Berkeley
Mathematics
Newsletter

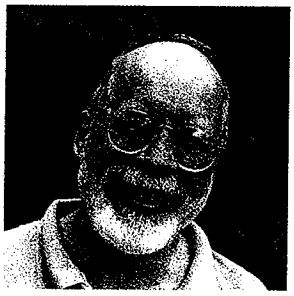
A newsletter of the Department of Mathematics and Center for Pure and Applied Mathematics at the University of California, Berkeley

Fall 2004 Vol. XI, No. 1

FEATURE ARTICLE
TOPOLOGY: HERE AND THERE

ROB KIRBY

We are very pleased to have two new topologists coming to Berkeley this year. Pete Teichner, from UCSD, works in a wide range of topology, from the study of low-dimensional manifolds to a broad topic involving bordism theory, topological modular forms, and some mathematical physics.



ROB KIRBY

Peter Ozsváth, from Columbia, will arrive in January, 2005. He is famous for the Ozsváth-Szabo Heegaard Floer Homology of 3-dimensional manifolds and knots. This theory provides a remarkable array of invariants for knots and links, and for 3- and 4-manifolds, closely related to Donaldson polynomials and Seiberg-Witten invariants.

It is in their honor that topology is the subject of this feature.

The most striking development, in my lifetime, in topology (and I would argue in all of math) is the probable proof by Grigori Perelman in Russia of the 3-dimensional Poincaré conjecture and its generalization by Thurston to the Geometrization Conjecture.

To understand what the Poincaré Conjecture is, begin with the definition of an n-dimensional manifold N^n: each point of N has a "neighborhood" which looks like ordinary n-space, (i.e. n-tuples of real numbers). Here, "looks like" technically means "homeomorphic", but intuitively means that if you flatten or smooth out the neighborhood then you can't tell that you are not in n-space.

The circle is a 1-dimensional manifold because if you stand at a point, the "neighborhood" around you looks like an arc which can be flattened into a line, i.e. 1-space.

The plane, or the sphere, or an inner tube, or the outside of a pretzel, are all 2-dimensional manifolds (or surfaces), because again if you stand at a point, your neighborhood looks like a curved plane, i.e. 2-space.

Except for the 3-dimensional plane, 3-dimensional manifolds are hard to visualize, but some examples can be described. For example the Cartesian product of a circle with any surface is a 3-manifold. So is the 3-sphere which

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LETTER FROM THE CHAIR

CHAIR TED SLAMAN

I have been told that there are three phases to being Chair of an academic department, which go along with the three years in a Chair's term. In the first year, as I can certify, the Chair lives in a haze of confusion and crisis. This, the "learning phase," is punctuated with exclamation marks indicating mistakes, missed opportunities, forgotten deadlines, and unintentionally offended colleagues. In the second year, the seasoned Chair feels empowered by experience and knowledge; the tasks are familiar and the deadlines are known in advance. In this "optimistic phase," the Chair works hard to build and improve the Department. Of course, the third year, the "exit phase," is spent finding the next Chair. Since I write to you in the first semester of my second year, I know there is work to do this year, but I am hopeful for the future.

The past few years have been chal-

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Highlights

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FACULTY HONORS AND AWARDS

DAVID ALDOUS

DAVID ALDOUS was elected Fellow of American Academy of Arts and Science.

F. MICHAEL CHRIST was awarded a Distinguished Teaching Award for 2004. The Distinguished Teaching Award is a campus-wide award which is given by the Committee on Teaching, Berkeley Division of the Academic Senate. From the announcement about this award:

MICHAEL CHRIST

> Teaching and research are both essential duties of Senate faculty members. The Committee on Teaching believes that excellence in teaching and excellence in creative and scholarly work go hand in hand. The Distinguished Teaching Award acknowledges the efforts of Senate faculty members who have successfully united these two roles. Lecturers are judged on their excellence in teaching and their contributions to the teaching mission of the University. The award is intended to recognize the distinguished teaching accomplishments of the faculty, accomplishments which may be exhibited at any time during a faculty member's career. Evidence of accomplishment does not necessarily require long years of service, which in themselves would not be considered sufficient grounds for recognition.

This award program was initiated to encourage and reward excellence in teaching on the Berkeley campus. Two hundred ten faculty members from 48 departments have been recognized for distinguished teaching since 1959.

