Fine LETTERS
Spring 2013, Issue 2
Department of Mathematics Princeton University

Department Chair's letter

This was a great year, though one of major transition. Our department welcomed two outstanding young stars to the senior faculty; Sophie Morel who arrived in September and Mihalis Dafermos *01 in January. In addition Sucharit Sarkar *09, Vlad Vicol, and Alexander Sodin joined us as assistant professors, Mihai Fulger, Niels Moller, Oana Pocovnicu, and Bart Vandereycken as instructors, and Stefanos Aretakis and Nicholas Sheridan as Veblen Research Instructors.

John Conway and Ed Nelson will retire at the end of the academic year joining Bill Browder *58 and Eli Stein who became emeritus last year. They are/were core faculty; stalwarts in research, mentorship, leadership and teaching. We will miss their regular departmental involvement though we look forward to their presence, insights and wisdom for many years to come. Andrew Wiles and Ingrid Daubachies transferred to emeritus status. Approximately two to three years ago they had moved to Oxford and Duke respectively. They continue to have our very best wishes in these positions. Finally, we note the passing of two mathematical giants; long time faculty member Arthur Wightman *49 (Professor, joint with Physics, 1949-1992) and William P. Thurston (Professor, 1974-1991).

Our department's alumni and faculty won many high recognition awards. These include the Nobel prize for Lloyd Shapley *53 for his work with David Gale *49 and a MacArthur Fellowship by Maria Chudnovsky *03. Of the first seven inaugural Simons Investigator awards in mathematics two were won by our faculty members Manjul Bhargava *01 and Amit Singer and two others by alumni H. T. Yau *87 and Terry Tao *96. Among many other faculty honors, Yasha Sinai won a lifetime achievement award from the AMS.

We had major changes in our administrative staff. In September, Scott Kenney, our beloved Department Manager of 25 years transitioned to Special Projects Manager. We hired Kathy Applegate, our fourth Department Manager in almost 80 years. As many of you know, Chairs in our department come and go but it is the Department Manager who de facto represents the department to the outside world. It's clear that we made a terrific choice and the department is in excellent hands.

Josko Plazonic, our remarkable Systems Manager of 12 years, moved next door to PICsciE. Our long time business manager Dona Vukson retired and we mourned the loss of faculty assistant Frances Wrobleski.

Jean Pierre Serre gave the inaugural Minerva Lecture series. He was followed by Ian Agol and Terry Tao *96. We are grateful to the Fernholz Foundation for enabling these well-received, exciting lectures.

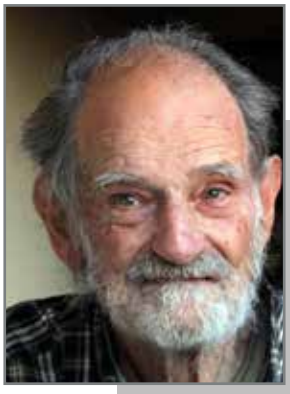
We are also grateful for a major contribution to the Class of 1971 Endowed Fund for Mathematics that provides discretionary support "to strengthen the mission of the Department of Mathematics."

I became Chair on July 1, 2012 following Alice Chang's three-year term. She faced the financial crises and its many ramifications, oversaw generational change in the leadership of the undergraduate program, introduced the Minerva program and made important administrative reforms. I am thankful for this as well as the many hours she spent informing me about the Chair office.

Walking the corridors of Fine Hall, I'm overcome observing nearly everyone - from senior faculty to junior faculty to graduate students to some undergrads - pushing themselves to open new mathematical frontiers and to address the most fundamental mathematical issues of the day. And yet they are immensely friendly and, when called upon, are always very helpful to do what is needed to carry out our research, mentorship and teaching mission.

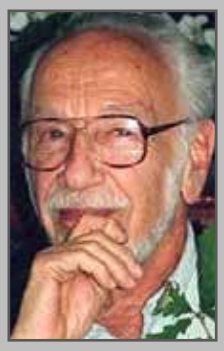
We have great faculty, students and staff, but face many challenges going forward. I'd appreciate hearing your thoughts, ideas, and stories. Feel free to write even if you are just interested in reconnecting with us.

David Gabai *77, *80, Chair
gabai@princeton.edu



Nobel Prize for an alumnus

Lloyd Shapley *53, won the 2012 Nobel Prize in economics for work he did in collaboration with another of our alumni, **David Gale *49**. Both were graduate students in the mathematics department at Princeton at a time when the field of Game Theory was emerging and some of its greatest names were here.



David Gale *49

Shapley, currently a professor emeritus of economics and mathematics at UCLA, shared the prize with Alvin E. Roth of Harvard. David Gale, who died in 2008, was a professor at UC Berkeley, and, like Shapley, had joint appointments in the departments of economics and mathematics.

For the complete Nobel citation go to:
http://www.nobelprize.org/nobel_prizes/economics/laureates/2012/




New appointments

New Professors

Mihalis Dafermos is a rising star in the field of General Relativity—a branch of mathematical physics which studies gravity and gravitation waves as a geometric property of space and time; the program was first initiated by Einstein in 1916. The field has been a central area of research in physics and, gradually over time, has developed to become a central branch of research in mathematical physics.

Dafermos earned a B.A. summa cum laude in mathematics from Harvard, in 1997 and a Ph.D. from Princeton in 2001, with Demetrios Christodoulou as his thesis advisor. He comes to Princeton from Cambridge University.

Sophie Morel is a world-leading mathematician who works in the fields of automorphic forms and algebraic geometry. Her work naturally intersects with topology, representation theory and number theory. She has made major advances in the theory of Shimura Varieties which, in turn, have been central to many recent developments in the Langlands Program.

Morel obtained a diploma in mathematics from the Ecole Normale Superieure in Paris in 2003, and a Ph.D. from the Universite Paris-Sud in 2005 (advisor: Gerard Laumon.) Before coming to Princeton, Morel was a professor at Harvard.

2013-2014 administrative positions

Chair: **David Gabai**

Associate Chair:
Christopher Skinner (F 2013)

Directors of Graduate Study:
Alex Ionescu and Nicolas Templier

Department Representative:
János Kollár
Associate Representative:
Jennifer Johnson

Senior Advisor: **John Mather**

Junior Advisor: **Tasho Kaletha**

Placement Officer: **Vlad Vicol**

Department Manager:
Kathleen Applegate

Administrative staff changes

Scott Kenney, our Department Manager for 25 years, stepped down from that position in September 2012. Scott, who came to the University in 1984 and worked in the former Statistics Department and the Office of the Registrar before coming to the Math Department in December 1986, has assumed a half-time position as Special Projects Manager in our department and calls it the best of both worlds: he remains in the department he has loved for the last 26 years and is now able to travel extensively with his wife, embrace the joys of being a grandparent, and spend more time pursuing his other interests.

