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THE Common Denominator

UCLA DEPARTMENT OF MATHEMATICS NEWSLETTER

Changing of the Guard at IPAM

Mark Green and Russel Caflisch at IPAM

INSIDE

Mark Green Ends His Remarkable Odyssey at IPAM

In May, UCLA Mathematics Professor Mark Green had one last bit of business to complete before he handed over the reigns of IPAM to new director and fellow faculty member Russel Caflisch—he was to shepherd his last NSF site visit as IPAM's director, the position he has held for nearly a decade. Since its founding in 1998, Mark and other leaders have made it IPAM's mission to make mathematics transformative to other scientific fields in order to promote and revolutionize new technologies that measurably impact the advancement of humankind.

The NSF panel apparently agreed that the mission is getting accomplished and in its most recent review deemed IPAM a "treasure." About Mark and the rest of the IPAM leadership, it declared: "The

continued on next page

Risky Business: IPAM's New Director, Russel Caflisch, Likes a Challenge

UCLA Mathematics Professor Russel Caflisch has never been afraid of risk, readily embracing it in his research and in his recent appointment to IPAM's directorship, following a national search. As new director, Russ sees his primary role as "making the connections between things." He clearly values his almost 20-year connection with the Department. "We have a terrific story in math at UCLA, with Terry Tao, IPAM and arguably the best math department in the country."

An applied mathematician who works on physics-based problems, Russ has focused his research interests in mathematical finance, Monte Carlo methods, kinetic theory, materials science, plasma dynamics, fluid dynamics, and partial differential equations. He is unabashedly excited about navigating future unchartered waters, a course set by IPAM and Director Emeritus Mark Green. He calls Mark "visionary" for establishing IPAM as an international math institute known for bringing together new scientific communities that put math squarely in the middle of the equation for solving some of the world's biggest challenges.

Russ wants to continue this course as the centerpiece of his directorship: "I'd like to look for math opportunities in our national technological needs, like renewable energy and risk management." He

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$2^{43,112,609}-1$:

What is so special about this number? See page 9.

Mark Green Ends His Remarkable Odyssey at IPAM

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IPAM leadership has worked with single-minded purpose and with a thoughtful approach to creating a world-class institute that is uniquely positioned to generate new interdisciplinary research and collaborations."

Once a self-described "firebrand on the dangers of hiring applied mathematicians," Mark credits open-mindedness and the muse of irony to his progression from pure mathematician to the leader of an institute that focuses on cutting edge problems across a broad array of disciplines. With what IPAM Director of Special Projects and UCLA applied mathematician Stanley Osher calls "the religion of a convert," Mark went about building interdisciplinary scientific communities "by hand."

Mark remembers IPAM's first program (Functional Genomics) in 2000, when the former pure math zealot found himself struggling to get up to speed on computational biology in what seemed to him to be a hopeless attempt to self-administer a crash course on the subject. Then remarkably he found himself hanging on every word of the program's opening tutorials. Says Mark, "The muse of irony undoubtedly was doing cartwheels." On the way home from the Lake Arrowhead roundup, he realized that the institute was on its way. Immersing himself in the scientific nitty-gritty would be a key strategy of Mark's directorship: "Probably the best decision I made was that I had to understand the science as much as I possibly could. I had to go to as many talks as I possibly could. I had to talk to as many people as I could. I had to get out on campus and meet the people who were going to be important."

He allows himself "one small success story": The 2004 program, Multiscale Geometry and Analysis in High Dimensions, brought together some of the greatest minds in pure mathematics: UCLA math professor Terry Tao, his Caltech collaborator Emmanuel Candes and Justin Romberg (Georgia Tech). During the program, they produced breakthrough results in compressed sensing, an area that has concrete and emerging applications in imaging, astronomy, MRI, signal processing, and linear coding, among others. This research is now the subject of a Defense Advanced Research Projects Agency (DARPA) program with $25 million in funding, which Mark points out is more money that IPAM has spent in its entire existence. His favorite moment of the program came when the NSF panel – which was simultaneously conducting its first site visit – asked: Is this interdisciplinary work? Participant David Donoho (statistics, Stanford), another major contributor to the genesis of compressed sensing, reportedly exclaimed, "You've got Terry Tao talking to geoscientists, what do you want?"

Mark is particularly proud of IPAM's impact on the careers and scientific development of a wide range of researchers in academia and industry across multiple fields: hurricane experts, cardiothoracic surgeons, Jet Propulsion Lab and Microsoft researchers, linguists and criminologists – they all came through IPAM's doors. And their impact on him was huge: "I always say, I've had a $30 million education." He takes great satisfaction that IPAM's impact continues to reach into surprising areas. A 2007 graduate summer school program, Probabilistic Models of Cognition: The Mathematics of Mind, has already produced results. Says Mark, "What NSF was impressed about was that there were new courses in psychology that had come out of a math institute."

"Looking back, it's just incredible that we really did this and pulled this off. I like to joke that it's like a start-up without stock options."

IPAM reaches across disciplines including astrophysics, atmospheric sciences, bioinformatics, biophysics, cellular biology, computer science, cryptography, electrical engineering, geophysics, mechanical engineering, medicine, physics, and psychology.

And the dividends keep paying out. Still, the muse of irony grows restless for its founding director emeritus: "What I was doing as director was really, really interesting, and I feel that it is more important than ever. Ironically, this means that it is time to move on."

As he resumes his teaching duties in the Department, Mark is formulating plans to introduce courses into the undergraduate and graduate curricula that no one has seen, drawing directly from the innovative math born at IPAM. "I'm trying to do a sequence that would prepare [undergraduate] students for pattern recognition and machine learning, looking at linear algebra and probabilistic models of application."

With characteristic curiosity, he goes through his shelves, overflowing with books that have inspired many of the IPAM's programs and workshops. "You pick them up and see that they're mostly math, except for the way they phrase it. Here's a little crypto section, a lot of Bayesian stuff, statistics, stochastic models, data mining, *The Journey of Man*. We did a workshop on *Genes, People, and Languages*. We had linguists, evolutionists, topologists, statisticians. You want to be able to tell people that this is what you can do with mathematics."

Mark scans another selection that takes him back to more revolutionary IPAM programs – neuroscience, genomics, analysis of ecological data. He looks up in wonder: "For me, it's been completely transformative. My view of what's important has changed."

IPAM's New Director, Russel Caflisch, Likes a Challenge

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has already made some progress in the former, having organized the past IPAM program, Mathematics in Nanoscale Science and Engineering. Its scientific focus involved mathematical modeling in miniaturization to advance technologies, such as solar power where the inefficiency and high cost of solar panels currently prevent this green energy source from being viable for wide-scale adoption.

He also sees an important role for math in handling risk. Certainly, the instability in the financial and credit markets is one area. Says Russ, "There's no reversing progress. If there's a breakdown, like the mortgage crisis, it means trying to do better and there's a role for mathematics."

In addition to his organizing experience, Russ also served on IPAM's Board of Trustees, where he helped set IPAM's agenda, and where he will continue to passionately advance key programs and initiatives. The institute's successful Research for Industrial Projects (RIPS) summer undergraduate research program, previously held in Los Angeles and Beijing, plans to branch out further to Berlin and beyond. Says Russ, "There's a small but determined group promoting math and science in developing countries. The one we've been talking about most is in Africa where Mark has a connection with his mentor Phil Griffiths and the Millennium Project."

He is also determined to push a commitment to diversity at IPAM. He cites IPAM's success in getting women involved as members in organizing committees, as speakers, and as participants at special events where they can forge collaborations and become mentors. "We have to keep trying hard. But it is really getting somewhere and there is tangible progress," enthuses Russ. He also aims to sponsor more events like the Blackwell-Tapia Conference, which honors David Blackwell and Richard Tapia, two figures who inspired students from diverse backgrounds to go into mathematics.