LAWRENCE C. EVANS was co-winner with N. V. Krylov (University of Minnesota) of the Leroy P. Steele Prize for Seminal Contribution to Research for his paper "Classical solutions of fully nonlinear convex, second order elliptic equations", Communications in Pure and Applied Mathematics 35 (1982), no. 3, 333-363.

The Leroy P. Steele Prizes were established in 1970 in honor of George David Birkhoff, William Fogg Osgood, and William Caspar Graustein and are endowed under the terms of a bequest from Leroy P. Steele. Prizes are awarded in up to three categories, limited this year to the field of analysis.

CRAIG EVANS

MARK HAIMAN was the first recipient of the E. H. Moore Research Article Prize, awarded at the January 2004 AMS meeting for his paper "Hilbert schemes, polygraphs, and the Macdonald positivity conjecture", Journal of the American Mathematical Society 14 (2001), 941-1006.

MARK HAIMAN

The prize is awarded every three years for the best research article to be published in one of the AMS journals during the preceding six calendar years a year before the meeting at which the prize is awarded. This is the first time the prize has been awarded.

CALVIN C. MOORE, along with Aimeé Dorr, UCLA Graduate School of Education and Information Sciences, was chosen as a 2004 co-recipient of the University of California Academic Senate's Oliver Johnson Award for Distinguished Senate Leadership.

The Oliver Johnson Award is given biennially to a member of the UC faculty who has performed outstanding service to the Academic Senate. Its broader goal is to honor all members of faculty (including Emeriti/ae Senate members) who have contributed their time and talent to the Senate. The award carries a small honorarium for the faculty member who receives it. Professors Moore and Dorr were honored at the Annual Senate Chairs Dinner July 21, 2004.

CALVIN MOORE

YUVAL PERES was invited to deliver the Fall 2004 Hans Rademacher Lectures in Mathematics at the University of Pennsylvania. The previous two speakers in this series were also Berkeley faculty: Dan Voiculescu and Richard Borcherds.

YUVAL PERES

BJORN POONEN was a "Distinguished lecturer at PIMS (Pacific Institute for the Mathematical Sciences)" in the summer of 2004. He gave a lecture series on the descent theory of Colliot-Thélène and Sansuc, and its conjectural application to the study of rational points on cubic surfaces.

BJORN POONEN

NICOLAI RESHETIKHIN received a Humboldt Research Award. The Alexander von Humboldt Foundation grants up to 100 Humboldt Research Awards annually to scientists and scholars from abroad with internationally recognized academic qualifications.

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FACULTY HONORS AND AWARDS

(continued from page 2)

The research award honors the academic achievements of the award winner's lifetime. Furthermore, award winners are invited to carry out research projects of their own choice in Germany in cooperation with colleagues for periods of between six months and one year. The award can amount to a maximum of 75,000 EUROS.

NICOLAI RESHETIKHIN

JAMES SETHIAN won the Norbert Wiener Prize in Applied Mathematics for his seminal work on the computer representation of the motion of curves, surfaces, interfaces, and wave fronts, and for his brilliant applications of mathematical and computational ideas to problems in science and engineering.

This prize was established in 1967 in honor of Professor Norbert Wiener and was endowed by a fund from the Department of Mathematics of the Massachusetts Institute of Technology. The prize is awarded for an outstanding contribution to "applied mathematics in the highest and broadest sense." The award is made jointly by the American Mathematical Society and the Society for Industrial and Applied Mathematics.

STEVE SMALE received an Honorary Degree in Computer Science in October 2004.

STEVE SMALE

ROBERT SOLOVAY was named one of the winners of the 2003 Paris Kanellakis Theory and Practice Award by the Association for Computing Machinery. The other winners were Gary L. Miller, Carnegie Mellon University, Michael O. Rabin, Harvard University, and Volker Strassen, University of Konstanz. The winners were acknowledged "for the development of efficient randomized tests of primality, enabling the practical realization of public key cryptography and demonstrating the power of randomized algorithms."

The Paris Kanellakis Theory and Practice Award honors specific theoretical accomplishments that have had a significant and demonstrable effect on the practice of computing. More information is available at the ACM website.

ROBERT SOLOVAY

BERND STURMFELS gave the Gergen Lectures at Duke University in April 2004 and the 2004 AMS Erdös Memorial Lecture. He was also honored as a Clay Senior Fellow, one of the first in the nation to be named as Clay Senior Scholars, in Utah, July 2004, where he gave a lecture entitled "Tropical Mathematics".

