henderson**

The fourth in a series of Undergraduate Faculty Enhancement (UFE) workshops at Cornell was held in the summer of 1998. These weeklong workshops are supported by grants from the National Science Foundation. Each year we have had many more applicants than we can accept, and preference is given to those who will be teaching geometry to future schoolteachers. This year's participants included thirty mathematics professors from around the U.S. and one from England. Cornell Professor David Henderson led the workshop with help from Kelly Gaddis, a recent Ph.D. from Cornell and currently an Assistant Professor at Buffalo State, Jane-Jane Lo, a Visiting Scholar in our department and currently teaching at Ithaca College, and Avery Solomon, Senior Lecturer at Cornell.

Follow-up surveys indicate that the workshops succeed in providing opportunities for university mathematics faculty to: experience new teaching strategies and techniques, experience and/or see examples of non-test based assessment schemes, learn about and observe techniques that have been successful in encouraging women and underrepresented minorities to excel in mathematics, learn new subject matter and experience new instructional materials, have the opportunity to interact and share with colleagues and experts incorporate both teaching techniques and new

curricular materials into their own courses, learn about national guidelines and standards put forth by Mathematical Sciences Education Board, National Council of Teachers of Mathematics, and the Mathematical Association of America, participate after the workshop in several of the following follow-up activities: use materials and techniques from the workshop in their own teaching, give a presentation/workshop on the new

techniques and materials to faculty in their home institution, share their own classroom experiences and materials with the workshop staff and other participants via e-mail, and use the workshop staff as a resource to assist in the implementation and evaluation of the new materials and techniques.

The fifth UFE workshop is scheduled for June, 1999.

## DEPARTMENT CREATES MALOTT ART FUND

By **Bob Strichartz**

With the the Math Department's move to Malott on the horizon, we are making plans to commemorate our updated presence on campus. Our goal is to acquire artworks for Malott that are both decorative and have a mathematical theme. We would like to commission artwork that embodies our view of mathematics as a profoundly human activity with deep connections to other human activities and nature. One possibility we are considering is a sculpture by Helaman Ferguson, who is both a mathematician and a sculptor. He has a catalog of works based on geometric and topological themes. Many of his works are exhibited in mathematics departments and centers around the world, including MSRI. He would consider doing a commissioned work based on math-

ematics related directly to Cornell. A sculpture realizing one of the Douady-Hubbard matings (the subject of Milnor's Kieval lecture this fall) is a possibility. Other possible artists are Kenneth Snelson, who does tensegrity sculptures, and George Roads, who creates kinetic interactive ball sculptures.

A committee to discuss artwork for Malott has been formed, chaired by Bob Strichartz and including Bob Connelly, John Hubbard, Peter Kahn, Anil Nerode, Beverly West and Keith Dennis. Contributions for the Malott Art Fund would be very welcome, and there are donation instructions on the last page of the newsletter.

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## GRADUATE STUDENT OUTREACH PROGRAM

by David Brown, *dab17@cornell.edu*

Each spring, the Public Service Center at Cornell coordinates the Graduate Student Outreach Program, which seeks to match graduate students with classes in local school districts. The goal of the program is to share the knowledge of graduate students with elementary and secondary students, enriching both the children's education and the graduate student's teaching skills. It also establishes a wonderful collaboration with local teachers and provides a glimpse into the life of teaching elementary and secondary students. The graduate student prepares his or her own eight session mini-course on a topic of his or her choice. The Public Service Center then solicits interest from local teachers, and once a mini-course is accepted, the graduate student and the teacher schedule eight meetings with the class.

Spring 1999 will mark my third year of participation in the Program, and it has been one of the most rewarding experiences of my graduate education. The first year I participated I taught a program entitled, "A Journey through Mathematics," consisting of eight distinct mathematical topics. I taught weekly in Harry Myers's seventh grade math class in the Candor School district. Among the topics were figurative numbers, topology, cryptology, polyominoes, and even proofs of the Pythagorean theorem. The challenge of such a program is balancing lecture with hands-on experience for the students. The first lesson I learned

was not to present results, but rather guide the students to a result. For example, after having students verify that they could tile a checkerboard with 32 dominoes, I had them conjecture and test to see if they could tile the checkerboard, minus two opposite corners, with 31 dominoes. The answer is no, but I was a bit surprised that a few students had the correct reason why this is impossible. This first course convinced me that the program benefits all the participants and left me looking forward for the next time.