In the IPAM tradition, Russ is ready to cross borders and take on more math frontiers, even as he's still discovering what's out there. He's particularly excited about the possibility of a future program on the mathematical modeling and analysis of privacy,

> **I'd like to look for math opportunities in our national technological needs, like renewable energy and risk management.**
>
> ***Russel Caflisch***

which is very closely related to encryption. In the ideal scenario, some data (e.g. health statistics) would be made public for analysis while other parts would remain private. Says Russ, "Being able to formulate this in a way that people can't hack is a real challenge. It's easy to say that a code can't be broken. It's very hard to say that a set of privacy guidelines can't be broken. It's fascinating and very timely, and we seem to be at a point of making real progress on it." The mix of number theorists and cryptographers in such a program does not preclude perhaps the participation of a reformed hacker, who might provide unorthodox insights into security issues. Considering such a possibility, Russ lights up: "That would be a nice public lecture."

faculty news

Improbable Probabilist: Tom Liggett Elected to the National Academy of Sciences

The path to research mathematics was not entirely predictable for 2008 National Academy of Sciences member and UCLA probabilist Tom Liggett. He tried out industry first, working for IBM during his college summers. The company's head of research in New York told him that in order to have a career with IBM, he should get a PhD in mathematics. Tom's undergraduate experiences at Oberlin College led to an interest in college teaching and that path also required a PhD in mathematics. Research was not part of the equation at that time.

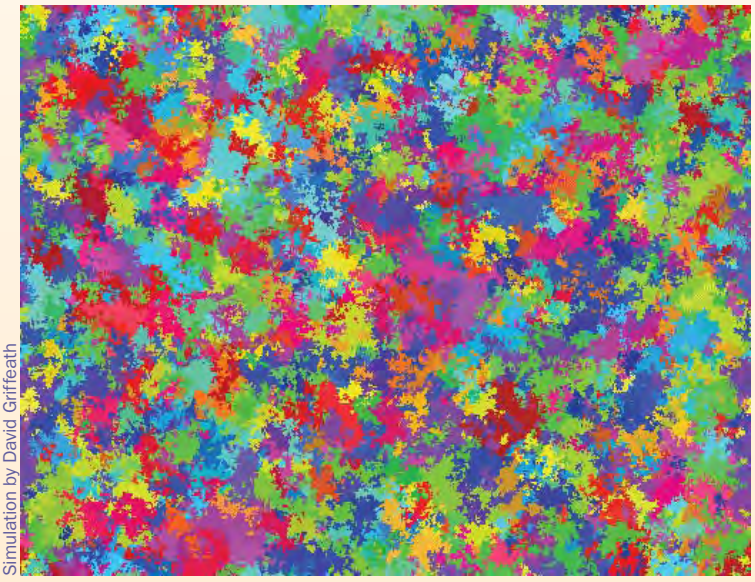
Nevertheless, after writing a thesis in probability at Stanford in 1969, which he wasn't entirely wild about, he decided to give research a try. He wrote away asking for job applications from four schools: University of Illinois, MIT, NYU and UCLA. Says Tom, "The other three sent me application forms – UCLA sent me an offer." He readily acknowledges that this would not happen today and marvels at the changes in the Department over the last 39 years. His area of probability theory has also changed greatly during this period. When he came to UCLA – with the intention of staying only two years – probability was more closely associated with statistics than with mathematics, and was only beginning to become an accepted part of the field. Probability's standing has shifted, partly because of its growing connections with the sciences and business, as well as with other parts of mathematics, such as analysis, PDE and combinatorics.

In his second year at UCLA, Tom wrote a paper with then UCLA colleague Michael Crandall that would turn out to be influential in nonlinear analysis. This experience led him to consider changing fields. Then, his research life changed dramatically when another UCLA colleague, Charles Stone, gave him a paper by Cornell probabilist Frank Spitzer that he thought would be of interest. Remembers Tom, "There was a certain amount of luck here. Mike Crandall happened to be at tea one day, asking about the problem that led to our work. And Chuck Stone gave me this paper. If Mike and I hadn't been at UCLA, and hadn't been at tea that day, who knows what might have happened. That's probability theory, right? The study of randomness." Spitzer's paper was unusual in that it was more concerned with descriptions of models and statements of open problems than with theorems and proofs. It turned out to be the beginning of something new: interacting particle systems. Tom jumped in: "I started working on these problems and was able to solve a few." Since then, he has played a leading role in developing this field, which has become an important part of probability theory.

Tom would go on to write the seminal book, *Interacting Particle Systems* in 1985, along with *Stochastic Interacting Systems: Contact, Voter and Exclusion Processes* in 1999. He has also contributed to a number of other fields, including nonlinear semigroups, subadditive ergodic theory, negative dependence, optimal stopping, combinatorics, random graphs, and renewal theory. He has authored or co-authored more than 90 papers with a far-flung network of collaborators, and has mentored eight PhD students and many postdocs.

Tom's groundbreaking research did not preclude him from actively participating in other important aspects of the Department and the profession. He spent eight years as Department chair and vice chair, and three years as chief editor of *Annals of Probability.* He fondly recalls teaching the lower division calculus sequence, which he did once, in order, over a two-year period, while really getting to know the students. Enthuses Tom, "One of the things I find exciting about the job I have is that at different stages of my career, I have been able to do quite different things. I wouldn't want to do any one of these things full-time."

Tom is looking forward to the NAS induction ceremony next year, and his 65th birthday conference, a workshop on interacting particle systems, organized by one of his former students in Beijing next June. And Tom thinks he definitely lucked out when UCLA offered him a job, application-free, nearly 40 years ago: "UCLA's a great place to be."



Simulation by David Griffeath

A snapshot of the "voter model" that was introduced by Holley and Liggett in 1975. Different colors represent different voter "opinions."

Terry Tao Goes to Washington

NSF Waterman Award and NAS Membership

NSF Alan T. Waterman Award

In a ceremony at the U.S. Department of State in Washington, D.C., last May, Fields Medalist Terry Tao accepted NSF's highest honor: the 2008 Alan T. Waterman Award. The annual award recognizes an outstanding young researcher in any field of science or engineering that is supported by NSF with a research grant of $500,000 over three years. Congress established the award in 1975 to mark NSF's 25th anniversary and to honor the agency's first director.

Terry's research involves harmonic analysis, an advanced form of calculus that uses equations from physics, and a related field, nonlinear partial differential equations, as well as the entirely distinct fields of algebraic geometry, number theory and combinatorics.

In his interview with the NSF, Terry talked about how he tackles problems: "I joke sometimes that math is all about making things trivial. You have this problem and you don't understand how it works, but once you see how it works, it's obvious. It's like solving a crossword puzzle. You say: what on earth is this clue? But then you say, oh! – if it's a good clue."

He's also something of a frontiersman when it comes to math: "I kind of view research like … the Wild West. There's this civilized area where there are these problems that we know how to do very well, that are very well understood, there's theory that we teach in classes, and that's sort of like the settled area. And then there's this wild unknown where we can't do anything. We would like to get there, but we can't yet. So there's a frontier where the techniques we have are almost working, but we have to make them just a little better before we can solve these problems – and that's where people work. Occasionally people try to be really ambitious and succeed and make a big breakthrough, but a lot of what we do is sort of steadily civilizing the frontier."

Through an outreach program for Waterman Award winners, Terry was invited to give a math lecture on the cosmic distance ladder to over 150 students at Thomas Jefferson High School for Science and Technology in Northern Virginia. Members of the math club gave him a tour of the school and full math rock star treatment, including mandatory autographing of students' calculators.

Professor Christoph Thiele, Professor Terry Tao, UCLA Chancellor Gene Block and NSF Assistant Director Tony Chan (mathematical and physical sciences)

NAS Membership

A week before the Waterman Award ceremony, Terry was elected as a foreign associate (because Terry is Australian) to the National Academy of Sciences (NAS) for his excellence in original scientific research. Membership in the academy is one of the highest honors given to a scientist or engineer in the United States. Terry will be back in Washington, D.C., in April to be officially inducted into the National Academy of Sciences in Washington, along with colleague Tom Liggett. Terry and Tom represent two of three UCLA professors elected to the academy in 2008, and join other UCLA math faculty elected in previous years: Professor Stanley Osher (2005) and Professors Emeriti Lennart Carleson (2006), Robert Steinberg (1985), and Lloyd Shapley (1979).