The Clay Mathematics Institute (CMI), based in Cambridge, Massachusetts, is dedicated to increasing and disseminating mathematical knowledge. CMI is perhaps most famous for its Millennium Prizes, which offer the sum of $1 million for the solution to any of seven outstanding unsolved problems in mathematics (www.claymath.org). Most of CMI's work, however, is carried out through direct support of the research of individual mathematicians (its Fellows and Scholars), and through schools and workshops for researchers and students.

BERND STURMFELS

MARIEL VAZQUEZ was a 2004 recipient of the Focus-Abengoa Foundation Research Award for the project "Mathematical and Computational Study of Topoisomerase II Action". The Focus-Abengoa Foundation is based in Sevilla, Spain. One of its main goals is to promote research and advanced studies in the sciences and in the arts.

In addition, Vazquez received an Association for Women in Mathematics (AWM) Travel Grant to participate in the AMS - SMM International meeting in Houston, May 2004.

MARIEL VAZQUEZ

DAN-VIRGIL VOICULESCU received the National Academy of Sciences Award in Mathematics.

The NAS Award in Mathematics is a prize of $5,000 awarded every four years for excellence in published mathematical research. Voiculescu was chosen "for the theory of free probability, in particular, using random matrices and a new concept of entropy to solve several hitherto intractable problems in von Neumann algebras." The award was established by the American Mathematical Society in commemoration of its centennial and has been presented since 1988.

DAN-VIRGIL VOICULESCU

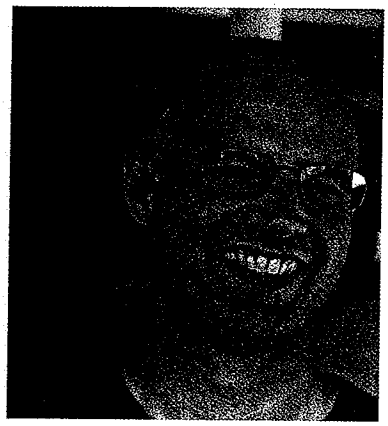
Professor Voiculescu joins an elite group of mathematicians who have received this honor:

1988.....Robert P. Langlands
1992.....Robert MacPherson
1996.....Andrew J. Wiles
2000.....Ingrid Daubechies
2004.....Dan Virgil Voiculescu Ω

NEW FACULTY

Peter Teichner

After receiving his PhD in 1992 from Gutenberg Universität in Mainz, Germany, Professor Peter Teichner taught mathematics at his alma mater until 1996. He then became Associate Professor of Mathematics at UC San Diego. In 1999 he was promoted to Professor.



PETER TEICHNER

Teichner received the Prize of the Universität Mainz for the best PhD thesis in 1992. His other awards include the Government of Canada Award, Hamilton, Ontario (1988-89), a research fellowship at the Max Planck Institut, Bonn (1989-90 and 2001-02), and the Feodor-Lynen Fellowship from the Alexander von Humboldt Foundation at UC San Diego (1992-94). He was a Visiting Scientist at Institut des Hautes Etudes Scientifiques (IHES), Bures-Sur-Yvettes, France, in 1995 and came to UC Berkeley and the Mathematical Sciences Research Institute (MSRI) with a Miller Research Fellowship in 1996-97. In 2002 Teichner was an invited speaker at the International Congress of Mathematicians (ICM) in Beijing. He was recently awarded an NSF 5-year grant. Teichner's research interests include geometric and algebraic topology.

Peter Ozsváth

Professor Peter Ozsváth received his PhD in 1994 from Princeton University. He taught at Princeton from 1998 to 2002 with a leave in 1999-2000 to teach at Michigan State University. In 2002 he became an Associate Professor at Columbia University. He was a member at the Institute for Advanced Study in Princeton from 2003-04.

Ozsváth received an Alfred P. Sloan Research Fellowship in 2000, an NSF Grant in 2002, and an NSF Focused Research Grant in 2003. In 2004 he co-organized the Clay Institute Summer Program on low-dimensional topology in Budapest, Hungry. In summer 2006 he will co-organize the Park City Mathematics Institute Summer Program. He is also a member of the Board of Editors, Geometry and Topology, since 2003. Ozsváth's fields of interest include topology and gauge theory.