Kathleen Applegate became our new Department Manager in September, coming to the Math Department after a position in the Teacher Preparation Program. She has been with the University since 1997, working in the Office of General Counsel and the Program in Law and Public Affairs. Kathy has a J.D. from Rutgers University and has served on many University committees, including as Co-Chair of the Academic Managers Group.

Josko Plazonic, our Systems Manager, accepted a new position with the Princeton Institute for Computational Science and Engineering (PICSciE). His last day was April 12, 2013.

Josko began his tenure in the Math Department as a graduate student in September 1995. After his obligatory military service in Croatia in the late-1990's, Josko returned to Fine Hall and became our Systems Manager in 2001.

Dona Vukson, Business Manager, retired in October 2012. She had been with the Math Department since November 1996 and served as the Assistant Department Manager for many years before becoming our Business Manager in the fall of 2011. Dona worked for the University for over 46 years and, prior to joining our department, worked in the Plasma Physics Laboratory, the Physics Department, and the Office of the Dean of the Faculty.

Frances Wroblewski, a Faculty Assistant in our department since the Spring 2011, died after a brief illness in February. She was highly appreciated for her unique ability to produce complicated mathematical slides and technical papers and her artistic talent.

New appointments


Sucharit Sarkar


Vlad Vicol A


Alexander Sodin

Assistant Professors

Sucharit Sarkar

Low dimensional topology and gauge theory, in particular knot theory, Heegaard Floer homology and Khovanov homology.

Ph.D. Princeton University (2009); Bachelor of Mathematics, Indian Statistical Institute (2005). Ritt Assistant Professor, Columbia University (2009-2012); Postdoctoral Fellow, Mathematical Sciences Research Institute, Berkeley, California (2010). Awards: Clay Research Fellow, Clay Mathematics Institute, (2009-Present)

Vlad Vicol

Nonlinear Partial Differential Equations and, in particular, mathematical fluid dynamics.

Ph.D., University of Southern California, Los Angeles (2010); B.Sc. from Jacobs University Bremen, Bremen, Germany (2005). L.E. Dickson Instructor, University of Chicago (2010-2012).

Alexander Sodin

Analysis and its applications.

Ph.D.,School of Mathematical Sciences, Tel-Aviv University (2010); M.Sc., School of Mathematical Sciences, Tel-Aviv University, summa cum laude (2005); B.Sc., School of Mathematical Sciences, Tel-Aviv University, cum laude. Member, Institute for Advanced Study, Princeton (2010-12).

Instructors

Mihai Aurel Fulger

Algebraic geometry. Ph.D. from the University of Michigan (2012); M.S. from SNSF in Bucharest, Romania (2007); B.S. from University of Bucharest (2006).

Niels Martin Moller

Riemannian and Conformal Geometry, Nonlinear Partial Differential Equations, Mean Curvature Flow, Minimal Surfaces, Functional Determinants and Torsions, Dirac Operators, Q-Curvature, Representation Theory in Geometry, Mathematical Physics, Quantum Computers. Ph.D. from the Massachusetts Institute of Technology (2012); M.Sc. from Aarhus University, Denmark (2007); B.Sc. from Aarhus University, Denmark (20015).

Oana Pocovnicu

Dispersive nonlinear Partial Differential Equations. Ph.D. (with honors) from Universite Paris-Sud 11, Orsay, France; M.S. from Alexandru Ioan Cuza University, Iasi, Romania (2009); M.S. from Universite Paris-Sud 11, France (2008); M.S., Superior Normal School in Bucharest, Romania (2007); B.S. (with honors), Alexandru Ioan Cuza University, Iasi, Romania.

Bart Vandereycken

Numerical analysis and linear algebra, Computational differential geometry. Ph.D. in mathematical engineering from K.U. Leuven, Belgium (2010); M.S. and B.S. summa cum laude in Computer Science, option Mathematical Engineering (2005). Previous positions: Postdoctoral Researcher, Ecole Polytechniqeu Federale de Lausanne (2011-2012); Postdoctoral Researcher, ETH, Zurich (1/2011-7/2011).

Veblen Research Instructors

Stefanos Aretakis

Partial Differential Equations, Analysis, General Relativity, Differential Geometry. Ph.D. from University of Cambridge (2012); M.A.St. from University of Cambridge (2007); B.A. University of Patras (2006).

Nicholas Sheridan

Homological mirror symmetry and tropical geometry. Ph.D. from the Massachusetts Institute of Technology (2012); B.Sc. (Honors) from the University of Melbourne (2006).

Retired

John Conway

John Conway, who is retiring next year, has been famous not only for his wide and profound influence on mathematics, but also for his ability to introduce the beauty of mathematics to a wide audience thanks to his boundless, playful creativity. As a researcher in mathematics he has had impressive results in a wide range of areas from classical geometry to Group theory, Number theory, Algebra, and Game theory. He is probably the most popular representative of mathematics to those outside the field, managing to awaken not only their interest but even their enthusiasm.

John Horton Conway was born on 26 December 1937 in Liverpool. His interest in mathematics started very early; at the age of four he could already recite the powers of two. When, at age eleven, his headmaster asked what he wanted to do with his life, he replied: "I want to read mathematics at Cambridge." He entered Gonville

Continued on back cover

Elias Stein

Elias M. Stein was born in Belgium in 1931. His family immigrated to the U.S., and he attended the University of Chicago, where he earned his Ph.D. under Antoni Zygmund. Stein held positions at M.I.T. and the University of Chicago, then came to Princeton as a full professor of mathematics in 1963. He has been a professor here ever since. He served twice as chairman of the Princeton math department, and has served also on the editorial boards of the Annals of Mathematics, Princeton's Annals of Mathematics book series, and other publications. His honors include the National Medal of Science and the Wolf Prize. He has been a leading member of the Princeton mathematics department for half a century

Stein is a towering figure in analysis. He brought Littlewood-Paley theory from an obscure topic to a powerful new way of viewing functions. Together with Ray Kunze, he discovered a basic difference between the Euclidean and semisimple Fourier transforms. Twice, (with co-authors) he completely transformed our understanding of Hp spaces. He proved the first restriction theorem for the Fourier transform, opening up a subject that has occupied leading analysts for decades. He discovered a fundamental mistake in the celebrated, supposedly complete enumeration of the irreducible representations of classical Lie groups; and he exhibited new representations. Perhaps most strikingly, he perceived the profound interconnections linking analysis on nilpotent Lie groups to partial differential equations and several complex variables. The list of Stein's major discoveries could be continued at length.

