Mathematics People

2012 Simons Investigators Named

The Simons Foundation has named twenty-one mathematicians, theoretical physicists, and theoretical computer scientists as Simons Investigators for 2012, the inaugural year of the program. The Simons Investigators program provides a stable base of support for outstanding scientists, enabling them to undertake long-term study of fundamental questions. The names and institutions of the awardees whose work involves the mathematical sciences and brief excerpts from the prize citations follow.

MANJUL BHARGAVA of Princeton University pursues algebraic number theory and the geometry of numbers in the tradition of Gauss and Minkowski. His overarching goal in this work is to count the basic objects of number theory and to make computational conclusions about their asymptotics. For example, it is conjectured that, in a certain natural sense, the average rank of the group of rational points of an elliptic curve defined over the rationals is 1/2. Bhargava and his student Shankar recently showed that it is less than 1. Previously, it was not even known whether the average rank is finite. In joint work with Dick Gross, Bhargava has also shown that the number of rational points on the majority of hyperelliptic curves is bounded by a certain small number independent of the genus of the curve.

ALICE GUIONNET of the Massachusetts Institute of Technology has done very important work on the statistical mechanics of disordered systems (and in particular the dynamics and aging of spin glasses), random matrices (with an emphasis on the combinatorics of maps), and operator algebra/free probability. She has extended the large deviation principle to the context of Voiculescu's free probability theory, and, in collaboration with Cabanal-Duvillard, Capitaine, and Biane, she proved various large deviation bounds in this more general setting. These bounds enabled her to prove an inequality between the two notions of free entropy given by Voiculescu, settling half of the most important question in the field. With her former students M. Maida and E. Maurel-Segala and more recently with Vaughan Jones and D. Shlyakhtenko, Guionnet has studied statistical mechanics on random graphs through multimatrix models. Their work on the general Potts models on random graphs branches out in promising directions within operator algebra theory.

CHRISTOPHER D. HACON of the University of Utah has produced some of the most important contributions to higher-dimensional algebraic geometry since Mori's in the 1980s. Hacon and his coauthors have solved major problems concerning the birational geometry of algebraic varieties, including the characterization of irregular varieties, boundedness theorems for pluricanonical maps, a proof of the existence of flips, the completion of the minimal model program for varieties of general type, and bounds for the order of automorphism groups of varieties of general type. His work has also led to solutions of other problems, such as the existence of moduli spaces for varieties of general type and the ascending chain condition for log canonical thresholds.

PAUL SEIDEL of the Massachusetts Institute of Technology has done major work in symplectic geometry, in particular on questions inspired by mirror symmetry. His work is distinguished by an understanding of abstract algebraic structures, such as derived categories, in sufficiently concrete terms to allow one to derive specific geometric results. On the abstract side, Seidel has made substantial advances toward understanding Kontsevich's homological mirror symmetry conjecture and has proved several special cases of it. In joint papers with Smith, Abouzaid, and Maydanskiy, he has investigated the symplectic geometry of Stein manifolds. In particular, work with Abouzaid constructs infinitely many nonstandard symplectic structures on any Stein manifold of sufficiently high dimension.

AMIT SINGER of Princeton University works on a broad range of problems in applied mathematics, solving specific applied problems and employing sophisticated theory to allow the solution of general classes of problems. Among

the areas to which he has contributed are diffusion maps, cryoelectron microscopy, random graph theory, sensor networks, graph Laplacians, and diffusion processes. His recent work in electron microscopy combines representation theory with a novel network construction to provide reconstructions of structural information on molecules from noisy two-dimensional images of populations of the molecule.

TERENCE TAO of the University of California Los Angeles has produced more than 200 publications in just fifteen years, spanning collaborations with nearly seventy mathematicians and establishing himself as a major player in the disparate fields of harmonic analysis, partial differential equations, number theory, random matrices, and more. He has made deep contributions to the development of additive combinatorics through a blend of harmonic analysis, ergodic theory, geometry, and number theory, establishing this field as central to the modern study of many mathematical subjects. This work has led to extraordinary breakthroughs in our understanding of the distribution of primes, expanders in groups, and various questions in theoretical computer science. For example, Green, Tao, and Ziegler have proved that any finite set of linear forms over the integers, of which no two are linearly dependent over the rationals, all take on prime values simultaneously infinitely often, provided there are no local obstructions.