Mina Aganagic

Invited to UC Berkeley as Assistant Professor 50% in Mathematics and 50% in Physics, Mina Aganagic's work focuses on theoretical particle physics, particularly string theory. She received her PhD from the California Institute of Technology in Theoretical Physics in 1999. From 1999-2003 Aganagic accepted a postdoctoral fellowship with the High Energy Theory Group at Harvard University, declining both a Miller Research Fellowship at UC Berkeley and the Robert H. Dicke Postdoctoral Fellowship at Princeton University that same year. Since 2003 Aganagic has been an Assistant Professor at the University of Washington in the Department of Physics. Ω

MINA AGANAGIC

IN MEMORIAM

Noted Geometer Shiing-Shen Chern

It is with great sorrow that we announce the death of noted geometer, colleague and friend, Shiing-Shen Chern.

Dr. Shiing-Shen Chern, 93, one of the greatest geometers of the 20th century and a professor emeritus of mathematics at the University of California, Berkeley, died Dec. 3 at his home in the Chinese city of Tianjin. Ω

POSTDOCTORAL FACULTY AND FELLOWS

HARUKO BRUCE

Mathias Drton, a Visiting Postdoctoral Researcher, received his PhD this year from the University of Washington. His research interests include algebraic methods for data analysis in computational biology.

MATHIAS DRTON

Remus Floricel, an NSERC postdoctoral fellow, received his PhD in 2002 from Queens University. His fields of interest lie in the areas of operator algebras and operator theory.

REMUS FLORICEL

Justin Holmer, a Visiting Assistant Professor, received his PhD in 2004 from the University of Chicago. His research interests include partial differential equations, harmonic analysis in Rn, and control theory.

JUSTIN HOLMER

Brian Osserman, a NSF Postdoctoral Fellow, received his PhD in 2004 from MIT. His fields of interest are positive-characteristic algebraic geometry, and enumerative algebraic geometry.

Scott Sheffield, a NSF Postdoctoral Fellow, received his PhD in 2003 from Stanford University. His research interests include probability and mathematical physics with particular interest in two dimensional statistical physics, Gaussian free fields, conformal field theory, and the Schramm Loewner evolution.

SCOTT SHEFFIELD

Sagi Snir, a Visiting Postdoctoral Researcher, received his PhD in 2004 from Technion-Israel Institute of Technology. His fields of interest lie in the areas of computational biology, distributed algorithms, and distributed computer networks.

SAGI SNIR

Kevin Woods, a NSF Postdoctoral Fellow, received his PhD in 2004 from the University of Michigan. His fields of interest are algorithms, generating functions, lattices points in polyhedra, integer programming, geometry of numbers, and complexity theory.

KEVIN WOODS

Dapeng Zhan, a Visiting Assistant Professor, received his PhD in 2004 from the California Institute of Technology. His research interests include complex variables, probability theory, and mathematical physics.

DAPENG ZHAN

Ω

VISITING FACULTY

Visiting from Stanford University, the Department is pleased to welcome **Grigori Mints** as a Visiting Professor for the fall semester. His fields of interest lie in the areas of logic, especially proof theory, its applications to philosophy, computer science, and linguistics, foundations of mathematics, and philosophy of mathematics.

GRIGORI MINTS

Visiting from CNS, Marseille, the Department is also pleased to welcome **Senya Shlosman** as a Visiting Professor for the spring semester. His fields of interest lie in the areas of Algebraic topology, mathematical physics, probability theory, and combinatorics.

Visiting from Yale University, the Department is pleased to welcome **Serge Lang** as a Miller Visiting Research Professor the fall Semester. His interests lie in the study of number theory and algebraic geometry. Recent work concerns Fourier analysis on Lie groups. Ω

SERGE LANG

GRADUATE STUDENT AWARDS

Awards for Outstanding Graduate Student Instructor for 2003-04 were:
Jameel Al-Aidroos
Seth Dutter
Norah Esty
Apollo Hogan
Benjamin Johnson
Walter Kim
Scott Morrison
Pace Nielsen
Jeremy Sain
Shahed Sharif

CPAM CHANGES

L. Craig Evans

L. Craig Evans has been appointed as the new director of the Center for Pure and Applied Mathematics (CPAM).

This fall 2004, we resumed the tradition of CPAM Interdisciplinary Lecture Series, meeting 12-1:30 most Thursdays in the Lewis-Latimer room of the UC Faculty Club. Participants buy their own lunch and then meet to eat together and hear an expository talk from 12:30-1:00. We have invited a wide range of UC faculty, both in mathematics and other disciplines, to give these lectures. Ω

FROM THE MATH - STATISTICS LIBRARY

Ann Jensen, Librarian

The rapid move from print to digital publication of journals that we have all experienced over the past years continues, but less dramatically. Now we all expect electronic versions of journal articles, and are disappointed when we don't find them or when the links don't work correctly. Behind the scenes, perhaps even bigger changes are occurring as the traditional business models of publishers, both commercial and professional society, are being challenged.