This past spring, I changed my program to deal with two topics in much more detail, met twice a week for four weeks and titled it, "Geometry in Nature and Science—An Introduction to Fractals." I chose to work with two schools, a sixth grade math class in the Newfield School District and another seventh grade math class of Harry Myers. The first part of the course dealt with investigating geometry in nature, such as growth patterns of plants and patterns in shells of certain animals. The messiest and most popular portion of these first four sessions was investigating soap bubbles and soap films, looking at such ideas as how to create minimal networks. The second part of the course focused on fractals and how to create them, emphasizing repeated patterns on ever diminishing scales. The culmination of the course involved students making many small colorful Sierpinski

Gaskets and testing whether they could work in groups to build one giant Sierpinski Gasket from their little ones, thus reinforcing the idea of repeated patterns.

While the program requires a great deal of time and thought, I have found the Graduate Student Outreach Program to be a rewarding experience and a pleasant diversion from university life. Students have been responsive and I have enjoyed exchanging knowledge with the teachers. I recommend the program to anyone who seeks an alternative to teaching undergraduate courses.

## CORNELL PH.D. WINS PRIZE

By Cliff Earle

On September 27, 1998 it was announced that Subhashis Nag had won the 1998 Shanti Swarup Bhatnager Prize in Mathematics. These prizes are the Indian government's highest awards in science and mathematics. Nag, who received his Ph.D. from Cornell in 1980, is also a Fellow of the Indian Academy of Science. Since his time as a graduate student in mathematics at Cornell, Nag has twice returned to the department as a visiting faculty member. He was a Visiting Assistant Professor in 1987-88 and a Visiting Professor in the Fall 1997 semester. We congratulate him on this new award.



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## COMINGS AND GOINGS...

### NEW FACULTY

#### By Nora Balfour

**Greg Buzzard**, a new H.C. Wang Professor, received his Ph.D. from the University of Michigan in 1995, and held a three-year appointment in the Department of Mathematics at Indiana University. During his time at Indiana, he took a couple of semesters off to do research at MSRI. His research centered on the dynamics of maps in several complex variables. He has worked mostly on questions of stability: i.e. when does a small change in a system lead to a correspondingly small change in the behavior of that system? In other areas of several complex variables, he has been interested in the construction of various maps with prescribed properties. He enjoys playing the violin and is a member of the Cayuga Chamber Orchestra. He also enjoys hanging out at the Math Table on Friday evenings.

**Adam Epstein** received his Ph.D. in 1993 from the CUNY Graduate Center under the direction of Dennis Sullivan. He has previously held appointments at SUNY Stony Brook and Caltech. His work is in the field of one-dimensional holomorphic dynamics, a subject that he views as the latest chapter in a tradition encompassing the study of compact Riemann surfaces and their Teichmüller spaces, as well as the classical value-distribution theory of entire and meromorphic functions. He is currently working to finish a foundational paper that clarifies the position of the central finiteness theorems of holomorphic

dynamics in this broader picture. His efforts to understand the overall context have kindled interests in mathematical logic and algebraic number theory.

**Vesselin Gasharov** obtained his undergraduate degree from Sofia University, specializing in algebra. In his undergraduate thesis, among other results, he and Irena Peeva resolved Eisenbud's Conjecture on the periodicity of resolutions with bounded Betti numbers. In 1990, Vesselin became a graduate student under Ira Gessel at Brandeis University. His thesis was on symmetric functions, an area that is at the interface of combinatorics and representation theory. One of the results in the thesis was a proof of a conjecture by Richard Stanley that the chromatic symmetric function corresponds to a character. After obtaining a Ph.D. in 1994, he held an Assistant Professor position at the University of Michigan from 1994-97, and a visiting position at MIT during 1997-98. He has written 20 research papers, 7 of them with co-authors. He became an H.C. Wang Assistant Professor at Cornell in July 1998, with research interests in combinatorics and commutative algebra, especially in the beautiful and fruitful interplay of ideas from these two areas.

**Anthony Kable** arrived in the department this year as an H.C. Wang Professor after a year as a Visiting Assistant Professor at Oklahoma State University. He completed his degree at OSU the previous year under the direction of Professor James Cogdell. His

research interests are in analytic number theory, more specifically the study of various zeta and L-functions to derive number-theoretic information. This often involves techniques drawn from complex and p-adic analysis and from the infinite-dimensional representation theory of algebraic groups. Anthony was married on July 7th of this year to Dr. Belinda Burner, who teaches English at Ithaca College.

**Irena Peeva** obtained her first research results as an undergraduate student, when she and V. Gasharov resolved Eisenbud's Conjecture on the periodicity of resolutions with bounded Betti numbers. They published a paper in the journal "Transactions of the American Mathematical Society." This paper won first prize in the Bulgarian Mathematical Competition for Best Undergraduate Research Work. She started graduate study in mathematics at Brandeis University in 1990. In 1994, Irena was awarded a Sloan Dissertation Fellowship; during the 1994-95 academic year she visited the University of Michigan. She received her Ph.D. in July 1995. Irena held an Instructor position at MIT from 1995-98, and a Postdoc at U.C. Berkeley in 1995-96. Irena became an Assistant Professor at Cornell in July 1998. Her work is in the field of Commutative Algebra, and she has co-organized four conferences on the subject. Her interests lie in applying methods and ideas from other branches of mathematics in order to obtain results in Commutative Algebra.