HORNG-TZER YAU of Harvard University is one of the world's leading probabilists and mathematical physicists. He has worked on quantum dynamics of many-body systems, statistical physics, hydrodynamical limits, and interacting particle systems. Yau approached the problems of the quantum dynamics of many-body systems with tools he developed for statistical physics and probability. More recently, he has been the main driving force behind some stunning progress on bulk universality for random matrices. With Laszlo Erdős and others, Yau has proved the universality of the local spectral statistics of random matrices, a problem that was regarded as the main challenge of random matrix theory.

SANJEEV ARORA of Princeton University has played a pivotal role in some of the deepest and most influential results in theoretical computer science. He started his career with a major contribution to the proof of the PCP (probabilistically checkable proofs) theorem, widely regarded as the most important result in complexity theory in the last forty years. The PCP theorem states roughly that every proof, of any length, can be efficiently converted into a special format in which correctness can be verified with high probability by reading small parts of it. The PCP theorem revolutionized our understanding of optimization problems and opened new directions in coding, cryptography, and other areas. Arora is also known for his breakthroughs in approximation algorithms, having solved long-standing open problems. Notable examples include his algorithms for the Euclidean traveling salesman problem and for the sparsest cut in a graph. He has made important contributions in many other areas, including the unique games conjecture (a conjectured strengthening of the PCP theorem) and the power and limitations of hierarchies of linear and semidefinite programs.

SHAFRIRA GOLDWASSER of the Massachusetts Institute of Technology has had tremendous impact on the development of cryptography and complexity theory. Starting with her thesis on "semantic security", she laid the foundations of the theory of cryptography. She created rigorous definitions and constructions of well-known primitives, such as encryption schemes (both public and private key versions) and digital signatures, and of new ones that she introduced, such as zero-knowledge interactive proof systems invented with Micali and Rackoff. Continuing her work on interactive proofs which allow a probabilistic polynomial time algorithm to verify mathematical proofs via interaction with a powerful prover, she and her coauthors extended the notion of interactive proofs to two-prover systems. They turned out to be of great significance in complexity theory, paving the way to the equivalent formulation of PCP. The expressive power of two-prover systems is huge (nondeterministic exponential time). Furthermore, she and her coauthors showed the connection between a scaled down variant of these systems and the hardness of approximation results for NP-hard problems, which led to the PCP theorem. On the algorithmic front, a problem of great significance is that of recognizing (and generating) prime numbers. Goldwasser and Kilian designed efficient probabilistic primality provers, which output short proofs of primality, based on the theory of elliptic curves. Together with Goldreich and Ron, Goldwasser originated the field of combinatorial property testing, devising a class of sublinear algorithms to test properties in dense graphs.

RUSSELL IMPAGLIAZZO of the University of California San Diego has made many deep contributions to cryptography and complexity theory. He and his collaborators showed that one-way functions exist if and only if pseudorandom generators exist. In other words, one can generate sequences of bits for which it is computationally hard to predict the next bit with accuracy much better than random guessing if and only if there are easy-to-compute functions that are hard to invert on the average. He also showed that there are worlds in which certain cryptographic primitives are strictly inequivalent. For example, there are worlds in which one-way functions exist but public-key encryption is not possible. One of his major contributions in complexity theory is the exponential-time hypothesis and its implications. The hypothesis states that there are problems for which it is hard to speed up the brute-force solution even by a small amount. Impagliazzo helped establish the first complete problem for this class. In joint work with Avi Wigderson, he showed that if there are problems in exponential time that require exponential-sized circuits to solve, then any efficient algorithm that uses randomization has an equivalent, efficient one that does not.

JON KLEINBERG of Cornell University is best known for his contributions in establishing the computational foundations for information retrieval and social networks. His information-retrieval work includes the use of link analysis (e.g., hubs and authorities) for ranking,

classification, and identifying web communities, the web as a graph, and understanding the success of latent semantic analysis. His work in algorithmic social networks (a field that he can be said to have started) includes the understanding of "small worlds" and decentralized search, analysis of bursty streams, and influence spread in social networks. Kleinberg has done work in many other fields, including approximation algorithms, communications networks, queuing theory, clustering, computational geometry, bioinformatics, temporal analysis of data streams, algorithmic game theory, online algorithms, and distributed computing.