Stein was the teacher of generations of leading analysts. His lectures are characterized by perfect clarity, concentration on essentials, and impeccable taste. In his interaction with students and co-workers he managed to convey the strong sense of optimism that is essential for mathematical discovery. He was a major influence on many lives.

Stein's books, including Fourier Analysis on Euclidean Spaces (with Guido Weiss), Singular Integrals, and Harmonic Analysis, are classics. These books have made it possible for mathematicians in isolated conditions, who have had no opportunity to work directly with Stein, to learn analysis at a high level and go on to do significant research.

In recent years, Stein has devoted great energy to creating a sequence of advanced undergraduate mathematics courses at Princeton, and writing (together with Rami Shakarchi) a four-volume set of accompanying textbooks, the Princeton Lectures on Analysis. The consensus of the students who took those courses, and of all who have read the Princeton Lectures, is that they set a new standard.

Reflections of an Emeritus by Edward Nelson

The physicist Sam Treiman once told a neighbor that the university was about to make him a professor emeritus. The neighbor said, "That's wonderful! They should have done that *years* ago!"

Teaching freshman calculus is fun, but it poses very different challenges from graduate teaching. A few years ago while grading the final exam, I felt an increasing sense of frustration that I couldn't articulate.

Finally I was able to put it into words: "I've been teaching these kids for forty years and STILL they don't understand!"

The high point of calculus teaching for me occurred on the first day of classes one year. I drew a parabola, found the slope of secant lines close to a point, and took the limit.

A student said, "Do you mean that is the *exact* slope of the tangent line? I didn't know you could do that! Can you do it with other functions too?" I knew that he was not a future mathematician, but I knew he was a fu-

Continued on page 8

Arthur Strong Wightman, Thomas D. Jones Professor of Mathematical Physics, Emeritus and former Chair of our department, died on January 13, 2013 at the age of 91.

Wightman, (1922 – 2013) founding father of Mathematical Physics

Wightman received his Ph.D. from Princeton in 1949 and joined the Princeton faculty that same year. He retired in 1992.

The field of modern mathematical physics was established at Princeton by Wightman in the 1960s when, inspired by the work of another Princeton mathematician, Eugene Wigner (Nobel Prize in physics), he originated the Wightman axioms which became the foundation of all later attempts to formulate a rigorous mathematical theory of relativistic quantum fields.

Through his wide-ranging activity at Princeton and at his summer schools in Europe he helped to develop the field of mathematical physics and to establish prominent research groups like those of David Ruelle in Paris, Juerg Froehlich in Zurich and Arthur Jaffe and Barry Simon in the USA.

His legacy is continued at Princeton by Edward Nelson, Michael Aizenman and Elliot Lieb.

The University flag over East Pyne was raised at half-mast in his memory between January 15-17 and a memorial was held on March 10 at the university as well as at the Institute for Advanced Study.

Moving remembrances by numerous prominent scientists are available on the Physics Department website at:

https://www.princeton.edu/physics/arthur-wightman/

William Thurston (1946-2012)

William Thurston was an eminent mathematician of immense vision, originality and breadth, who not only proved spectacular theorems, but also discovered many new subfields of mathematics and reinvigorated many others. Perhaps more importantly, he taught mathematicians to think in new geometric ways.

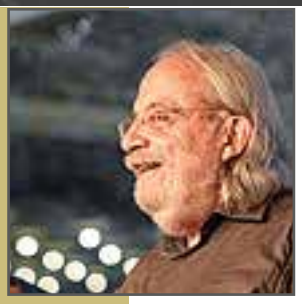
Thurston received his Ph. D. from Berkeley in 1971 under the supervision of Mo Hirsch, and, after brief stops at the Institute for Advanced Study and MIT, he joined the Princeton faculty as a full professor in 1974 and remained here until 1991. Soon after arriving at Princeton he developed his fundamental theory of automorphisms of surfaces and its central connections with Teichmuller theory. In the next few years, he formulated and proved major cases of the all-encompassing Geometrization conjecture (ultimately proved by Grisha Perelman) for 3-dimensional manifolds as well as formulating other major conjectures that were the driving forces for a torrent of research over the next 30 years. Subfields of mathematics, independent of geometrization, discovered or renewed in this period include the classification of Kleinian groups, theory of circle packings, orbifold theory, hyperbolic Dehn filling, volumes of hyperbolic 3-manifold, incompressible surfaces, and contact structures. In the 1980s he made fundamental contributions to the theory of rational maps and automatic groups.

Thurston was very generous with his ideas. He had 26 Ph. D. students from Princeton and 7 from other institutions, including William Goldman '77. Many of Thurston's students have become well-known mathematicians including three who are currently chairs at Princeton, Yale (Yair Minsky *89) and Stanford (Steve Kerckhoff *78).

His honors include the Veblen Prize (1976), the Waterman prize (1977), the Fields medal (1983), membership in the National Academy of Sciences (1983), the first AMS book prize (2005) (for his Three Dimensional Geometry and Topology based on courses he taught at Princeton), and the (2012) AMS Steele Prize for seminal contributions to research.

Thurston (front, center) with some of his students at the 60th birthday conference held in his honor at Princeton in June 2007. (1st row L to R) C. Hodgson, S. Fenley, R. Meyerhoff, R. Schwartz, B. Farb, D. Canary, Y. Minsky (2nd 3rd rows L to R) M. Bridgeman, B. Wang, S. Kerckhoff, S. Choi, D. Gabai, J. Weeks, G. Walsh, W. Goldman. **web.math.princeton.edu/conference/Thurston60th/**

Conference in honor


May 8-11, 2012

Speakers:

Alejandro Ádem
Ian Agol
Tony Bahri
William Browder
Fred Cohen
Jeremy Kahn
Robion Kirby
Peter Kronheimer
Robert Lipshitz
Dusa McDuff
John Morgan
Jacob Rasmussen
Douglas Ravenel
Nicolai Reshetikhin
Karen Vogtmann
Daniel Wise

Panorama of Topology

Conference on the occasion of William Browder's retirement

William Browder's mathematical work continues Princeton's long tradition of leadership in the field of topology begun by Alexander and Lefschetz. His profound influence is measured both by the impact of his work in the areas of homotopy theory, differential topology, and the theory of finite group actions as well as through the important work of his many famous students. He and S.P. Novkov pioneered a powerful general theory of "surgery" on manifolds which, together with the important contributions of Bill's student, D. Sullivan, and those of C.T.C. Wall, has become a standard part of the topologist's tool kit.

After early schooling in the Yonkers public schools, Bill entered MIT in 1951, following in the footsteps of his two brothers, Felix and Andrew. There, he majored in mathematics after a short flirtation with physics.