Every day fewer and fewer of you have need to enter the physical library, but you are likely using more resources made available by the library. Remember the library as one of your information providers and let us know how well things are working for you, both in the library and in the digital library. As the in-library usage falls, so does our staffing level, but we still aim to provide the best service we can whether you are at the circulation desk or at your personal workstation. We would like to hear about your concerns or any concerns you hear from your students.

We will not have to undertake a journal cancellation project this year, though we are still in a mode where, to add new titles, we must cancel existing titles. Caution is still needed with our serials expenditures, but our monographic funds remain steady and slightly increased for this year. Like the Math Department, the Library has pulled its reins tighter and tighter, but we are still here building our collections during these difficult times. Ω

HONORS FOR UNDERGRADS

McKINNEY FAMILY CAL BAND SCHOLARSHIP

The Department of Mathematics is happy to announce the McKinney Family Scholarship for undergraduates who are both majoring in Mathematics and participating in the Cal Band.

Andrew Fan, first recipient, was presented the 2003-04 scholarship at the May 2004 commencement. **Wesley Arai, Edward D. Kim, Joseph Gaye, Kristin Haute,** and **Brian Wolf** are recipients for 2004-05 scholarships.

ANDREW FAN

Undergraduates who think they may qualify for next year's scholarship should contact Catherine Pauling in our undergraduate advising offices, 643-9292, pauling@math.berkeley.edu.

ALICE T. SHAFER MATHEMATICS PRIZE

Elana Fuchs, undergraduate senior in Mathematics, has been selected for honorable mention for the 2004 Alice T. Schafer Mathematics Prize. This prize is a nationwide award for outstanding undergraduate women in mathematics. Elana has participated in Research Experience for Undergraduates (REU's) at Penn State in the summer 2003, and Duluth State University this past summer 2004. These experiences have led to two articles "Explicit Formulas for the Modular Equation" (joint authorship with Paul Baginsky) and "Longest Induced Cycles in Cayley Graphs" submitted to the Electronic Journal of Combinatorics. Currently she is working with Professor Ken Ribet on extending methods of Zarhin for showing that the Jacobians of certain curves have no nontrivial endomorphisms. She plans on applying to graduate schools for Fall 2005. Ω

ELANA FUCHS

UNDERGRADUATE COMPETITIONS

Mathematical Contest in Modeling (MCM)

This spring a team of undergraduates under Professor Craig L. Evans competed in the 2004 Mathematical Contest in Modeling (MCM).

The team, consisting of **Anand Kulkarni** (Mathematics / Physics), **Nathaniel Singer** (Mathematics), and **Ephrat Bitton** (Industrial Engineering & Operations Research), placed in the top ten percent of teams in the world out of about six hundred and won the rank of "Meritorious Winner" - roughly, a second place finish.

During the MCM, teams of three students work over a five-day period to develop and publish a mathematical solution to a complex real-world problem. This year's team developed a model to represent the behavior of lines at amusement parks and an optimization scheme to minimize the time spent waiting in line - no doubt, a problem of great interest to those members of the mathematics community who enjoy roller coasters.

Undergraduate teams are forming for the twenty-first annual competition to be held in February 2005. Interested students can contact Professor Craig Evans, Anand Kulkarni (this year's student coordinator), or Catherine Pauling for more information.

UCB Putnam Team Ranked Fourth

The 2003 Berkeley team comprised of **Boris Bukh, Maksim Maydanskiy,** and **Austin Shapiro** received honorable mention. There were teams from 401 institutions. Among the top five highest ranking individuals was Gabriel Carroll, now at Harvard. Gabriel took graduate classes at UC Berkeley while still in high school at Oakland Tech.

The 64th competition of the William Lowell Putnam Mathematical competition was held on December 6, 2003. A total of 3615 students from 479 colleges and universities in Canada and the United States participated in the competition.

Each year the Department of Mathematics offers a class to prepare for this competition. Visiting Professor Olga Holtz taught the Fall 2004 class. However, students do not have to be in the Math H 90 seminar to participate. Results of the December 2004 exam will be announced in March 2005.