To view NSF's video interview with Terry Tao, visit
http://www.nsf.gov/news/news_summ.jsp?cntn_id=111541&org=NSF&from=news

faculty news

The After Math: UCLA Mathematics Professors Retire

Theodore Gamelin

Since joining the Department in 1968, Professor Emeritus Theodore Gamelin has explored a broad research agenda in function algebras and function theory, from approximation problems and extremal problems in the plane to function theory on Banach spaces and infinite polydiscs, to the study of second duals of function algebras. He has authored three important research monographs on these subjects. His classic *Uniform Algebras* (1969) is still the definitive source on many applications of Banach Algebras to other areas. His short *Uniform Algebras and Jensen Measures* (1968) contains significant results not found elsewhere. And his *Complex Dynamics* (1993) with Lennart Carleson is an excellent introduction to an area of important current research written in Ted's distinctive, crystal clear style. For the last 10 years, Ted enthusiastically embraced the Department's commitment to undergraduate mathematics teacher preparation, guiding its nationally recognized programs for training secondary school mathematics teachers. He chaired the undergraduate teacher preparation committee, taught the capstone course for the undergraduate program, and oversaw the grant that supports the Department's teacher preparation of undergraduates. He was also involved in preparing and editing materials for the Mathematics Content Program for Teachers and Students, which trains elementary school teachers to teach middle school mathematics. He also served as the faculty advisor for the California Math Project, a statewide professional development program. In 2007, he was instrumental in establishing the Philip C. Curtis Jr. Center for Mathematics and Teaching to bring together the Department's K–12 activities.

Ronald Miech

Professor Emeritus Ronald J. Miech has spent 44 years on the faculty, making key contributions to the Department. In research, Ron established a reputation in number theory and group theory, especially additive number theory and the theory of p-groups. In teaching, he worked to improve the quality of course offerings. Ron is especially notable for his initiatives in developing and structuring enduring programs. He designed and directed the Department's successful Program in Computing (PIC), whose broad mission is to teach computing to undergraduates in the College of Letters and Science. He played a central role in establishing the flexible mathematics/applied science major and its spinoffs and plans, such as the actuarial plan, which have contributed to the diversity of major options for students. His efforts in this regard are a factor in the Department's distinction of having one of the highest number of math majors (900 this fall) of any mathematics department in the country. During his career, Ron served as the undergraduate vice chair for the Department and as a member or chair of numerous committees of the Academic Senate.

Faculty News in Brief

In October, the AAAS (American Association for the Advancement of Science) Council elected Professor **Tony Chan** as a fellow in mathematics. "Triple A-S" is an international non-profit organization dedicated to advancing science worldwide. It also publishes the journal *Science*, which has the largest paid circulation of any peer-reviewed general science journal in the world. Tony is currently NSF's assistant director for mathematics and physical sciences.

In April, the John Simon Guggenheim Memorial Foundation granted number theorist Professor **Chandrashekhar Khare** one of only four fellowships in mathematics. Candidates in the arts and sciences were chosen from a group of more than 2,600 applicants. Guggenheim Fellows are appointed on the basis of stellar achievement and exceptional promise for continued accomplishment. Shekhar was also awarded the 2007 Fermat Prize for Mathematics Research by the Université Paul Sabatier. He was recognized for his proof of Serre's modularity conjecture in number theory in collaboration with Jean-Pierre Wintenberger.

The Alfred P. Sloan Foundation awarded Assistant Professor **Inwon Kim** a 2008 Sloan Research Fellowship in mathematics. Established in 1955, these fellowships are intended to enhance the careers of the very best young faculty members in seven specified fields of science: chemistry, computational and evolutionary molecular biology, computer science, economics, mathematics, neuroscience, and physics. Inwon is one of two UCLA 2008 Sloan fellowship recipients.

Mathematical logician Professor **Itay Neeman** has been named the new director of UCLA's Logic Center. Itay succeeds Professor Tony Martin. The center was established in 2004 to foster teaching and research in logic, broadly understood to include all areas of mathematical and philosophical logic, as well as the applications of logic to philosophy, linguistics, and computer science.

new faculty

Christian Haesemeyer joins the Department's algebra group as an associate professor with interests in algebraic geometry and algebraic topology, especially the theory of algebraic cycles and the theory of singularities. His investigations employ various homology theories, e.g., in algebraic K-theory, motivic cohomology, cyclic homology, and A1- homotopy theory. The latter is an algebraization of homotopy theory that played an important role in Voevodsky's proof of the Milnor Conjecture, as well as in the Bloch-Kato conjecture. Christian's work in algebraic K-theory has already resulted in the solution of two 30-year-old conjectures, the Weibel and Vorst conjectures; in the study of singularities of algebraic varieties; and in a 35-year-old problem of Bass. Christian completed his PhD at Northwestern University under the direction of Eric Friedlander and Andrei Suslin in 2003. Subsequently, he was an assistant professor at the University of Illinois at Chicago, where he produced papers appearing in top journals, including the *Annals of Mathematics* and the *Journal of the American Mathematical Society*.

Ciprian Manolescu brings his extraordinary depth in low-dimensional topology to his appointment as associate professor in the Department's newly reinvigorated topology group. Ciprian uses sophisticated theories, such as Floer homology and symplectic geometry, to study low-dimensional manifolds. As a high school student, he won gold medals three years in a row in the International Mathematical Olympiad. His career as a research mathematician began while still an undergraduate at Harvard University when his thesis was published in revised form as Sieberg-Witten-Floer stable homotopy type of three-manifolds with $b_1=0$, a remarkable paper that would have been among the best PhD theses in topology that year. At Harvard, he was a three times Putnam Fellow, receiving one of the five highest scores on the nationwide Putnam Exam. Ciprian earned his PhD from Harvard in 2004, working under Peter B. Kronheimer, and was awarded the prestigious Clay Research Fellowship. Before coming to UCLA, he was an assistant professor in mathematics at Columbia University.

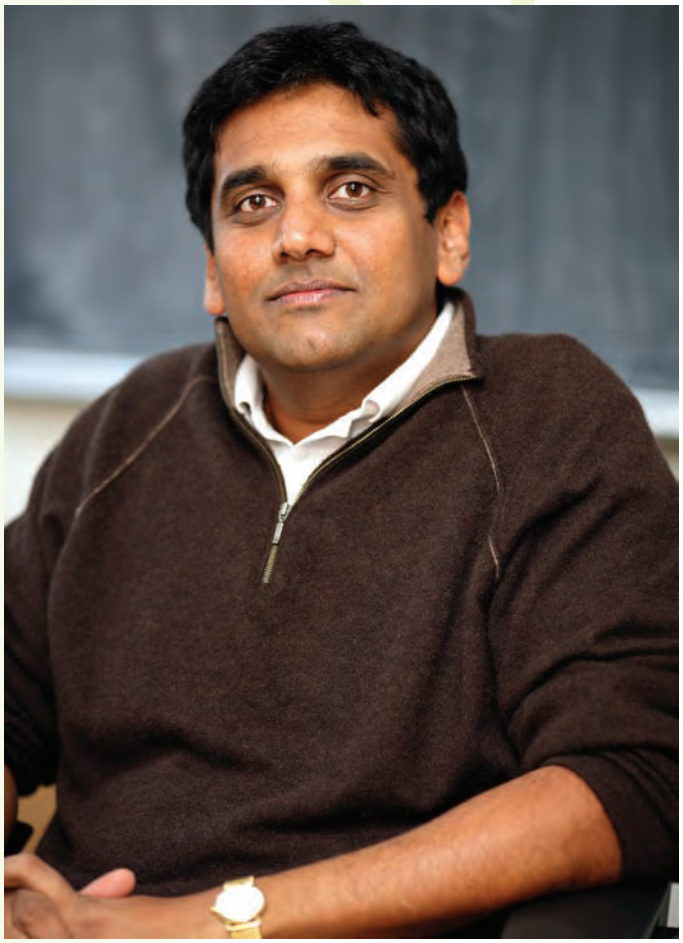
Sébastien Roch joins the Department in 2009 as assistant professor in the probability group and as one if the most promising young probabilists in the country. Born in Canada, Sébastien received his PhD from the statistics department at UC Berkeley in 2007 under E. Mossel. He is now in the second year of a postdoc with the Theory Group at Microsoft Research. Sébastien's work in probability theory emphasizes problems arising from theoretical computer science and biology. He is an unusually prolific and interactive mathematician, having already written over 20 papers with a total of 16 coauthors. Several of Sébastien's results have come as a surprise to experts, including his recent proof of statistical inconsistency of a technique known as ancestral maximum likelihood for reconstructing phylogenetic trees from currently available data. He received his diplôme d'ingénieur in mathématiques appliquées (2001) at École Polytechnique in Palaiseau, France, and his MScA in operations research (2003) and BEng in engineering physics (2002) at École Polytechnique in Montreal, Canada.

focus on research

Serre's Conjecture: A Solution Spanning Algebra, Analysis and Geometry

by Professor Chandrashekhar Khare

UCLA mathematics professor Chandrashekhar Khare was awarded the 2007 Fermat Prize for Mathematics Research by the Université Paul Sabatier (Toulouse) for solving the Serre modularity conjecture. His extraordinary work, in collaboration with Jean-Pierre Wintenberger, made international headlines in number theory. Over 30 years ago, renowned French mathematician Jean-Pierre Serre made his conjecture that by its importance and seeming inaccessibility at the time it was made, exerted a tremendous influence on the subject. Following is Shekhar's explanation of the conjecture and its proof.