In 1954, he came to graduate school in Princeton where he received his degree in 1958. For his Ph.D. thesis, Bill investigated the homology of loop spaces based on a beautiful idea given to him by his advisor, John Moore. On the eve of Bill's departure to Rochester in August 1957, Moore discovered a flaw in his original idea. After the initial disappointment, Bill realized it was a blessing in disguise, as it led to the writing of a new thesis which he completed in a much more independent way. He considered this to be a significant point in

# of William Browder






his mathematical development.

Among the results of which Bill is most proud is his analysis in 1960 of the homology of H-spaces following the program begun by Heinz Hopf and Armand Borel. This led to the remarkable extension to H-Spaces of E. Cartan's famous result that the second homotopy group of a Lie group vanishes. Later in 1962, building on the work of Milnor and Kervaire, Bill showed that one could characterize differentiable manifolds in terms of homotopy theory. At roughly the same time, S.P. Novikov in Moscow obtained similar results independently. The work became known as Browder-Novikov theory and later, as surgery theory. Bill's famous book on the subject, "Surgery on Simply-Connected Manifolds," appeared in 1968.

In collaboration with Jerry Levine and Roger Livsey in 1963, Bill developed a new technique for codimension-one surgery, influential in the future developments by Siebenmann, Farrell, Novikov, and Wall.

Bill showed in 1967 that Kervaire invariant vanished in the important case of framed manifolds of dimension not equal to a power of two minus two. He did this by reducing the problem to homotopy theory and relating the invariant to the Adams Spectral Sequence. This led him to the discovery of a new and unexpected example of a framed manifold in dimension thirty with non-vanishing Kervaire invariant. Forty years after Bill's work, the vanishing of the Kervaire invariant was settled, in all but the single dimension of 1926, by the celebrated work of Hill, Hopkins, and Ravenel.

In his 48 years at Princeton, Bill served in various capacities in the Mathematics Department, including as Chairman. He also served as chairman of the Resources Committee of the University and as a member of the Concerts Committee. For a decade, he was an editor for the Annals of Mathematics.

Bill has advised 30 Ph.D. students and numerous undergraduates who went on to brilliant careers. Among his Ph.D. students is a recipient of the Fields Medal, two recipients of the National Medal of Science, and many others who have enjoyed distinguished careers.

The Minerva Lectures

The Start of a Tradition

The Minerva Distinguished Lecture Series, established last year, debuted in the fall with lectures by three prominent mathematicians.

The inaugural lectures were delivered by **Jean-Pierre Serre**, of the Collège de France who was in residence at our department between October 8 and 19, 2012. The topics of his three lectures were: Equidistribution, How to use linear algebraic groups, and Counting solutions mod p and letting p tend to infinity.

The second distinguished lecturer was **Ian Agol** of U.C. Berkeley whose lectures, presented at the end of October, focused on **3-Manifolds and the Virtual Haken Conjecture** and were designed to be accessible to a general mathematical audience at the level of a colloquium talk. The first lecture was an overview of 3-manifold topology in order to explain the meaning of Waldhausen's virtual Haken conjecture and Thurston's virtual fibering conjecture, and how they relate to other problems in 3-manifold theory. The second lecture gave some background on geometric group theory, including the topics of hyperbolic groups and CAT(0) cube complexes after Gromov. The third lecture discussed the proof of Wise's conjecture, that cubulated hyperbolic groups are virtually special. Part of this result is joint work with Daniel Groves and Jason Manning.

The third set of three lectures were delivered by **Terence Tao**, of UCLA in the second week of February 2013.

In his first lecture, Tao discussed the role of certain ingredients in the solution of two old problems: 1. an old problem of Dirac and Motzkin which seeks to determine the minimum number of ordinary lines spanned by n noncollinear points, and 2. an even older problem of Sylvester (the "orchard planting problem") which seeks to determine the maximum number of 3-rich lines. The second lecture gave an example of algebraic geometry being applied in modern combinatorics. The third lecture presented recent work of Tao and Van Vu, as well as parallel work of Erdos, Schlein, and Yau, on establishing several cases of a universality phenomenon.

Reflections of an Emeritus continued from page 4

ture something exceptional. In fact, he was Stanley Jordan (see Wikipedia.)

The high point of teaching a graduate course was when I was teaching differential geometry (not my main field). I worked out the formula for the motion generated by the Lie product of two vector fields, involving the limit of following the first flow for a very short time, then the second, then the inverse of the first, then the inverse of the second, and repeating a large number of times. The formula produced a muscular memory in my arms: it was just what you do when parking a car. I went to Woolworth's, then just across Nassau Street, and bought a toy car to demonstrate to the class, for which I received a sitting ovation.

I proved that it is possible to park in any space that is even slightly longer than your car; to learn how see physical pages 42-46 of www.math.princeton.edu/~nelson/books/ta.pdf

The most rewarding kind of teaching is the direction of Ph.D. theses. Among many highly enjoyable such adventures, one sticks out because Greg Lawler and I stumbled onto a strange and highly efficient procedure: I would suggest that he prove such and such and he would find a counter-example; then I would say that so and so could not be true, and he would find a proof. He finished his thesis on loop-erased random walks in jig time by this method.

I was the department's first webmaster, constructing the protocols, all but the final step of getting an IP address, to connect us to the World Wide Web. But the most rewarding administrative experience I had was one year when I was director of graduate studies. I would interview each graduate student. Michael O'Nan was one of them; this was back in the old Fine Hall. Something in his demeanor prompted me to call him back as he was about to leave. It turned out that he was unhappy with the thesis problem in analysis he had been assigned; what he really wanted to work on was finite groups. There was no one the department who could advise such a thesis. I made some phone calls (there was no email then) and arranged for him to work with Daniel Gorenstein. Michael's thesis was an essential step in the classification of finite simple groups.

Retirement means retirement from teaching and administration, not from doing mathematics!

Faculty awards and recognition

The 2013 AMS Leroy P. Steele Prize

Presented annually by the American Mathematical Society, the Steele Prize is one of the highest distinctions in mathematics. The prizes were awarded on January 10, 2013, at the Joint Mathematics Meetings in San Diego.

Yakov Sinai
2013 AMS Steele Prize for Lifetime Achievement

Yakov Sinai received the 2013 AMS Leroy P. Steele Prize for Lifetime Achievement. The prize was presented on January 10, 2013, at the Joint Mathematics Meetings in San Diego.

The citation notes the overwhelming influence of Sinai's work over the past half-century, including his more than 250 research papers and his several books. He supervised more than 50 doctoral students, many of whom have themselves become leaders of the field.