If interested in the December 2005 Putnam competition, please see Catherine Pauling. Ω

OTHER MATH UNDERGRADUATE AWARDEES

Todd Gaylord, Applied Mathematics major, won first place in the 2004 National Collegiate Boxing Championship at Reno, Nevada in the 132-pound weight category.

A high school athlete in football, track & field, and wrestling, Gaylord took up boxing when he discovered CAL lacks a wrestling program.

As the 2004 Boxing Champion and National Title Holder, Todd received the coveted award belt.

TODD GAYLORD

Triple major **Michael Fogel** (Applied Math/Astrophysics/Physics) received the 2004 Astronomy Department Citation.

Senior **Nathaniel Singer** was the top junior male student at UC Berkeley in 2003. In addition he was awarded the Sproul Scholarship, the Datatel Scholarship, and the prestigious Goldwater Scholarship.

Junior **Lucija Zubonja** received the Seffens Scholarship for 2004. This is a full scholarship for students with certain majors, mostly engineering and mathematics majors. Lucija has been awarded this scholarship since her freshman year. Ω

MANAGER'S REPORT

MARY PEPPLE, MANAGER

A FOND FAREWELL

The academic year 2003-2004 closed with the retirement of our Department Manager Lou Maull. Lou served the University for 22 years, 12 of them in Mathematics. She began her UC career in 1982 at Berkeley's Graduate Division. She later worked at the Center for Research in Management before coming to Math in 1992. She retired on July 9, 2004. We are grateful to Lou for her exemplary service supporting the mission of the Department and the Campus and wish her the best.

In the middle of the 2004-05 academic year, we also bid farewell to our longtime colleague Rondi Phillips who was laid off due to budget cuts. Her event planning and newsletter production have enriched our program since 1989. Rondi's contributions include coordination of the Bowen, Chern, Tarski, and Diperna Receptions, the daily Teas, the Graduate and Undergraduate Receptions, the State of the Department Reception, Cal Day, Commencement, and outreach to alumni and newly admitted undergraduate students. We thank her for her dedicated service to the Department. Her efforts will be sorely missed by all of us.

RONDI PHILLIPS

NEW FACES IN NEW PLACES

We have successfully filled five vacant staff positions this year. In December 2003, Lynn Ly was hired by the Center for Pure and Applied Mathematics to handle travel, payroll and benefits for visiting scholars, graduate student researchers, and faculty. She graduated from UC Berkeley in December 2003 with a degree in Economics. For the last four years, Lynn has worked in the Math Department as a work-study student. We are especially fortunate to have her join our full-time staff.

LYNN LY

Julie Ashworth joined our support staff in April of 2004. She has over eight years of UNIX Systems Administration experience, including user support, server maintenance, and programming. Julie joins us from Rochester, Minnesota, where she worked for the Mayo Health Clinic as a Systems Programmer. She enjoys living in Berkeley and is proud to work for UCB. We are very pleased to have someone with Julie's expertise working for the Math Department.

JULIE ASHWORTH

Dave Mina joined Undergraduate Student Services as our Front Office Coordinator in June 2004. He came to Mathematics from the Math Diagnostic Testing Project where he worked for 15 years. We are very pleased to have been able to promote Dave from within the department. His excellent customer service skills will be an asset to our front desk operation. Judie Welch is temporarily filling the vacant position in the Math Diagnostic Testing Project.

DAVE MINA

In July 2004, Kathy Santos joined Mathematics as the Evans Hall Building Coordinator and Facilities Specialist. For the last 15 years she has worked for Residential and Student Service Programs on the UC Berkeley campus. Her work experience includes facilities management, emergency preparedness planning, building and safety coordination, and web-based graphic design marketing. We are extremely fortunate to have her join our staff.

KATHY SANTOS

In June 2004, Lou Maull's administrative torch was handed to me when I accepted the position of Department Manager. My background includes over 16 years of UC experience managing Facilities and Food Service Operations for Residential and Student Service Programs. I am honored to serve this world-renowned Mathematics Department.