One of the reasons Serre's conjecture attracted so much attention in the 1980s and 1990s, is that it implies Fermat's Last Theorem (FLT). This is a claim of the 17th century French mathematician Pierre Fermat (who worked as a judge in Toulouse) that most believe he never really proved. FLT asserts that the equation $a^n + b^n = c^n$ for a positive integer $n > 2$ has no solutions in integers a, b, c, besides the trivial ones when one of a, b, c is 0. This statement tantalized number theorists for more than three centuries, before Andrew Wiles proved Fermat to be correct in 1994, with the last step taken with the assistance of Richard Taylor. The work of Wiles on FLT used a very special known case of Serre's conjecture. In turn, the methods Wiles developed have played a key role in the resolution of Serre's conjecture.

Many important results in mathematics build bridges between different areas of mathematics. Sometimes these bridges exist only as blueprints, aka conjectures, seen in the mind's eye as an important element of a sought after architectural unity, but not yet built. What makes such bridges tantalizing is that no one area is adequate to build them, while once built they bring traffic to all the areas, increasing the commerce of ideas between them, and enriching the subject. Serre's conjecture is one such elegant bridge that spans algebra, analysis and geometry.

Algebra: The algebraic aspect of Serre's conjecture is that it asks questions about Galois groups, named after their inventor, the French mathematician Evariste Galois. Around 1830 Galois discovered a new kind of symmetry that algebraic numbers can have. Algebraic numbers are roots of polynomial equations with coefficients in the rational numbers like $X^2 + 17$ or $X^5 + 3X + 1$. The symmetries that Galois considered permute the roots of a polynomial equation around. He attached to a polynomial equation the group of its symmetries, and showed that the nature of the group revealed a lot about the nature of the polynomial and its roots. In doing so he showed that the roots of polynomial equations cannot always be given by a simple for-

mula that generalizes the high school formula for solving quadratic equations. The criterion for when this can be done is in terms of the group of symmetries, or Galois group, of the polynomial.

Serre's conjecture is concerned with the Galois group, which is the symmetries of all roots of all polynomial equations with coefficients in the rational numbers. It seeks to understand polynomials whose Galois group is 2×2 matrices with coefficients in finite fields, one of the natural cases (in the hierarchy of the classification of finite simple groups) to think of beyond the *abelian* case that was settled by a theorem of Kronecker and Weber in the 19th century.

Analysis: Serre's conjecture seeks to understand these Galois groups in terms of certain complex analytic functions on the upper half plane that have a certain symmetry property under the action of the group $SL_2(\mathbf{Z})$ on the upper half plane via fractional linear transformations. These functions, called *modular forms*, are ubiquitous in number theory, and although defined analytically have also a remarkably algebraic and geometric flavor. They first appeared as generating functions for counting the number of ways of writing integers as sums of squares.

The pioneering work of Martin Eichler and Goro Shimura (1950s) built a one-way bridge that allowed one to pass from a modular form to a Galois group. After their work one could ask if the bridge would allow traffic in the other direction too. For this one asks if a certain "generating function" one can attach to a Galois group of a certain type is a modular form, and thus in particular as a complex function has some highly non-obvious symmetries.

Geometry: Elliptic curves like $y^2 = x^3 + 3x + 1$ give rise to Galois groups. They also arise from modular forms as in the fundamental work of Eichler and Shimura. Yutaka Taniyama asked in the 1950s if all elliptic curves arise from modular forms, and this question was made much more precise and central through the efforts of Shimura and Andre Weil. Serre's conjecture logically implies the conjecture of Shimura, Taniyama and Weil.

Serre made his conjecture in the early 1970s. Stimulated by ideas of G. Frey and Y. Hellegourach that linked FLT and elliptic curves, Serre made his conjecture more precise in the 1980s. This precise form of his conjecture implied FLT (thus as an afterthought!).

> **"Many important results in mathematics build bridges between different areas of mathematics."**
>
> ***Chandrashekhar Khare***

Prime Discovery: $2^{43,112,609}-1$

On August 23, 2008, the world's first explicitly known prime with more than 10 million decimal digits was reported on a UCLA mathematics computer. The discovery is part of the Great Internet Mersenne Prime Search (GIMPS, www.mersenne.org), a distributed computing project started 12 years ago that employs tens of thousands of computers worldwide in an organized effort dedicated to the search for Mersenne primes. A Mersenne prime takes the form of 2^P-1, where P is a known prime. At present, there are fewer than 50 known Mersenne primes. The UCLA Mersenne prime is $2^{43,112,609}$-1, and the actual number has 12,978,189 digits.

The Department is a proud contributor of computing time for GIMPS, and in recognition of the individual discoverers, the GIMPS project leaders, and every GIMPS participant's contributions, credit for the discovery goes to Edson Smith of the UCLA mathematics computing group, George Woltman, Scott Kurowski, et al. The Electronic Frontier Foundation (www.eff.org) has announced an award of $100,000, half of which will go to the Department when EFF confirms the discovery. The mission of the awards is to promote collaborative computing – not just in the search of prime numbers that are important in mathematics and encryption – but for other large problems that can be solved by similar methods.

The new prime is not the first Mersenne prime to be found at UCLA. In 1952, Professor Raphael Robinson used UCLA's SWAC (Standards Western Automatic Computer) computer giant to find five distinct Mersenne primes with P equals 521, 607, 1279, 2203 and 2281. These were the first Mersenne primes discovered in over 75 years, and the first to be discovered using computers. In 1962, Alexander Hurwitz found two more Mersenne primes (P equals 4253 and P equals 4423) using UCLA's powerful IBM 7090 computer. UCLA's most recent prime number was discovered on a computer named *zeppelin.pic.ucla.edu*, a Dell Optiplex 745 running Windows XP with an Intel Core 2 Duo E6600 CPU running at 2.4 GHz. The name "zeppelin" is part of the computing group's classic rock band series of computers and refers to the legendary group Led Zeppelin.

For more information on the UCLA Mersenne prime discovery, visit http://www.math.ucla.edu/~edson/prime.

events

Conference Preview

2008 – 2009 Distinguished Lecture Series

October 19 – 24: National Medal of Science and Wolf Prize recipient **Elias Stein**, Princeton University

November 17 – 21: 2006 ICM speaker **Mario Bonk**, University of Michigan

January 12 – 17: Fields Medalist and Wolf Prize recipient **Gregory Margulis**, Yale University

Logic Center Gathering

January 30 – February 1: This Very Informal Gathering of Logicians (VIG) is the 15th in a series of logic meetings at UCLA that began in 1976. This year's meeting is being organized in part to honor John Steel (UC Berkeley) on the occasion of his 60th birthday. The gathering's focus is on areas of logic related to Steel's work, including descriptive set theory, inner models, recursion theory, reverse mathematics, and philosophy of mathematics.

Mathematicians Rock Students at High School Open House

The Department hosted over 100 advanced math students from four local high schools, including Loyola, Hawthorne, Leuzinger and Palm Springs, along with their teacher-leaders Alex Cardenas, Curtis Goehring, Eugene Kwong, Allen Martin and Bruce Raymond. Students and teachers were dazzled by math faculty presentations showing how math works in the real world. Applied mathematician and Disney consultant Joey Teran demonstrated the wizardry of math in special effects blockbuster filmmaking; Math Circle director Olga Radko engaged students in the math game Nim; number theorist Jonathan Rogawski drew the connections between math and internet security; Martin Short showed the math behind crime modeling; and Todd Wittman applied calculus to image processing. Palm Springs High student body president Susana Salazar was so math-struck she vowed to become a math major if she was accepted to UCLA. Susana joins the Department as a math-applied science major this fall.