Daniel Spielman of Yale University has done important work in theoretical computer science, applied mathematics, and operations research. His work on smoothed analysis of linear programming provides mathematical justification for why the simplex method to solve problems works well in practice even though worst-case analysis shows that there are instances in which it takes exponential time. A small random perturbation converts any linear programming instance into one that, with high probability, is solved efficiently by the simplex algorithm. Similar perturbation results hold for many other problems and provide an alternative to worst-case analysis, which may be too pessimistic. His codes based on expander graphs achieve near-optimal rate and nearly linear time encoding and decoding algorithms.

Michael Brenner of Harvard University has collaborated with biologists, physicists, and engineers from a variety of subfields. His work seamlessly integrates analytical and computational approaches to solve problems ranging from fundamental issues in fluid mechanics to engineering design to the evolution of protein functionality and from the aerodynamics of whale flippers to the ejection of fungal spores. Particularly noteworthy are his achievements in understanding the singularities and nonlinearities that control how droplets, jets, and sheets of fluid change shape and break up. His work in this area has potential impact for optimizing devices ranging from inkjet printers to cell sorters. His research has also led to the development of general methods for simplifying the dynamical models of many coupled oscillators that arise in contexts such as atmospheric chemistry.

Hirosi Ooguri of the California Institute of Technology is a mathematical physicist and string theorist whose work on Calabi-Yau manifolds has yielded important new insights into the D-brane structures crucial to string theory. His work on the relationship of supersymmetric gauge theories to string theory and to gravity has fostered the rapid development of the AdS/CFT correspondence, which relates quantum properties of gauge theories to solutions of higher-dimensional classical field equations in the presence of black holes and curved space-time. He is perhaps best known for his innovations in the use of topological string theory to compute Feynman diagrams in superstring models.

—From a Simons Foundation announcement

Yun Awarded 2012 SASTRA Ramanujan Prize

Zhiwei Yun of Stanford University has been awarded the 2012 SASTRA Ramanujan Prize. This annual prize is awarded for outstanding contributions to areas influenced by the Indian genius Srinivasa Ramanujan. The age limit for the prize has been set at thirty-two, because Ramanujan achieved so much in his brief life of thirty-two years. The prize carries a cash award of US$10,000. Because 2012 is the 125th anniversary of the birth of Srinivasa Ramanujan, the prize will be given in New Delhi (India's capital) on December 22 (Ramanujan's birthday).

The prize citation reads as follows: "Zhiwei Yun has made fundamental contributions to several areas that lie at the interface of representation theory, algebraic geometry, and number theory. Yun's Ph.D. thesis on global Springer theory at Princeton University, written under the direction of Professor Robert MacPherson of The Institute for Advanced Study, is opening up whole new vistas in the Langlands program, which represents one of the greatest developments in mathematics in the last half-century. Springer theory is the study of Weyl group actions on the cohomology of certain subvarieties of the flag manifold called Springer fibers. Yun's global Springer theory deals with Hitchin fibers instead of Springer fibers (taking the lead from earlier work on Hitchin fibers by Gérard Laumon and the 2010 Fields Medalist Bao-Châu Ngô) which he uses to determine the actions of affine Weyl groups on cohomology. His work is expected to lead to a geometric and functorial understanding of the Langlands program. Many papers by him on global Springer theory have arisen from his Ph.D. thesis; one appeared in 2011 in *Advances in Mathematics* and another will soon appear in *Compositio Mathematica*.

"Bao-Chau Ngô was awarded the 2010 Fields Medal for his proof of the Fundamental Lemma in the Langlands program. Yun has made a major breakthrough in the study of the Fundamental Lemma formulated by Jacquet and Rallis in their program of proving the Gross–Prasad conjecture on relative trace formulas. Yun's understanding of Hitchin fibrations enabled him to reduce the Jacquet–Rallis fundamental lemma to a cohomological property of the Hitchin fibration. This work, considered a gem of mathematics, appeared in 2011 in the *Duke Mathematical Journal*. Yun has collaborated with Ngô and Jochen Heinloth on a seminal paper on Kloosterman sheaves for reductive groups, which will appear in the *Annals of Mathematics*. In this wonderful joint paper, Ngô, Heinloth, and Yun re-prove a unicity result of Gross on automorphic representations over the rational function field and use the geometric Langlands theory to effect the construction of l-adic local systems.