Philip Holmes
2013 AMS Steele Prize for Mathematical Exposition

Philip Homes and John Guckenheimer of Cornell, shared the 2013 Steele Prize for Mathematical Exposition. Holmes is the Eugene Higgins Professor of Mechanical and Aerospace Engineering, a Professor of Applied and Computational Mathematics, an associated faculty member in the Department of Mathematics, and a member of the Neuroscience Institute.

Holmes and Guckenheimer are honored for their book, Nonlinear Oscillations, Dynamical Systems, and Bifurcations of Vector Fields.

2012 Haim Nessyahu Prize

Professor **Alexander (Sasha) Sodin** was awarded the 2012 Haim Nessyahu Prize in Mathematics. Sodin's thesis, Random Matrices with Independent Entries, and Other Topics in Asymptotic Probability Theory, written under the supervision of Professor Vitali Milman at Tel-Aviv University deals with the statistical properties of large random matrices and their eigenvalues. Part of this thesis has been published in the Annals of Mathematics.

Dénes König Prize

Professor **Zeev Dvir** (jointly appointed Assistant Professor in the Mathematics and Computer Science Department) is the recipient of the Dénes König Prize for the 2012 year. The Prize is named in honor of Dénes König (1884-1944) a Hungarian mathematician and an early pioneer of discrete mathematics. He wrote the first book in the field of graph theory, and his name is associated with many fundamental results. The prize is named in his honor, as his influence over the field is still being felt.

Manjul Bhargava and Amit Singer appointed Simons Investigators

The Simons Investigator Award offers research support for five years. The award requirements are that a scientist be engaged in theoretical research in Mathematics and have a primary appointment as a faculty member at a U.S. institution. These appointments began on August 1, 2012.

Manjul Bhargava awarded the Infosys Prize 2012

Manjul Bhargava has been awarded the Infosys Prize 2012 by the Infosys Science Foundation in Bangalor, India. Now in its fourth year, the Infosys Prize ranks among the highest monetary awards in India that recognize scientific research.

The prize for each category includes a gold medallion, a citation certificate and a monetary award.

Alfred P. Sloan Research Fellowship

The prestigious two-year fellowship has been awarded to Assistant Professors

Zeev Dvir
Anna Wienhard

Manjul Bhargava NAS member

Manjul Bhargava was elected a member of the National Academy of Sciences on April 30, 2013.

Zhiwei Yun (*09) awarded the SASTRA Ramanujan Prize

The SASTRA Ramanujan Prize is awarded annually for outstanding contributions by young mathematicians to areas influenced by Srinivasa Ramanujan. Previous laureats with Ph.Ds from Princeton include: Terence Tao, Kannan Soundararajan, Manjul Bhargava, and Akshay Venkatesh

Alice Chang Elected to the Academia Sinica

Professor Alice Chang was one of 20 new Academicians and 1 Honorary Academician elected to the Academia Sinica (Taiwan, Republica of China.)

Honorary Degree for Paul Seymour

Professor Paul Seymour was awarded an Honorary Doctorate from the Technical University of Denmark at their commencement on May 3, 2013.

2012 MacArthur Fellowship for Maria Chudnovsky (*03)

The MacArthur Fellows Program awards unrestricted fellowships to talented individuals who have shown extraordinary originality and dedication in their creative pursuits and a marked capacity for self-direction.

http://www.macfound.org/fellows/862/

Sophie Morel receives EMS Prize for Young Researchers

Professor Sophie Morel has been awarded an EMS Prize for Young Researchers at the 6th European Congress of Mathematics in Krakow.

The citation reads: "*For her deep and original work in arithmetic geometry and automorphic forms, in particular the study of Shimura varieties, bringing new and unexpected ideas to this field.*"

The Junior Seminars by Tasho Kaletha, Junior Advisor

Junior seminars are an essential part of the undergraduate math program at Princeton. In fact, they are so essential that starting in the fall of 2013 each junior in the math department will have to take at least one junior seminar. Students who have not yet participated in a seminar might wonder how it differs from a normal course. The difference is quite significant. For one, the topics covered in seminars are rarely taught in classes. In the past these have included discussions on Spectral Methods in Data Analysis, involving cryogenic microscopy and the google search algorithm, Deligne's work on the Weil Conjectures, Arithmetic of Elliptic Curves, and Networks.

A maybe even more important difference is that in a seminar it is the students who give most of the lectures. The instructor will usually give the initial one or two lectures in order to introduce the topic and set up the base camp. From there on, each student is assigned a topic that they have to study independently and prepare a presentation on. While the mathematical material is often complicated, preparing and giving the presentation can be equally challenging. Being able to explain a piece of math to one's peers goes far beyond understanding it, and it is that ability that a student seminar is supposed to build and nurture. It does so in two ways, once with the oral presentation(s) that each student gives, and once with the short seminar paper that each student writes at the end of the seminar. The ability to communicate math in both verbal and written form is an essential part of being a mathematician. As Professor Bhargava likes to say, if you do some mathematics in the forest (or elsewhere…) and no one is there to see or hear it, did you really do it? But communicating mathematics is not only important for the mathematical community, it is also important for one's own development. It is sometimes said that to understand something well, you should try to explain it to someone else. It is often in the process of explanation that one has an epiphany (the sudden realization that one finally understood what was going on -- or even the sudden realization that one actually has no idea what is going on, contrary to what one thought earlier). The collegial atmosphere that develops in a seminar and the active participation of the students makes the learning experience quite unique and very rewarding and makes seminars very popular with students.

UNDERGRADUATE AWARDS

Class of 1939 Princeton Scholar Award

Juanhe Tan '13 was recognized by President Tilghman at the Opening Exercises on September 9, 2012 with the Class of 1939 Princeton Scholar Award.

The award is given to undergraduates who, at the end of their junior year, have achieved the highest academic standing for all preceding college work at the University. This year, the award was shared by Aman Sinha and Juanhe Tan. Juanhe Tan lives in Singapore and is an A.B. candidate in mathematics, pursuing a certificate in East Asian studies. Last fall, he received the Shapiro Prize for Academic Excellence.

Tan's research interests span overlapping areas in mathematics and philosophy, such as logic and the philosophy of mathematics, as well as algebra, number theory, epistemology, and metaethics. He is also interested in East Asian film and language. He plans to focus his senior thesis on logic, the foundations of mathematics or algebraic number theory.

Tan serves on the Committee on Undergraduate Admissions and Financial Aid, as treasurer of the East Asian music group Vtone, and as a peer tutor and peer academic adviser in Mathey College. He has also been a member of the Sympoh Urban Arts Crew and artistic director of the Princeton Chinese Theatre.

After graduation, Tan has committed to serving one and a half years in Singapore's military and six years in civil service, preferably in public policy.