Attention mathematics teacher-leaders: Please contact Lisa Mohan at lisam@math.ucla.edu if you are interested in participating in our 2009 High School Open House.

Math in the Public Eye

2008 UCLA Science Faculty Research Colloquia

Professor Stanley Osher's lively lecture, Mathematics in the Real World and the Fake World, focused on the mathematics behind images for applications in such varied fields as criminology, medicine, and Hollywood filmmaking.

Public Symposium Honored Professor Mark Green's 60th Birthday

Alumni and colleagues attended a public symposium and reception to honor Professor Mark Green and his contributions to IPAM as the institute's founding director. As a result of his leadership over the past decade, IPAM's impact on mathematics research and its applications to technology has been resounding. Yale University Professor and IPAM Scientific Advisory Board Chair Peter Jones spoke about IPAM's programs and recent trends in research. Professor and NSF Assistant Director for Mathematics and Physical Sciences Tony Chan followed with a lecture on IPAM's people, history and impact.

Public Events Preview

Logic Center Public Symposium

Ever wonder what logicians, linguists, philosophers and computer scientists have in common? Join us for a free public symposium and reception in spring 2009.

Check www.math.ucla.edu for updates.

Special Awards Ceremony

Horn-Moez Prize for Excellence in First-Year Graduate Studies

Zaher Hani receives his award.

Karen Horn, daughter of Professor Alfred Horn (1918 – 2001)

Graduate Vice Chair Don Blasius presents the award to Yao Yao.

Robert Sorgenfrey Distinguished Teaching Awards

Professor Bob Brown and faculty awardee Andrea Brose

Professor Bob Brown and faculty awardee Richard Elman

Postdoctoral awardee Paul Jenkins. Graduate student recipients were Jason Asher, Paul Bunn, Luke Cherveny and Eric Radke.

Dissertation Year Fellowships and Beckenbach Award

Dissertation Year Fellowships were awarded to **Craig Citro**, **Victor Lie** and **Michael Vanvalkenburgh**. **Yunho Kim** received the 2008 Beckenbach award.

2007–2008 Distinguished Lecture Series

Fields Medalist **Charles Fefferman** of Princeton University, one of the world's leading researchers in mathematical analysis, gave a series of highly accessible and very broadly attended lectures on his current research on the fundamental topic Interpolation of Functions on R^n.

Nevanlinna Prize winner **Avi Wigderson**, Herbert Maass Professor at the Institute for Advanced Study, gave a series of lectures Some Topics in Computational Complexity. The talks surveyed three topics: randomness, expander graphs, and algebraic computation, where questions of computational efficiency have led to important new insights, results and open problems.

Celebrated number theorist **John Coates**, FRS, Sadleirian Professor of Pure Mathematics at the University of Cambridge, gave a series talks on Iwasawa theory, emphasizing the non-abelian case, which he has pioneered, and reporting on recent progress by his PhD student M. Kakde. The series, which started from first principles, was highly appreciated by number theorists, both students and faculty at UCLA, many of whom work in areas to which Coates has made foundational contributions.

graduate news

Message from New Graduate Vice Chair Dima Shlyakhtenko

I want to take this opportunity to thank our previous graduate vice chair Don Blasius. It is through his efforts and those of many vice chairs before him that we have a thriving and strong graduate program, a key asset of the Department. The excellence of our program is evident from the achievements of our recent graduates. For example, in recent years several graduating PhD students received the prestigious Clay Liftoff awards and NSF postdoctoral fellowships. This fall, we admitted a class of 29 graduate students who come from over half a dozen countries, in addition to the United States and Canada. As we look ahead, our aim is to continue to build upon existing strengths and teach our students wonderful mathematics. One of the challenges is to ensure funding for the program given the uncertain budgetary outlook and the impending expiration of the VIGRE NSF grant that has been the main support for our graduate students over the last eight years. With continued investment in our high-ranking research program, we are confident that we can remain competitive and attract the finest minds in mathematics.

UCLA Math Moves Up in *U.S. News & World Report* 2008 Rankings

From 2006 to 2008, the Department continued its upward trajectory as a top-rated mathematics research institution by improving or maintaining its national graduate program rankings overall and across research groups. In five out of eight research areas, the Department ranks in the top 10.

***U.S. News & World Report* Rankings**	**2006**	**2008**
Overall	12-13*	12
Algebra/number theory/algebraic geometry	10-11-12*	10
Analysis	6	4
Applied math	4	3-4*
Discrete math and combinatorics	>10	8
Logic	2	2

**Indicates shared ranking*

Promising Plans for Graduating PhDs

The Clay Mathematics Institute named UCLA mathematics grad **Adrian Ioana** as one of three 2008 Clay Research Fellows. Adrian is currently a postdoctoral researcher at Caltech and will maintain a joint affiliation with the Department during the three years of the fellowship award. Adrian completed his PhD under Professor Sorin Popa in 2007. Clay Research Fellows are selected for their research achievements and their potential to become leaders in research mathematics. Past recipients include Professors Terry Tao and Ciprian Manolescu.

UCLA Mathematics PhDs **Jeremy Brandman**, **Inessa Epstein** and **Robert Waelder** were named recipients of the prestigious National Science Foundation 2008 Mathematical Sciences Postdoctoral Research Fellowship (MSPRF). Jeremy will conduct his fellowship at New York University; Inessa will be at Caltech; and Robert will head to the University of Illinois at Chicago.

The Department's PhD graduates have secured postdoctoral positions at Princeton University's Institute for Advanced Studies, New York University and Caltech, among others. Industry placements include Facebook, Jet Propulsion Laboratory and Credit Suisse.

Spotlight on Grad Students

Craig Citro: Computational Number Theorist

Craig Citro was married this summer in a memorable ceremony featuring silly string and vows adapted from Dr. Seuss' *Green Eggs and Ham*. But it isn't just his new wife, Asia, that he can't live without. Two years ago at a workshop he met Sage, an open source mathematics software program that changed his life and his research in modular forms, a very abstract area of number theory that has applications to cryptography. Rediscovering his computer science roots, Craig remembers sitting down to play: "I started computing and for me it was: where has this been all my life? Modular forms had been these things I had been studying for two years. All of a sudden in that one instant, they went from these things that I kind of believed in to these things I knew really well." Sage's mathematician founder William Stein started developing the program in 2005 as an alternative to other closed-source proprietary programs. Since then, Craig and over 100 serious mathematician-developers have contributed to the project that performs the heavy computational lifting across mathematical research areas, including arithmetic geometry and algebraic geometry. A mathematician who draws the distinction between those who are more like artists – such as his advisor and renowned number theorist Haruzo Hida – and the ones who are engineers, Craig is proud to be an engineer: "I think of myself as a little more low-brow. I like to splash around in the mud." Craig will continue to get his hands dirty as a postdoc under Stein at the University of Washington following his final dissertation year this fall. For more on Sage, visit http://www.sagemath.org/.

Bin Dong: Math Rescues Emergency Medicine

Captivated by Professor Stanley Osher's image processing class, Bin Dong found himself shifting research gears when Stan introduced him to Professor of Emergency Medicine Eric Savitsky, who is also the director of the UCLA Center for International Medicine. Eric had a real-life, real-time problem with major implications for emergency medicine and battlefield applications. While ultrasound imaging is useful for allowing doctors to treat patients with life-saving injections, the 3D real-time images are noisy, and only experienced practitioners are able to accurately guide the needle to its target, such as a tumor. Approaching it as a tracking problem, Bin employed powerful PDEs to highlight the point of the needle and de-noise the surrounding region. Two-dimensional imaging scans, such as CTs and MRIs, have higher quality resolution but include big trade-offs, including increased time, expense, and harmful radiation. Says Bin, "Working with image processing techniques – which are very advanced these days – ultrasound has the possibility to be more effective than these non real-time medical imaging scans." He's also collaborating with Aichi Chien in radiology, using PDEs and level-set methods to capture 3D volume and curvature measurements of potentially lethal aneurysms. And he hasn't completely abandoned his original research on wavelets, which he and his former advisor in Singapore, along with Stan and Aichi, are using in conjunction with PDEs and level-sets in a multi-scale representation framework to solve surface inpainting (reconstruction) problems. Says Bin, "I love to cooperate with different people, especially from different fields. I can learn a lot from them and it opens my mind."