"Yun has also done significant work in algebraic geometry. His recent article with Davesh Maulik on the Macdonald formula for curves with planar singularities will appear in the *Journal für die reine und angewandte Mathematik*. Yun's most recent work on the uniform construction of motives with exceptional Galois groups is considered to be a fundamental breakthrough. A construction like Yun's

was sought by Fields Medalists Serre and Grothendieck for over forty years, and Yun's work is considered one of the most exciting developments in the theory of motives in the last two decades."

Zhiwei Yun was born in Changzhou, China, in 1982. He received his bachelor's degree from Peking University in 2004 and his Ph.D. from Princeton University in 2009. He was a visiting member at the Institute for Advanced Study in 2009–2010 and held the C. L. E. Moore instructorship at the Massachusetts Institute of Technology during 2010–2012. In fall 2012 he joined the mathematics faculty at Stanford University.

The 2012 Prize Committee consisted of Krishnaswami Alladi (chair), Frits Beukers, Kathrin Bringmann, Benedict Gross, Kenneth Ribet, Robert Vaughan, and Ole Warnaar. Previous winners of the SASTRA Ramanujan Prize include Manjul Bhargava and Kannan Soundararajan (2005), Terence Tao (2006), Ben Green (2007), Akshay Venkatesh (2008), Kathrin Bringmann (2009), Wei Zhang (2010), and Roman Holowinsky (2011).

—From a SASTRA Ramanujan Prize announcement

Willwacher Awarded Lichnerowicz Prize

THOMAS WILLWACHER of Harvard University has been awarded the 2012 Lichnerowicz Prize in Poisson Geometry for his "deep and fundamental contributions to Poisson geometry, combining techniques from quantum field theory, homological algebra, and graph complexes." According to the prize citation, "his results include proofs of Kontsevich's cyclic formality conjecture for cochains and Tsygan's cyclic formality conjecture for chains. Together with Severa, he established the homotopy equivalence between Kontsevich's and Tamarkin's formalities of the little disk operad. More recently, he proved that the cohomology of the Kontsevich graph complex is isomorphic to the Grothendieck-Teichmueller Lie algebra."

The André Lichnerowicz prize in Poisson Geometry for notable contributions to Poisson geometry is awarded every two years to researchers who completed their doctorates at most eight years before the awarding of the prize. The prize is named in memory of André Lichnerowicz (1915–1998), whose work was fundamental in establishing Poisson geometry as a branch of mathematics.

—Eckhard Meinrenken, University of Toronto

MAA Awards Presented

The Mathematical Association of America (MAA) presented several awards at its Summer MathFest in Madison, Wisconsin, in August 2012.

The Carl B. Allendoerfer Awards, established in 1976, are made to authors of expository articles published in *Mathematics Magazine* and carry a cash prize of US$500. The awardees for 2012 are: P. MARK KAYLL, "Integrals Don't Have Anything to Do with Discrete Math, Do They?", *Mathematics Magazine* **84**, no. 2 (2011), pp. 108–119; and JOHN A. ADAM, "Blood Vessel Branching: Beyond the Standard Calculus Problem", *Mathematics Magazine* **84**, no. 3 (2011), pp. 196–207.

The Trevor Evans Award, first awarded in 1996, is made to authors of exceptional articles accessible to undergraduates and published in *Math Horizons*. The award carries a cash prize of US$250. The awardees for 2012 are: NATHAN CARTER and DAN KALMAN, "Harvey Plotter and the Circle of Irrationality", *Math Horizons* **19**, no. 2 (2011), pp. 10–13.

The Lester R. Ford Awards, established in 1964, are made to authors of expository articles published in the *American Mathematical Monthly* and carry a cash prize of US$500. The awardees for 2012 are: DAVID A. COX, "Why Eisenstein Proved the Eisenstein Criterion and Why Schönemann Discovered It First", *American Mathematical Monthly* **118**, no. 1 (2011), pp. 3–21; RAVI VAKIL, "The Mathematics of Doodling", *American Mathematical Monthly* **118**, no. 2 (2011), pp. 116–129; PETER SARNAK, "Integral Apollonian Packings", *American Mathematical Monthly* **118**, no. 4 (2011), pp. 291–306; and GRAHAM EVEREST and THOMAS WARD, "A Repulsion Motif in Diophantine Equations", *American Mathematical Monthly* **118**, no. 7 (2011), pp. 584–598.