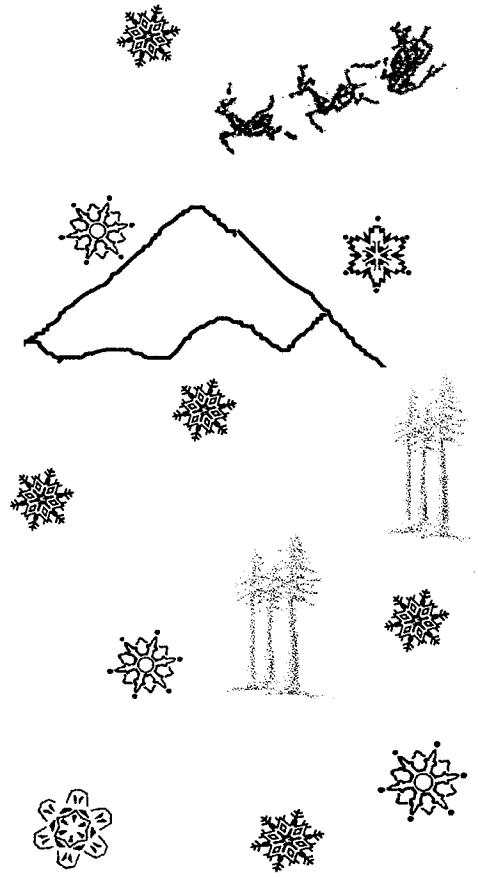
BUDGET CLIMATE 2004-2005

The Mathematics Department was required to take a 2.25% permanent budget cut for this year. Our cutbacks were taken in temporary academic staff, permanent staff, special events, and general supplies and equipment. Shrinking resources will require that we streamline our operation and improve our efficiency, while we continue to support the teaching and research mission of the Department and the University. Ω

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 list of our donors from 1995-2004 can be found on the departmental website at http://math.berkeley.edu/.

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.Ω



Happy Holidays from the Math Department!

LETTER FROM THE CHAIR *(continued from page 1)*

lenging for the Department. Along with the rest of the University, we have lived through a sequence of budget cuts and student fee increases. We have reduced the number of Miller Assistant Professors and the number of graduate student admissions, thereby increasing the pressure on our teaching and research programs. I want to thank the faculty, graduate students, and staff for their dedicated effort and hard work last year. (I want to especially thank those who saw me through my learning phase.)

I am very pleased to report that the Department is vibrant and exciting in spite of the economic down cycle. As you can read in the newsletter, we made three very strong appointments. We added two topologists, Peter Oszváth (recruited from Columbia) and Peter Teichner (recruited from UCSD). Berkeley has been famous for topology, but by retirements and separations we had grown thin in that area. Thin no more, we are back. We also added a string theorist, Mina Aganagic (recruited from the University of Washington), who will have a joint appointment in the Mathematics and Physics Departments. Mina adds to our strength in mathematical physics and to our interactions with the physicists.

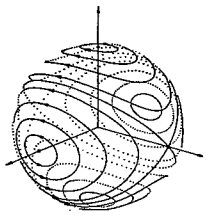
The Department received an astonishing collection of awards and prizes this past year. Be sure to look at the awards page and notice the ones for teaching and service, as well as the ones for research.

I want to express the Department's gratitude to Robert G. Uomini and Louise B. Bidwell for permanently endowing The Shiing-Shen Chern Chair in Mathematics. Funds from the endowment will be used to support one or more distinguished visiting mathematicians as well as teaching and research activities related to the visitors. We expect to invite at least one such visitor each year. Thank you for this generous gift.

What is the most important need in the Department for the next few years? The answer is funding for graduate student support. We have some 70 faculty members, but budgetary constraints limited our incoming graduate class of 2004 to 26 members. This is a waste, like having an exquisite car in the garage with no gasoline in the tank. The Department needs to increase its endowment for graduate fellowships from the current $3.3 million to $10 million. Professor Robert Coleman, in our own department, kicked off the campaign with a donation of $300,000 to establish a fund for the support of graduate students in his mother's name. Thank you, Robert.

In summary, there is fantastic mathematics here, in spite of our tight budget. Information on upcoming events, such as the lectures to be given by the Chern Professors, is posted on our new webpage, http://math.berkeley.edu, along with the calendar of weekly seminars and announcements of Departmental interest. As it says there, come with an enthusiasm for the subject and you will be welcome. Ω

THE DEPARTMENT OF MATHEMATICS



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In addition, (company name) _____ will match my gift. The company matching gift form

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The Department of Mathematics wishes to thank all alumni, parents, students, faculty, staff and friends who support the Department.

☐ Direct my gift to the Department of Mathematics Annual Fund, to be used for the Department's greatest need at the Chair's discretion.