Putnam Competition

The Princeton team earned an honorable mention in this year's William Lowell Putnam Mathematical Competition. Congratulations to **Bowei Liu** who had one of the top 25 individual scores and received an award of $250. Congratulations also to **Arku Adhikari**, **Wesley Cao**, **Alan Chang**, **David Corwin**, **Kubrat Danailov**, **Evgeni Dimitrov**, **Jay Hashop**, **Bumsoo Kim**, **Ante Qu**, **Zev Rosengarten**, **Alexander Smith**, **Matthew Superdock**, **Juanhe Tan**, and **Allen Yang**, who all earned an honorable mention for their individual scores.

Goldwater Scholarships

The Goldwater Scholarship, honoring Sen. Barry Goldwater, is a premier award for outstanding undergraduates interested in careers in mathematics, the natural sciences and engineering.

The 2012-13 winners are juniors **Eric Chen** and **Daniel Kriz**, both mathematics majors. Chen is from Lawrenceville, Ga., and Kriz is from Ann Arbor, Mich.

One- and two-year Goldwater Scholarships cover tuition, fees, room and board up to a maximum of $7,500 per year. The Princeton recipients are among 271 scholarship winners selected from a field of 1,107 students nationwide.

Recent Goldwater Scholars have been awarded 80 Rhodes Scholarships, 118 Marshall Awards, 110 Churchill Scholarships and numerous other distinguished fellowships.

Impressions from the summer RTG

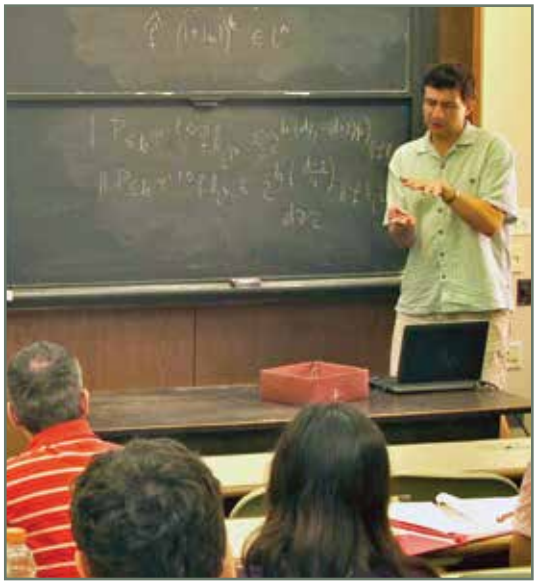
by a graduate participant, Alexi Harrington Hoeft, University of Virginia

Some of those who were at Fine Hall over the later part of the summer may have noticed a three-week resurrection in the afternoon tea-time at the department. This was due to the presence of about 20 late undergraduate and early graduate students from across the country participating in the NSF Research Training Grant (RTG) summer school in analysis and geometry hosted by the Princeton math department.

The first 10 days of the program focused on topics in harmonic analysis and featured two daily lectures by Princeton's Elias Stein—whose Princeton Lectures in Analysis were being used as texts for the course—and NYU Courant's Arie Israel, who had received his PhD in 2011 at Princeton under Charles Fefferman. The second half featured a shift in focus to nonlinear dispersive and and hyperbolic partial differential equations. The lecturers were Alexandru Ionescu and Sergiu Klainerman of Princeton and they gave a tantalizing taste of recent work done by the department's General Relativity and Analysis at Princeton (GRAP) research group.

In a world full of REU-type programs, this RTG summer school stood out as quite singular. Avoiding the standard practice of doling out summer-sized research problems—a format lending itself more naturally to areas such as combinatorics or applied mathematics—this program gave students a whirlwind tour of selected advanced topics in analysis and was at times able to offer glimpses of the current research frontier. The fast-paced lectures were supplemented by daily post-tea-time problem sessions led by the patient TAs, Phil Isett and Shiwu Yang, both graduate students at Princeton.

Beyond their roles as lecturers and TAs, the six leaders were also mentors. They joined the students for conversation at events in the Professor's Lounge on the 13th floor of Fine Hall or in the common room to learn about the students' motivations and future goals in analysis and give advice for choosing thesis topics or applying to graduate school. Also, the wide range of participant backgrounds and experience levels allowed for busy lunch hours in Frist exchanging tips or teaching each other the finer points from lecture. Around the department, there was the ever-cheerful smile and can-do support from the department's graduate administrator Jill LeClair, and the chance to learn local lore from the program's scientific coordinator, Kevin Hughes (Princeton PhD, 2012). And, happily, the tea-time cookies never failed to lure in the department's other graduate students or faculty members for some engaging conversation.



Summer Program For Mathematics Majors, 2013

This summer our department will support 14 undergraduate mathematics majors to participate in various research programs. Most of these students will be working with department faculty during a period of 8 weeks, some individually and others in groups. Often these projects are precursors to senior theses. This program is generously supported in part by the **Jaywood Lukens '30 Scholarship Fund, thanks to a bequest from Jane H. Lukens W30.**

Ryan Peckner

Ryan is in his third year of Ph. D. studies. He grew up in Los Angeles and completed his undergraduate degree at UC Berkeley. He has been performing regularly at our recitals.

I came to both math and the piano relatively late, not taking either seriously until I was in high school, and not coming to understand what either one is really about until several years after that. At first they both appealed to me on a purely technical level – math for its computational challenges, and the piano for the showy antics that so often take the place of actual music making. It was the combined effect of Scriabin's Vers la Flamme and Ravel's Gaspard de la Nuit that led me to see the far profounder possibilities of music. Scriabin and Ravel each had an amazing ability to find deeply human elements in the totally abstract – which is also what math is about in many ways, and why I think I find both it and music so compelling.

My single greatest mathematical inspiration, and the main reason I'm at Princeton, was the work of Katz and Sarnak connecting eigenvalues of random matrices to zeros of finite field zeta functions. I found their ideas, and the observations going back to the 70's on which they're based, to be beautiful, unusual and shocking in ways I'd never imagined math could be. Given that their work meant so much to me as an undergraduate, it was surreal at first to come here and start working with Peter Sarnak, and I had all sorts of wild mathematical ambitions since I really had no idea what goes into a PhD thesis. But Peter is a phenomenal advisor and knew how to ground me. He got me working on concrete, substantive problems – getting my hands dirty, as he says, and it's been incredibly rewarding to do so.