The George Pólya Awards, established in 1976, are made to authors of expository articles published in the *College Mathematics Journal* and carry a cash prize of US$500. The awardees for 2012 are: LESLIE A. CHETEYAN, STEWART HENGEVELD, and MICHAEL A. JONES, "Chutes and Ladders for the Impatient", *College Mathematics Journal* **42**, no. 1 (2011), pp. 2–8; and T. S. MICHAEL, "Guards, Galleries, Fortresses, and the Octoplex", *College Mathematics Journal* **42**, no. 3 (2011), pp. 191–200.

Established in 2004, the Annie and John Selden Prize for Research in Undergraduate Mathematics Education honors a researcher who has established a significant record of published research in undergraduate mathematics education and who has been in the field at most ten years. The prize carries a cash award of US$500. The 2012 prizewinner is LAURA ALCOCK of the Mathematics Education Centre at Loughborough University. "Dr. Alcock's work is theoretically based, product-oriented, and pedagogically sound," the prize citation states. "She has a deep understanding of mathematical content that is evident in all her writing."

The Henry L. Alder Award for Distinguished Teaching by a Beginning College or University Mathematics Faculty Member was established in 2003 to honor beginning college or university faculty members whose teaching has been extraordinarily successful and whose effectiveness in teaching undergraduate mathematics is shown to have influence beyond their own classrooms. The award carries a cash prize of US$1,000. The awardees for 2012 are KATHRYN LEONARD of California State University Channel Islands, SUSAN MARTONOSI of Harvey Mudd College, and MICHAEL POSNER of Villanova University.

—From an MAA announcement

Martin Named Jefferson Fellow

CLYDE MARTIN of Texas Tech University has been named a Jefferson Fellow for 2012. His research interests include control theory and the development and analysis of mathematical and statistical models in agriculture, the environment, and medicine.

The Jefferson Science Fellows program was established in 2003 as an initiative of the science and technology adviser to the U.S. secretary of state to further build capacity for science, technology, and engineering expertise within the U.S. Department of State. The program is based on the premise that science and technology make fundamental contributions to the security, economic, health, and cultural foundations of modern societies and are integral to the development and implementation of foreign policy. Fellows serve one-year assignments working full time in the Department of State or the U.S. Agency for International Development, then remain available as consultants after returning to their academic careers.

—From the Jefferson Science Fellows website

Haldane, Kane, and Zhang Receive 2012 Dirac Medal

The Abdus Salam International Centre for Theoretical Physics (ICTP) has announced the Dirac Medalists for 2012, three condensed matter physicists who furthered the understanding of the strange conductive qualities of topological insulators. The winners are DUNCAN HALDANE of Princeton University, CHARLES KANE of the University of Pennsylvania, and SHOUCHENG ZHANG of Stanford University.

First awarded in 1985, the Dirac Medal is given in honour of P. A. M. Dirac, one of the greatest physicists of the twentieth century and a staunch friend of ICTP. It is awarded annually on Dirac's birthday, August 8, to scientists who have made significant contributions to theoretical physics. The medalists also receive a prize of US$5,000. The Dirac Medal is not awarded to Nobel Laureates, Fields Medalists, or Wolf Foundation Prize winners, although many Dirac Medalists have proceeded to win these prestigious prizes.

—From an ICTP announcement

Camacho Receives SACNAS Award

ERIKA T. CAMACHO of Arizona State University has received the 2012 Distinguished Undergraduate Institution Mentor Award from SACNAS (Society for Advancement of Hispanics/Chicanos and Native Americans in Science).

Camacho's passion is to continue the work and legacy of her mentors, including high school math teacher Jaime Escalante, in creating educational opportunities for individuals from marginalized communities. She involves students in her work at the interface of mathematics and its applications to biology and sociology. Her leadership, scholarship, and mentoring have won her national recognition. She has served on the Diversity Advisory Committee of the Society for Industrial and Applied Mathematics and the Mathematics Task Force of SACNAS.