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The information you provide will be used for University business and will not be released unless required by law. A portion of all gifts is used to defray the costs of administering the funds. All gifts are tax-deductible, as prescribed by law.

FEATURE ARTICLE

Topology: Here and There

(continued from page 1)

consists of the points at distance one from the origin in 4-space.

The classification of 1- and 2-dimensional manifolds has long been known, but not for 3-manifolds. The Poincaré Conjecture, over 100 years old, states that if a 3-manifold has trivial fundamental group, then it is the 3-sphere.

What is the fundamental group? Imagine placing a rubber band (a circle) around a sphere. If you put it exactly on an equator, it will stay there, but if you move it slightly it will shrink along the sphere to a point. However if you place a rubber band around an inner tube, it cannot shrink to a point. The fundamental group measures how many ways one can place a rubber band on a manifold where we do not distinguish between two placements if one rubber band can be deformed to the other without cutting the band or leaving the manifold.

Thus the Poincaré conjecture states that if there is no interesting way to place a rubber band on a 3-manifold N^3 such that it won't shrink to nothing, then N must be the 3-sphere.

This conjecture has analogues in all dimensions. Dimensions one and two are easy, and the conjecture in dimensions 5 or greater was proved by Stephen Smale around 1960, and a variation by John Stallings soon afterwards. Mike Freedman (Berkeley lecturer in 1973-75) proved the 4-dimensional case. Both Smale and Freedman won Fields medals for their work.

Bill Thurston's Geometrization Conjecture says that any 3-manifold can be cut up into a finite number of pieces such that each piece has a particularly nice geometric structure. It might be flat like the plane, or hyperbolic like a 3-dimensional saddle, or spherical like a sphere. (There are five other possibilities.)

Perelman's idea is to use geometry. He starts with an arbitrary 3-dimensional manifold N with an arbitrary metric which gives N curvature. Then he shows that if the most curved parts of N try to flatten out faster compared to less curved parts, that in the limit N ends up with constant curvature. (Technically, he shows that Ricci flow works. This follows a program of Richard Hamilton.)

In the case when N has trivial fundamental group, the Poincaré conjecture, Perelman shows that N must evolve to constant curvature one, and this is then the actual 3-sphere.

It should be said that Perelman's work has not yet been entirely checked. Armies of distinguished mathematicians are poring over the proof. Much of it is clearly beautiful and correct. Any day now we expect to hear the Poincaré Conjecture has been checked, and the more general Geometrization Conjecture not so long after.

Over a decade ago, there were three very famous conjectures: Fermat's Last Theorem (which fell to Andrew Wiles in 1993-94), the Poincaré Conjecture (probably already fallen), and the Riemann Hypothesis (still standing). Ω

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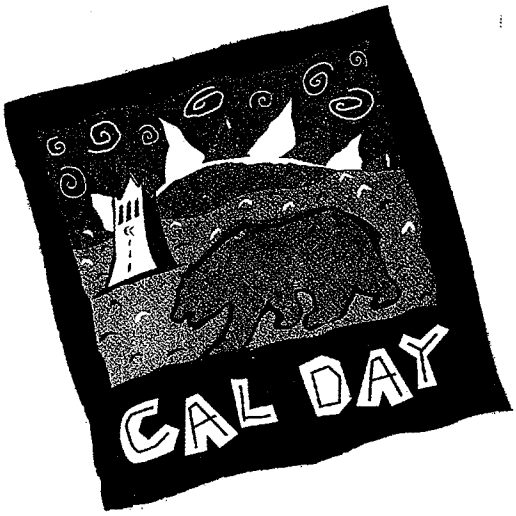
CAL DAY 2005

CAL DAY 2005 is almost here!

On this special day when the University shows off what goes on around here there are many places of interest to visit, fun things to do, lectures, demonstrations, and displays to see, even some shopping for international gifts.

And of course, in the Math Department, there will be videos all day long! This year the Department of Mathematics will again show a video entitled "The Elegant Universe." After it aired on KQED, the San Francisco Bay Area's public TV station, we ordered it to show to visitors. It's quite impressive!

In addition, there are book sales and T-shirt sales by the Mathematics Undergraduate Student Association and course advisors available to answer questions for students interested in Mathematics or Applied Mathematics as their major. Ω



CAL DAY will be on
Saturday,
April 16, 2005
Open from
9 am - 4 pm.
Come join the fun!

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