Yongning Zhu: Virtual Surgery, the Next Generation

After studying computer graphics in Canada, Yongning Zhu decided to come back to math. Says Yongning, "I really like applied math. I can do math as well as do something pretty useful for other people." Under her advisor, Assistant Professor Joey Teran, she is working on a potentially groundbreaking algorithm that will allow the computer to simulate how human muscle behaves, which will help train doctors in virtual surgery simulations. Based on multigrid methods pioneered by Department guest professor Achi Brandt (The Weizmann Institute of Science, Israel), Yongning is developing faster, more efficient numerical methods for multigrid solvers for PDEs. After the algorithm is stable and tested, the simulation will be implanted for the new multi-core computer platform being developed by Intel to substantially increase processing speed. Says Joey, "If you want to do a full procedure on a really complicated piece of geometry like a heart, it's just too slow. That's where Yongning comes in – to make simulations run fast enough for the next generation."

Yao Yao: Somewhere Between Pure and Applied

Passionate about anime and the two-dimensional world, Yao Yao is also focused on mathematical problems that describe multiple behaviors in the physical world. Yao is working on a free boundary problem that involves nonlinear PDEs and applied analysis, research that falls somewhere between pure and applied mathematics. Yao was originally attracted to the applied math, image processing world but then became interested in applied analysis after taking a measure theory course with Assistant Professor Inwon Kim, who is now her advisor. Explains Inwon, "Yao was coming from an applied math context and I'm the most borderline faculty, so to speak." Applied analysis models involve material sciences, physics, and fluid dynamics, for example, but the tools that these borderline researchers use often come from pure math. Yao is working with Inwon and mathematical physicist Professor Lincoln Chayes on a phase transition model describing ice freezing and formation of snow crystals. The problem also has connections to motion of droplets, which interests Lincoln and other probabilists. The method combines probability, specifically interacting particles, and nonlinear PDEs to generate a good approximation for understanding freezing.

undergraduate news

Coming Soon: Financial Actuarial Math Major

For the past nine years, the Department's actuarial science program has grown substantially both in enrollment and in successful placement of graduates. More than 40 of its graduates have entered the actuarial profession, filling a critical need for actuarial expertise in Southern California and the West. The Department currently offers an actuarial plan option under its math/applied science major, consisting of two courses, which cover subjects that are the foundation for an actuarial career.

Given the strong marketplace and increasing student demand for a more comprehensive actuarial program, the Department will embark on a major expansion. Over the next three to four years, UCLA mathematics plans to roll out several additional actuarial classes with the aim of offering a financial actuarial mathematics major. These courses will cover all the subjects in the preliminary examinations for membership in the Casualty Actuarial Society and the Society of Actuaries. In addition, a field study course is being planned to help students gain practical experience in the actuarial field.

UCLA math alumni panelists

Disaster L.A.: Students Save the Day with Math

This summer, UCLA mathematics and Harvey Mudd undergrads, under the direction of applied math faculty Professor Andrea Bertozzi and Assistant Adjunct Professor Martin Short, devised sophisticated mathematical approaches for responding to a fictional terrorist attack on Los Angeles. Their REU project, funded by a joint Army Research Office grant (UCLA, Brown, USC) employs powerful new algorithms to: detect Internet-based attacks, specifically denial of service attacks on law enforcement emergency response systems; implement environmental boundary tracking in the event of multiple dirty bombs, using futuristic robots with Geiger counters and flight capabilities to ensure efficient emergency evacuation; predict crime dynamics neighborhood-by-neighborhood for efficient allocation of law enforcement resources to hotspots; implement video-tracking capabilities that can detect potential terrorists who leave suspicious packages in high-value target areas, such as LAX; and maximize the efficiency of sensor networks involved in tracking by employing smart sleeping policies to conserve network power.

Graduating Students Take Top Honors:

■ **Daus Prize Wen Jia Meng** is a mathematics/economics major, maintaining a 4.0 GPA in both her major and cumulatively. She plans to pursue a career in actuarial science. ■ **Sherwood Prizes: Miles Lopes** notably completed honors courses in algebra and analysis with a 4.0 mathematics GPA while also pursuing a physics degree. His post-graduate plans include work for the U.S. National Park Service in Yosemite Park before beginning a PhD program in math next fall. ■ **James Von Brecht** is a departmental scholar in applied math, who also earned departmental honors and was an involved member of Phi Beta Kappa. He will pursue a PhD in applied math at UCLA. ■ **Vladislav Voroninsky** is a departmental scholar in applied math and received Latin honors, graduating summa cum laude. He will pursue a PhD in applied math at UC Berkeley. ■ **Ira Boyle Transamerica Scholarship: Andini Wibowo** is a double major in mathematics/economics and statistics, receiving a 4.0 in both majors. She will graduate with highest college honors and recognition on the dean's honors list. She plans to pursue a career in actuarial science.

Career Day with UCLA Math Alumni

In May, math majors gathered to hear successful UCLA mathematics alumni share how their math degrees are paying off in the real world. The panel included Susan Everingham (RAND), Roni Fischer (rlf associates, inc.), Lindsay Henson (Cornerstone Research), Hayward Kaiser (Mitchell Silberberg & Knupp, LLP), Caline Khavarani (Hawthorne High), Harry Kraushaar (Rubicon Resources), Nick Marechal (The Aerospace Corporation), James Park (Watson Wyatt Worldwide), and Doug Tung (CircleUp.com). Alumni represented a wide range of professional backgrounds, including aerospace technology; actuarial science; computer and Internet technology; economic, financial and strategic consulting; entrepreneurial ventures; finance; management consulting; research and policy; strategic planning; and teaching.

If you are interested in participating on our 2009 alumni panel, contact Lisa Mohan at lisam@ucla.edu.

Former Track Coach Makes Great Run at 2008 Commencement

UCLA mathematics alum and one-time UCLA varsity letterman and track coach Winston C. Doby made a passionate pitch to math grads to consider careers in teaching. Vice chancellor of student affairs at UCLA for 20 years, Winston played a prominent role in improving K–12 education in California, including the creation of California Teach, a program that aims to significantly increase the number of science and math teachers graduating from UC campuses.

Spotlight on Students

Nizar Amoussa
Mathematics of Computation

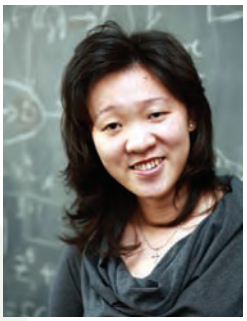
After immigrating to California from Syria, Nizar Amoussa worked to establish himself and his family, taking a series of part-time jobs. Then he turned to Citrus Community College and enrolled in a calculus class. Nizar's love of math became a turning point in his fortunes. He reduced his hours as a cashier and increased his hours as a math tutor, racking up a series of awards, including a scholarship from JPL that allows him to do summer research at Caltech. His project working for a geology professor incorporates math, thermal dynamics and programming, which combines Nizar's interest in computer science and math. Says Nizar, "I like to be creative in my work and I like math because of that." The mathematics in computation major in the Department was a perfect fit, and Nizar transferred to UCLA. He considers math professor Rodolfo De Sapio his ideal instructor, citing his accessibility during office hours and his real analysis course. Nizar went on to do extra credit work for Rodolfo as well as for postdoc Virginia Pasour, who taught numerical analysis. Nizar has signed on to be the Undergraduate Mathematics Students Association's social director next fall and will be increasing the math club's profile on Facebook. He also plans to get his master's in math at UCLA.