—From a SACNAS announcement

d'Alembert and Decerf Prizes Awarded

Every two years the Société Mathématique de France awards the d'Alembert Prize. Established in 1984, the prize is intended to encourage mathematical works in the French language and the exposition of mathematics for the general public. It recognizes an article, book, radio or television broadcast, film, or other project that is designed to improve understanding of mathematics and its recent developments.

The d'Alembert Prize for 2010 was awarded to A. ALVAREZ, E. GHYS, and J. LEYS for their film *Dimensions: A Mathematical Promenade* and its associated website (`http://www.dimensions-math.org/`). The film has been appreciated by viewers all over the world for its high graphical and artistic quality and the simplicity with which it introduces geometric concepts. Originally made in French, the film has been translated into many different languages.

The 2012 d'Alembert Prize was presented to ROBIN JAMET for his work on communicating about mathematics with young people, most notably the "Magic Math" project of Science et Vie Junior, and to SHAULA FIORELLI VILMART and PIERRE-ALAIN CHÉRIX for their "popularization triptych" at the Museum of the History of Science in Geneva, for a project of the Swiss Mathematical Society, and for the publication *Les Jeux Sont Faits*, a collaborative effort with Radio Television Switzerland.

In 2012 the SMF also awarded the Anatole Decerf Prize, which was established to promote the pedagogy of mathematics. The 2012 Decerf Prize was awarded to FRANCIS LORET for his work in mathematics education and popularization and to *Accromath*, a Canadian publication that is distributed free of charge and that maintains high scientific and pedagogical quality.

—Allyn Jackson

Singh Awarded Inaugural Leelavati Prize

SIMON SINGH, author, journalist, and television producer, was awarded the inaugural Leelavati Prize for outstanding contributions to public outreach in mathematics by an individual. The award was presented at the 2010 International Congress of Mathematicians (ICM) of the

International Mathematical Union (IMU) and will be given every four years at the ICM.

Singh studied physics at the Imperial College London and later got his doctorate in particle physics working at Emmanuel College, Cambridge University, as well as at CERN, Geneva. In 1990 he joined the BBC and in 1996 directed an award-winning documentary, *Fermat's Last Theorem*, also the title of his 1997 book. He is also the author of *The Code Book: The Secret History of Codes and Code Breaking* (1999) and has produced television and radio series about mathematics.

—From an ICM announcement

PECASE Awards Announced

Three young scientists whose work involves the mathematical sciences have received Presidential Early Career Awards for Scientists and Engineers (PECASE) from President Obama. They were among twenty nominated by the National Science Foundation (NSF). SUZANNE M. SHONTZ of Pennsylvania State University was honored "for exemplary research in computational and data-enabled science and engineering that bridges applied mathematics, computer science, and scientific applications, and for contributions to education, including new curricula and approaches that encourage diversity in this emerging field." MARIEL VAZQUEZ of San Francisco State University was recognized "for excellent interdisciplinary and international research at the interface of mathematics and biology and for creativity and dedication to recruiting, training, mentoring, and helping students from underrepresented groups achieve their goals." BRENT R. WATERS of the University of Texas at Austin was honored "for visionary research on novel encryption methods that provide powerful new tools in computer security, an area of national importance, and for service on an election study group, which provided valuable outreach and tangible impact on the community."

—From an NSF announcement

China Girls Mathematical Olympiad

Eight young women formed the U.S. team to compete at the 11th annual China Girls Mathematical Olympiad (CGMO). All won medals, including one who achieved a perfect score. The girls-only international competition was held in Guangzhou in August 2012.

Gold medals were awarded to VICTORIA XIA, sixteen, from Vienna, Virginia—she received a perfect score and won her second consecutive gold medal—who will be a junior at the Thomas Jefferson High School for Science and Technology; DANIELLE WANG, fifteen, from Campbell, California, a sophomore at Westmont High School, who also won a gold medal last year; and ALICIA WENG, sixteen, from West Hills, California, who will be a junior at North Hollywood High School. Silver medals were won by CYNTHIA DAY, seventeen, from San Jose, California, who recently graduated from Lynbrook High School and will be a freshman at Stanford University this fall (she was also a medalist at the 2009 and 2010 CGMO); COURTNEY GUO, sixteen, a U.S. citizen who is a junior at the International School of Beijing in China; LAURA PIERSON, twelve, from Oakland, California, who is the youngest student to ever compete on the U.S. team (she will be a seventh-grader this fall at Hillcrest Middle School); and JINGYI ZHAO, sixteen, from Culver, Indiana, who will be a junior this fall at Culver Academies. A bronze medal was awarded to GABRIELLA STUDT, sixteen, from Silver Spring, Maryland, who begins her junior year at Montgomery Blair High School.