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## COMINGS AND GOINGS...

Irena has co-authored 20 research papers, obtaining algebraic results by innovative applications of foremost results in the fields of combinatorics, integer programming, subspace arrangements, computer algebra, algebraic geometry, and algebraic topology.

**Ravi Ramakrishna** received his Ph.D. in 1992 from Princeton University. He held positions at the University of Chicago and Yale before coming to Cornell as an Assistant Professor. His area of interest is algebraic number theory. In particular, he is interested in Galois Theory, the branch of mathematics that has to do with the symmetries of solutions to equations, and how this subject relates to classical questions such as solutions to Diophantine equations. Ravi's wife Janet teaches mathematics at Ithaca High School.

**Laurent Saloff-Coste** grew up in France, and received his Ph.D. in 1983 with N. Varopoulos in Paris at Paris VI. He held a junior position at CNRS from 1985 to 1992, at Paris VI. During these years he visited MIT several times, and met his wife, Cathy, while there in 1989. In 1990 they returned to Paris for two years. They then moved to Toulouse where he held a more senior position at Université Paul Sabatier. He began at Cornell in June of 1998, and finds the Math department both friendly and very stimulating. They have a son, Sam, born in 1996 in France, and a daughter Claire, born in Ithaca last October.

### FACULTY ON LEAVE 98/99

Acad. Year: Persi Diaconis  
Mark Gross  
Moss Sweedler

Fall: Allen Hatcher

Spring: Ken Brown  
Rick Durrett  
John Hubbard

### VISITING PROGRAM 98/99

Acad. Year: Samer Habre  
James Hall  
Rachel Hastings  
KevinMacEwen

Fall: Karl David

### TEACHING VISITORS 98/99

Acad. Year: Sergei Artemov  
Thomas Deck  
Hongyu He  
Daina Taimina  
Vladimir Veselov

Fall: Karoly Bezdek  
Boris Okun

### VISITING SCHOLARS 98/99

Acad. Year: Jane-Jane Lo

Fall: Christopher Atkin  
David Finston  
Zhonggen Su

## STAFF CHANGES

By Colette Walls

**Bob Terrell** was hired as a part-time computer consultant/advisor in December 1997. He fills half of the position vacated by Rachel Engler at the end of last year. His primary responsibility is to maintain the math computer network. Bob is also an adjunct professor in the department. The other half of our computer support budget line was filled in late May '98 by **Doug Alfors**, who also works in the department as the director of the Mathematics Support Center. Doug provides primary computer support to the departmental administrative staff. Both Bob and Doug provide support to faculty and graduate students.

In April 1998, our long term accounts coordinator, **Terri Denman**, left to take the administrative manager position in the Department of Rural Sociology at Cornell. Terri was first hired in the Math Department in September 1985. In June 1989, she was promoted into the accountant position to replace Tony Augustine. Terri will be missed for her dry wit and exemplary skills. We thank her for her many years of good service to the department, and we wish her the best of luck in her career at Cornell.

**Gayle Davis** accepted the position of accounts coordinator effective April 13, 1998. She has worked at Cornell for over 20 years. Starting in 1991, she worked for the College of Industrial and Labor Relations in

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## COMINGS AND GOINGS...

budget, fiscal management, and general operations. Prior to working for ILR, she held accounting positions at the Biotechnology Program, the Department of Biochemistry, and Statutory Finance and Business Services. Gayle has comfortably and confidently settled in, and we consider ourselves fortunate to have her with us.

**Cheri Farnsworth** resigned as Undergraduate Coordinator this past September when she enrolled

in graduate studies at Wells College. This fall, she's completing her student teaching at the Alternative Community School in Ithaca. Upon completing her teaching certification, Cheri plans to teach American History at the junior or senior high school level. Cheri was a personable and gracious receptionist, and we were sorry to see her go.

Although we all miss Cheri, I'm happy to report that **Nora Balfour**

agreed to become the Undergraduate Coordinator effective 10/1/98. Nora has spent the past year and a half as the receptionist and administrative assistant for the Dean's Office in the College of Arts and Sciences. Nora's thoughtful analysis of business operations has already proved helpful. In the short time she's been here, she has endeared herself to all. We look forward to getting to know her better.

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Nora L. Balfour  
Editor

Department of Mathematics  
129 White Hall  
Cornell University  
Ithaca, NY 14853-7901