Marla Mattenson
Math-Applied Science

At 37 years old, Marla Mattenson defies the math student stereotype. A former birthing coach, massage therapist and one time journalism major, Marla graduated in June and has been accepted to Claremont Graduate University, having secured a prestigious Math for America fellowship funded by former mathematician-turned-billionaire hedge fund manager, Jim Simons. At Claremont, Marla is getting a dual master's in education and math, while teaching math at LAUSD's new Helen Bernstein High School. Her math journey began in a community college chemistry class, which she was taking toward a potential medical degree. She loved the math behind it. Says Marla, "That's when I really lit up." After she transferred to UCLA as a math major, her ensuing years were filled with dramatic turns, including temporarily switching to sociology. When she had an epiphany that she wanted to finish in math, the Department enthusiastically welcomed her back. With the support of Math for America, Marla is looking forward to bringing her special spirit to math education: "I feel that teaching math is probably one of the most creative things I can do." She will be returning to the Department to teach her successful undergraduate workshop: The Math Anxiety Cure: Even Math Majors Get Math Anxiety.

Meghana Reddy
Applied Math and Electrical Engineering

Meghana Reddy is a strong advocate for young women in math and science and had a perfect role model early on: her mom, who is a top computer programmer for the Los Angeles County Internal Services Department. Starting out in pure math, Meghana transferred into the school of electrical engineering, but liked math so much, she added applied math for a double major. Last summer, Meghana put her numerical analytical skills to work at NASA's Ames Research Center in Silicon Valley, where she developed algorithms for a data-mining program that classifies military and commercial airline safety reports. She is in awe of the strong female leadership at NASA, as well as the support of UCLA mathematics professors like Luminita Vese. Says Meghana, "Professor Vese always comes to the Women in Math get-togethers and she's just really encouraging." Her junior year Meghana will resume her position as president of the Undergraduate Mathematics Students Association, where she plans to continue to push for inclusiveness, as well as different experiences. Last year they went to see the award-winning play Proof. Says Meghana: "We were able to see math in a very different way through theater."



Andini Wibowo
Math-Econ and Statistics

Having already passed three actuarial exams and studying for her fourth, Andini Wibowo is a passionate proponent of her future profession. She also likes that being an actuary is unusual, especially in her native Indonesia. Says Andini, "Everybody knows what a doctor is, right? I'm an actuary. I say that it's basically risk analysis and you predict when people die. And then people start talking to me more." Last summer, she interned at Hewitt Associates in Newport Beach, working in retirement consulting. She credits Assistant Adjunct Professor Long Koong, who teaches the Department's actuarial courses, for sharing his experience. Says Andini, "Other math classes are so quiet. But Professor Kong points to people and says, 'So what do you think is the next step?' He's amazing. He talks about his work as a real consultant." As former president of the Actuarial Club, Andini organized the club's first alumni dinner last year and is looking forward to another first this fall: the Actuarial Career Fair. She also plans to come back to teach exam seminars to aspiring UCLA mathematics actuaries, even when she starts a full-time position: "This is my passion."

math education

Keynote speaker Zalman Usiskin, Professor Emeritus Phil Curtis, Curtis Center Executive Director Heather Calahan and Department Chair Christoph Thiele

Celebration of Phil Curtis' 80th Birthday and Center Inauguration

Second Annual Mathematics and Teaching Conference

In March, friends, research colleagues and math education leaders gathered to inaugurate the center's opening and honor Professor Emeritus Phil Curtis on the occasion of his 80th birthday. A special pre-conference focused on Phil's research area of Banach algebras, and participants reflected on his outstanding contributions to the field. Bill Bade (UC Berkeley), Phil's longtime collaborator, wrapped up two days of math talks with reminscences of 50 years of productive research and family backpacking trips to the Sierras, fondly recalling the "genius of Phil" for supplying the group with a wine mule. Still passionate about mathematics, Phil continues to look ahead: "There are still many unsolved problems. In particular, someone's got to settle the question: Is there a weakly amenable uniform algebra different from C(X)?"

Following the research meeting, over 225 mathematics teachers, educators and mathematicians from Southern California gathered for the main conference to discuss strategies for energizing mathematics classroom instruction. Highlights included the keynote talk by University of Chicago Professor of Education Zalman Usiskin on: The Current State of Middle School and High School Mathematics in Our Nation. The conference also held an alumni reunion for the Department's math education program. Says Executive Director Heather Calahan, "Our alumni gave presentations on what they had learned teaching in the classroom. It was a wild success. And we'll be doing the same thing next year." The center also established The Philip C. Curtis Jr. Mathematics Teacher Leader Award, which will be presented to an alumnus at next year's conference.

Progress Report

Los Angeles Math Circle (LAMC) Scores

The LAMC team, represented by Alexandre Boulgakov, Jeff Manning and Patrick Chen, placed in the top 1 percent nationwide in the 59th Annual American Mathematical Contest for grade 12. The competition for grades 10 and 12 (AMC 10/12) is the first of a series of contests sponsored by the Mathematical Association of America. Twelve LAMC students went on to the second stage of the contests, the American Invitational Math Exam, by scoring in the top 1 percent of the AMC 10 or in the top 5 percent of the AMC 12. In this stage, Alexandre and Jeff were among 500 students in the country who qualified for the last stage of the nationwide competition, the USA Math Olympiad. Jeff Manning also received a first place prize, and LAMC student, Eureka Ma, received an honorable mention in the 10th Bay Area Math Olympiad.

Olga Radko, LAMC director

Mathematics Diagnostic Testing Project (MDTP)

MDTP welcomes new site director Mary Sirody, who has spent 10 years as a mathematics teacher leader, most recently at The Design High School, where she was director of instruction; and Granada Hills Charter High, where she was department chair. The project develops, distributes, scores, and reports the results of tests that measure student readiness for mathematics courses ranging from pre-algebra to calculus.

Teacher Continuing Education: Math Content Program for Teachers and Students (MCPT)

In November, the California State Board of Education adopted the algebra readiness program developed by MCPT Director Shelley Kriegler and Professor Emeritus Ted Gamelin, along with MCPT staff. Since then, sales of *Introduction to Algebra* by its non-profit publisher have surpassed $1.5 million. The text is now widely available to California public middle schools to increase the achievement of struggling students.

UCLA Mathematics Institute for Young Scholars: Summer 2009

The institute will be a five-week, day-long program for high school students under the direction of mathematical physicist Professor Lincoln Chayes. The program will

focus on probability, a topic largely outside the usual school curriculum. Students will attend course lectures taught by UCLA mathematics faculty, problem-solving sessions led by UCLA graduate students, and plenary seminars on a variety of topics. Scholars will also participate in a number of special outings, including a visit to IPAM's Research in Industrial Projects for Students (RIPS) program.

Undergraduate Math Teacher Preparation

This fall, the Department welcomes a record 47 mathematics for teaching majors. Last year, the Joint Math Education Program placed 13 graduates in local schools, including Crenshaw High, Hawthorne High, King Drew Medical Magnet, Lawndale High, Leuzinger High, West Adams, Wilson Preparatory High and Berendo Middle School.

Research in Math Education

Under the direction of Professor Emeritus Ron Miech and Lecturer Heather Calahan, UCLA math undergrads Beatriz Mendez and Stephanie Wu compiled research on how the infant brain learns mathematics. Their summer Research Experiences for Undergraduates (REU) project – Numerical Cognition: An insight on how the brain processes arithmetic – represents the center's foray into undergraduate mathematics education research. The center plans to grow the REU program to six students next summer.

For more information on the Curtis Center's present and future programs, contact Heather Calahan at calahan@math.ucla.edu and/or visit www.curtiscenter.math.ucla.edu.