I think the beauty of number theory for me lies both in my fascination with the prime numbers and the way it applies techniques and ideas from other fields. Probability theory, harmonic analysis and Riemannian geometry are by now standard tools in a field that originated solely from curiosity about patterns in the integers! I've been working recently on the Möbius disjointness conjecture – a problem which is firmly rooted in basic ideas about the randomness of prime numbers, yet for which I've had to learn a great deal of abstract ergodic theory and homogeneous dynamics. I'm sure I would find these subjects interesting in their own right, but it's more satisfying to know while grappling with them that they may give me insight into the the number-theoretic questions I find so intriguing.

I try to stay social and active and pursue as many non math-related interests as possible while still getting work done. I find that constantly focusing my mind on a single pursuit quickly gets me stuck in an exhausting, unproductive loop, and my mathematical understanding tends to be much sharper when there's a broad variety of ideas and experiences to stimulate me. So if I were to deign to give advice to other students, it would be that when you're truly stuck (which is the case much of the time!), don't keep persisting on the same circular path. Look for other avenues, both within and outside of math, that can lead you to a fresh perspective on things. You may end up back where you started but at least you'll have good reason to have done so.

Giulia Sacca

Giulia is finishing her Ph.D this year. She is originally from Rome, Italy and completed her undergraduate studies at the Sapienza University of Rome. Her advisor is Gang Tian and her thesis topic is in Algebraic Geometry; moduli spaces of sheaves on surfaces.

I always had a lot of fun doing math in school, but it wasn't my main focus. I was very interested in other subjects like philosophy, history and art. It was therefore hard to decide what to do in college but I thought I would first give math a try. At the beginning of college, my grandmother gave me some books about differential geometry and Lie groups.

I remember getting really excited in a linear algebra class at the Sapienza in Rome, when the professor, Paolo Piccinni, showed how the lines in the projective plane could be thought of as points of a dual projective plane. That class and one on Riemann surfaces taught by E. Arbarello had a major influence on me. I was also impressed by an algebraic geometry class taught by Claire Voisin in Paris the year before I came to Princeton. I ended up with a passion for Geometry.

My career in mathematics continues a family tradition: my grandmother Ida Cattaneo Gasparini was a differential geometer and I always admired her very much (my grandfather Carlo Cattaneo also was a mathematician who did fluid dynamics and general relativity but I never met him). Like Claire Voisin, she had five children but also found time and energy to do mathematics!

I didn't like Princeton when I first came here, but it has grown on me very much since then and I think my years here have been overall very nice and I will remember them fondly. There is a particularly fun and stimulating atmosphere among the grad students in Fine Hall, which I think is not common in other math departments.

I am now looking forward to my three year post-doc at Stony Brook!

Friday, May 10 - The 2013 Annual Recital

From the director of graduate studies

Alexandru Ionescu

I've had a great first year as Director of Graduate Studies as I got to know many of our graduate students at seminars, training sessions, and informal lunches. It is a privilege to watch them interact with each other and with faculty, learn Mathematics, and become outstanding researchers. Also, it is a pleasure to work both with Nicolas Templier and Jill LeClair; their experience, competence, and dedication are priceless.

We are excited to welcome a large and diverse class in the Fall of 2013: 16 new graduate students will join us, one of the largest classes in recent years. We have had great support from the Graduate School and from our own faculty recruiting this extremely talented group of students. Graduate students bring so much energy and enthusiasm to the department!

The Open House is our annual event for students admitted to the Ph.D program to check out the Department and speak to faculty and graduate students in order to help form their final decision on what graduate program to attend. This year the event was extended from one day to two days so that any prospective students who wanted to could attend Thursday courses or seminars and also get to visit the Institute for Advanced Study. President Shirley M. Tilghman was an honored guest at our tea party.

The Graduate Open House March 2013

Excellence in Teaching

Shrenik Shah, currently a teaching assistant and 4th-year graduate student, has been honored by his students for excellent teaching in MAT 201: Multivariable Calculus.

Clay Research Fellowship

Aaron Pixton, a current 4th-year graduate student, has been appointed to a five-year Clay Research Fellowship beginning September 1, 2013.

Aaron Pixton will receive his Ph.D. in 2013 from Princeton University under the supervision of Rahul Pandharipande. His research is in enumerative algebraic geometry. The topics he has worked on recently include the tautological ring of the moduli space of curves, moduli spaces of sheaves on 3-folds, and Gromov-Witten theory.

Clay Research Fellows are selected for their research achievements and their potential to become leaders in research mathematics. All are recent Ph.D.'s, and most are selected as they complete their thesis work. Terms range from one to five years, with most given in the upper range of this interval. Fellows are employed by the Clay Mathematics Institute, which is a U.S. charitable foundation, but may hold their fellowships anywhere in the U.S.A., Europe, or elsewhere in the world.

Graduate Student Teaching Prize

Daniel Shenfeld won the first annual Graduate Student Teaching Prize. A special tea party was held on February 6th to celebrate the occasion.

From our alumni

With love from Canada by Donald.A.S Fraser *49

Thanks to Princeton Math for the very Fine Letters to us all, renewing our-bonds with the great. I arrived at the Department in '47 to study Analysis and Algebra but moved, laterally, to Statistics under Wilks and Tukey, enjoying the intellectual richness and freedom of PU Math, and then deeply missing the special place after the degree in '49! Fortunately I had a visiting appointment in '55, and then an opportunity to join senior faculty in '63, which regretfully I was unable to accept.

Donald A. S. Fraser *49 with wife, Nancy Reid, University of Toronto Professor in Statistics, at the ceremony for receiving the OC, Order of Canada, December 2011.

Statistics '47-'49 was largely Neyman-Pearson testing but with an openness to numerical issues and to a then current monograph by Jeffreys on Bayes. How could a discipline like statistics, with two theories that give contradictory results, be in Science; and indeed be in Princeton Math? But there was an openness to examine such intellectual conflicts, and this openness still provides great inspiration. There have of course been many constructs for a core theory of statistics, but strangely the frequentist-Bayes duality including contradictions is still powerfully present after all these years.

How can a split in theory survive so many years? Certainly there is a dominant feeling in the discipline that Statistics is just exploring, and even a cultural view that the frequentist-Bayes split doesn't really matter. But also there have been huge developments in theory: Emphasis has shifted from Normal-based to exponential-based models, both for theory and for exploration; Approximations based on the exponential are providing wide generality in applications; Saddlepoint methods introduced to statistics by Daniels in '54 were initiated generally by Barndorff-Nielsen and Cox in '79. These methods and extensions provide full third-order inference widely. And now there is an equivalence between the Bootstrap and the higher-order saddlepoint-based inference theory.

Indeed there is an emerging recognition that continuity provides the unifier: how could 65 years pass with the frequentist-Bayes contradictions, and with continuity largely ignored? If one recognizes the role of continuity, then the frequentist and Bayes approaches don't disagree. Indeed it brings into focus that seeking a distribution for an unknown parameter, no matter how much desired, is unreachable in general, whether this be as a confidence distribution or as a Bayes distribution. An element of this was identified by Dawid, Stone and Zidek in '73. The frequentist-Bayes contradictions have been resolved: what's next? Hopefully something without the internecine struggles, and maybe a shorter time frame!

Congratulations to our alumni elected to the National Academy of Sciences

Four of the eight mathematicians elected in 2013 are graduate alumni.

- Manjul Bhargava *01
- Greg Lawler *82
- Avi Wigderson *83 (CS)
- H. T. Yau *81

Our most recent graduates, their advisors, their theses, where they went after Princeton

Will Cavendish

D. Gabai. Finite-Sheeted Covering Spaces and Solenoids over 3-manifolds

Oxford University/Postdoctoral Research Fellow

Jonathan Luk

I. Rodnianski. Linear and Nonlinear Wave Equa-tions on Black Hole Spacetimes

UPenn/NSF Postdoctoral Research Fellow

Chi Li

G. Tian. Kahler-Einstein metrics and K-stability

SUNY/Stony Brook/Simons Instructor

Mohammad Farajzadeh Tehrani

G. Tian. On Moduli Spaces of Real Curves in Symplectic Manifolds

Cornell University/Visiting Assistant Professor

Kevin Hughes

E. Stein. Arithmetic analogues in harmonic analysis: Results related to Waring's problem

University of Edinburgh/ Postdoctoral Research Fellow

Mathematics + Motherhood

by Lillian Pierce *09

Lillian Pierce is currently finishing a postdoc as a Marie Curie Fellow and NSF postdoctoral fellow at Oxford. Next year she will be a professor at the Hausdorff Center for Mathematics in Bonn, Germany, and in 2014 she will join the faculty at Duke University.

I turned my Ph.D. thesis in to the mathematics department in early March 2009, and defended it in early May. In between, I gave birth to my first child. She learned to walk during my postdoc at the IAS; by the time she was saying "Mama," we moved to England for my postdoc at Oxford; a year later, I had our son.

We're a dual-career family: my husband is a neuroscientist. In the last four years, our careers have moved our family between apartments in Princeton, Oxford, London, Germany, New York, and San Diego. We've tried nannies, day cares, half-years of maternity and paternity leave, flying in family to help, flying to family for help. We are probably as proficient at managing our young family as we're going to get, but the fact is that even on days when no one has stomach flu, it still isn't easy. Partly there are just too many things that need doing on any given day. But also there is a melancholy thread that runs through our daily life: fundamentally, none of us, short or tall, is happy that we are separated, children from parents, all day.

Recently, I've recalled a concept I encountered in an undergraduate social psychology course at Princeton: cognitive dissonance. This refers to the discomfort we feel when we simultaneously hold two conflicting cognitions, such as: (+) my children would prefer to be with me all the time; (-) for many of their waking hours, I am at work. Psychological theory posits that people actively seek to bring their cognitions back into consonance by changing one of the cognitions, changing the weighting of the cognitions, or adding a new one.

I can add more cognitions. (+) Being a mathematician is my life dream. (+) I love the daily work of mathematics. (+) My well-paid, stable job is important to my family's financial well-being. (+) We are careful to hire the best care for our children that is available. (+) My children run to the door shouting with joy when their caregiver arrives in the morning. Consonance starts to return!

I like this paradigm as a way to identify the sometimes conflicting directions that ultimately combine to form the orientation of my internal compass. On some lucky days, I can add a cognition like (+) I think I'm close to a breakthrough on my project! Then I leave the house before breakfast, eager to get back to work. But on a recent difficult day, I had to weight (+) My collaborator has flown in from a different continent to work with me; (-) The nursery just called; my one-year-old son has a fever of 105 F. My husband was out of town; it was clear my baby was safe with his caregiver, but my internal compass said the dissonance was unsustainable. Even if I could have added (+) We're doing super-duper math, it wasn't going to help. I went home to hold my red-cheeked baby.

Day by day, we treasure our children and delight in their development, consciously absorbing the joy of the hours we do spend with them. Meanwhile, we keep moving forward, pace by pace, in our careers. It's worth it to us to have both aspects in our life. In fact, when it comes down to it, here's a cognition I really couldn't endure: (-) Not doing mathematics. Because here's another cognition that's been with me ever since I can remember: (+) Every time I return to the mental world of mathematics, I know I'm home again.

Our most recent graduates, their advisors, their theses, where they went after Princeton

Rodolfo Rios Zertuche

A. Okounkov. Near-involutions, the Pillowcase Distribution, and Quadratic Differentials

Princeton University/Lecturer; Brown University/Postdoctoral Fellow; Max Planck Institute for Mathematics/Visiting Post-doctoral Fellow (2014)

Stefan Patrikis

A. Wiles. Variations on a Theorem of Tate

IAS Member; Oxford University/Postdoctoral Research Fellow

Ilya Vinogradov

Y. Sinai. Effective Bisector Estimate with Application to Apollonian Circle Packings

University of Bristol/Postdoctoral Research Assistant

Xin Wan

C. Skinner. The Iwasawa Theory for Unitary Groups

IAS Member; Columbia University/Postdoctoral Fellow

Kevin Wilson

M. Bhargava. Three perspectives on n points P^{n-2}

Knewton/Data Scientist (NYC)

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Conway, continued from page 4

and Caius College, Cambridge, in 1956 and was awarded his B.A. in 1959. He began research in number theory supervised by Harold Davenport, received his doctorate in 1964, and, remaining at Cambridge, was appointed as College Fellow and Lecturer in Mathematics. He left Cambridge in 1986 to become the John von Neumann Chair of Mathematics at Princeton University, where he was always entrusted with the task of teaching pre-major mathematics courses.

Conway has been honored with numerous awards like the Berwick Prize (1971) the Pólya Prize (1987), the Nemmers Prize in Mathematics (1998), the American Mathematical Society's Leroy P. Steele Prize for Mathematical Exposition (2000). He was elected a fellow of the Royal Society of London (1981) and of the American Academy of Arts and Sciences (1992).

His proudest achievement is the discovery, in 1970, of a new system of numbers, the surreal numbers — a continuum of numbers that include infinitesimal and infinite numbers. Conway hopes that the surreals will find application in the near future.

New Undergraduate Course Offering Fall 2013: MAT 301
The History of Mathematics

Come to hear about research going on in Fine Hall, mingle with your old professors and meet future mathematicians. Refreshments will be served.

Alumni Open House

Friday, May 31, 2:00 p.m,

Fine Hall Common Room

President Tilghman addressing the students at our department's 2013 Graduate Open House.

Open House 2013
details on page 11