alumni news

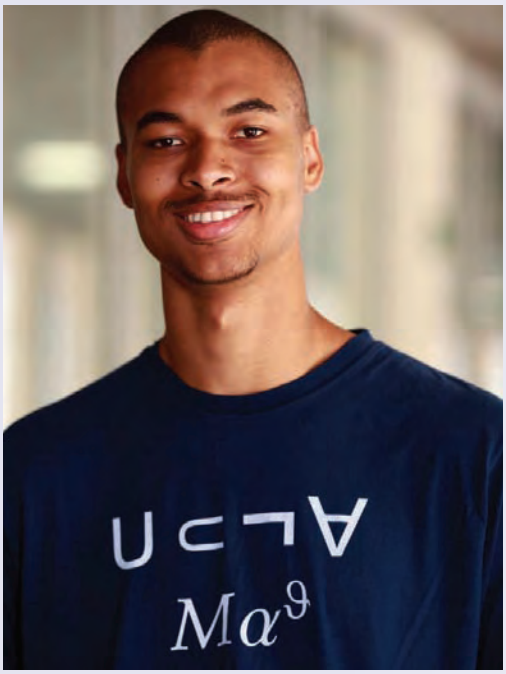
Alumni Make Waves

In February, the Academy of Motion Picture Arts and Sciences presented 1996 UCLA mathematics alum **Ron Fedkiw** with the Scientific and Engineering Award for his contributions to the development of the Industrial Light & Magic (ILM) fluid simulation system. Ron earned his PhD in 1996 under Professor Stanley Osher. ■ With the publication of her latest book, 1998 UCLA mathematics grad **Danica McKellar** continues her quest to help young girls discover the joy of mathematics. *Kiss My Math: Showing Pre-Algebra Who's Boss* challenges 7th to 9th graders to take on this next level of mathematics by giving them the tools to ace tests and homework in a unique just-us-girls style. Her first book, *Math Doesn't Suck: How to Survive Middle School Math Without Losing Your Mind or Breaking a Nail*, is a national bestseller. During her academic career, she co-authored the paper, The Chayes-McKellar-Winn Theorem. Danica is also known for her roles on the television series "The Wonder Years" and "The West Wing." ■ Former UCLA mathematics graduate student **Amber Puha** was awarded the Applied Probability Society (APS) Best Publication Award for 2007 for three papers with co-authors H. Christian Gromoll and Ruth J. Williams. Amber completed her PhD at UCLA under Professor Tom Liggett in 1998 and is currently an associate professor at California State University, San Marcos.

Contact Lisa Mohan at lisam@math.ucla.edu with your news. We want to hear from you.

Keep Current with UCLA Math

Keep in touch and help us go green by updating your e-mail contact here:
www.uclalumni.net/MathUpdate



Math undergrad Daniel Stewart models the 2008 Department T-shirt.

Contact Lisa Mohan at lisam@math.ucla.edu for T-shirts and bags.

UCLA math tote bag. Made of durable and washable polyester in UCLA blue and gold, it unstuffs to a full-size shopping bag and stuffs back into an integrated sack. It also easily fits into your pocket, purse or backpack.

gifts

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Patty Boyle Establishes Endowment for Actuarial Science Program

UCLA alumna Patty Boyle has made a substantial commitment to the expansion of the Department's undergraduate actuarial science program through the creation of the **Ira and Patty Boyle Endowed Actuarial Science Fund**. The program would not be possible without the efforts of Patty's late husband, Ira Boyle. Both Patty and Ira graduated Phi Beta Kappa and summa cum laude from UCLA in 1972; Ira with a BS in mathematics, and Patty with a BA in psychology. Following graduation, Patty returned to UCLA to earn an MA in special education, while Ira went to work for Transamerica Life Companies, becoming a Fellow of the Society of Actuaries in 1976. One of Ira's responsibilities at Transamerica was to recruit new actuaries. This proved challenging, as existing actuarial college programs were concentrated in other parts of the country, and few prospects were willing to relocate to Los Angeles. Sensing an opportunity, Ira approached his alma mater about offering classes, and the actuarial studies program in the Department was born.

Following his death at the age of 42 in 1993, Transamerica established the Ira Boyle Transamerica Scholarship to honor Ira. The scholarship is awarded annually to a UCLA math student who demonstrates excellence in the pursuit of actuarial studies. Two additional funds, the Ira L. Boyle Memorial Fund and the Ira L. Boyle Endowment for Actuarial Science and Mathematics, were created to provide support for actuarial exam fees and club activities; and for the purchase of books, periodicals and study materials. In June 2008, Patty continued her husband's legacy and made a lasting commitment to the program with her generous $100,000 endowment.

Patty Boyle presents the Ira Boyle Transamerica Scholarship to Andini Wibowo at commencement

Patty is on the board of Women in Philanthropy at UCLA and a member of the Chancellor's Associates. Continuing in their parents' footsteps, son David is a UCLA alumnus and daughter Rebecca works as an actuary.

Special Thanks A generous gift was made in loving memory of Bernadine Sorgenfrey-Weston and former UCLA mathematics professor Robert Sorgenfrey by Bernadine's husband, Professor Emeritus **John Fred Weston** (Anderson School); her niece, **Sybil Bowers Momii**; and her grand nieces, **Cristina Feldott** and **Jessica Wright**. The gift to the 2008 Sorgenfrey Teaching Awards continues the family's generous support of the awards, which were established in 1996 to honor exemplary teaching in the Department. ■ UCLA mathematics alumni **Demetrios Brizolis** and **Dan D. Gutierrez** helped us achieve our $50,000 endowment goal for the Horn-Moez Prize for Excellence to support our graduate students. ■ Alumna **Deborah Janes** and her employer Microsoft Corporation made a substantial gift-in-kind donation of Microsoft Office Professional software. ■ An anonymous tribute gift was made in support of Professor V.S. Varadarajan's 70th birthday conference: Symmetry in Mathematics and Physics. ■ **S. L. and Betty Huang** provided generous graduate student support by funding annual awards in mathematics. This year's recipient was Zaher Hani, a student of Professor Terry Tao. Tim Austin was the 2007 awardee.

UCLA Math Alumni Couple Make Commitment to the Curtis Center

UCLA mathematics alumni Judy and Roy Glickman have made a substantial gift to The Philip C. Curtis Jr. Center for Mathematics and Teaching to support the Los Angeles Math Circle (LAMC), one of the center's K-12 student outreach programs, which showcases "beautiful" mathematics to local middle and high school students. The former Harvard-Westlake School mathematics teacher and her husband, who graduated from the UCLA School of Law, met in 1967 as undergraduate UCLA math majors. Two years later, in 1969, they were married. This February, the couple re-enacted their engagement outside Boelter Hall and made a new commitment to the Curtis Center with a $50,000 donation to the LAMC. The weekly math circle brings together math faculty members and lecturers and local middle and high school students to discuss classical mathematics topics, solve problems and train for competitions. Through the Glickmans' generous gift, young students who love math will have the unique opportunity to experience mathematics taught by university-level mathematicians.

Roy and Judy Glickman

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If your name should appear on this list, contact Lisa Mohan at lisam@math.ucla.edu. Gifts made after June 30, 2008, will appear in our fall 2009 newsletter.

Dear Friends, Colleagues, Students and Alumni:

I invite you to enjoy our annual edition of *The Common Denominator*, where we highlight the spectacular wave of momentum that UCLA Math continues to ride following the 2007 AMS award for exemplary achievement in a math department. This last year we achieved new heights with higher rankings for our graduate program, the addition of talented new researchers, prominent awards and new leadership roles for our faculty, and a place on the national stage for our math education programs.

From 2006 to 2008, *U.S. News & World Report* reported UCLA Math moving up in the rankings of best graduate schools, both overall and across research fields. Three new faculty hires promise to bring more of this renewed energy to our algebra, probability and topology groups. Among a wealth of faculty awards this year, the election of professors Tom Liggett and Terry Tao to the National Academy of Sciences last spring is particularly notable. Tom and Terry are two of only three UCLA professors who were elected to the academy this year.

We also welcome fellow colleague Mark Green back to the Department, as he ends his remarkable reign as founding director of UCLA's renowned NSF-funded math institute, IPAM. At the same time, we celebrate the appointment of Professor Russ Caflisch as IPAM's new director following a national search. I am particularly proud that two of our own have assumed key roles in one of the most innovative math institutes in the nation. Mark's visionary leadership and Russ' selection perfectly demonstrate the deep bench of mathematical talent we have in the Department. In light of recent world developments, UCLA mathematicians and IPAM promise to figure even more prominently in critical solutions to some of the nation's biggest challenges, including alternative energy and risk management.

Equally gratifying is seeing concrete results of the Department's commitment to the mathematics leaders of the future in our K-12 community. Students participating in the Los Angeles Math Circle, a program run by our math education center, scored in the top 1 percent nationwide and ranked first in Southern California in mathematics competitions.

Finally, I am thrilled to share another wave of momentum. Last year, the Department more than doubled our donor base thanks to the enthusiasm and commitment of our generous alumni and friends. There is certainly no better gauge of our success than your personal investment in our mission to advance mathematics for the benefit of our scientific community, the economic vitality of the region and our cultural progress.

Thank you for continuing to be a part of our journey.

Best regards,
Christoph Thiele

UCLA Department of Mathematics

Fall 2008 Newsletter

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