The highly competitive Math Olympiad consists of a rigorous two-day examination. On each day, the girls were presented with four proof-based math problems and had four hours in which to solve them. This year, the CGMO drew 204 girls from ten countries: Japan, Russia, Korea, the United States, the Philippines, Hong Kong, Macau, Taipei, Singapore, and China. Founded in 2002, the CGMO began as a regional competition for teams of female students from China and other eastern Asian countries. It was later expanded to invite teams from more countries. The first team from the United States was sent in 2007. The girls on the U.S. team wrote an online travelogue that shared their impressions during their trip to the 2012 CGMO (see `http://www.msri.org/cgmo/2012`).

The participation of the U.S. team in the CGMO is sponsored by the Mathematical Sciences Research Institute (MSRI) in Berkeley and the Mathematical Association of America (MAA). The team's eight secondary school students were chosen from the top ranks of female finalists in the 2012 USA Mathematical Olympiad (USAMO). The team's head coach is Zuming Feng, a math teacher on the faculty of Phillips Exeter Academy, who has been the leader of the USA International Mathematical Olympiad (IMO) team and the director of the Mathematical Olympiad Summer Program (MOSP) since 2003. Former U.S. team members and gold medalists Jennifer Iglesias, who enters Carnegie Mellon University's Ph.D. program in mathematics this fall, and Sherry Gong, who will begin a Ph.D. program in mathematics at the Massachusetts Institute of Technology, returned again as assistant coaches to help coach the team in China and during the team's training in June at the MAA-run MOSP at the University of Nebraska at Lincoln.

Funding for the program is provided by the Akamai Foundation; Delta Air Lines, Inc.; the MAA; MSRI; the National Science Foundation; the S. S. Chern Foundation; and the Sunlin and Priscilla Chou Foundation.

—From an MSRI news release

Prizes of the European Mathematical Society

The European Mathematical Society (EMS) awarded ten prizes at the Sixth European Congress of Mathematics in Krakow, Poland, in July 2012. The EMS Prizes were

awarded to young researchers (not over the age of thirty-five who are European or who work in Europe) for excellence in contributions to mathematics. The awardees, their affiliations, and brief citations follow.

SIMON BRENDLE of Stanford University was honored "for his outstanding results on geometric partial differential equations and systems of elliptic, parabolic, and hyperbolic types, which have led to breakthroughs in differential geometry, including the differentiable sphere theorem, the general convergence of Yamabe flow, the compactness property for solutions of the Yamabe equation, and the Min-Oo conjecture."

EMMANUEL BREUILLARD of Université Paris-Sud, Orsay, was honored "for his important and deep research in asymptotic group theory, in particular on the Tits alternative for linear groups and on the study of approximate subgroups, using a wealth of methods from very different areas of mathematics, which has already made a long-lasting impact on combinatorics, group theory, number theory and beyond."

ALESSIO FIGALLI of the University of Texas at Austin was recognized "for his outstanding contributions to the regularity theory of optimal transport maps, to quantitative geometric and functional inequalities, and to partial solutions of the Mather and Mañé conjectures in the theory of dynamical systems."

ADRIAN IOANA of the University of California San Diego was honored "for his impressive and deep work in the field of operator algebras and their connections to ergodic theory and group theory, and in particular for solving several important open problems in deformation and rigidity theory, among them a long-standing conjecture of Connes concerning von Neumann algebras with no outer automorphisms."

MATHIEU LEWIN of the University of Cergy-Pontoise was recognized "for his groundbreaking work in rigorous aspects of quantum chemistry, mean field approximations to relativistic quantum field theory, and statistical mechanics."

CIPRIAN MANOLESCU of the University of California Los Angeles was honored "for his deep and highly influential work on Floer theory, successfully combining techniques from gauge theory, symplectic geometry, algebraic topology, dynamical systems, and algebraic geometry to study low-dimensional manifolds, and in particular for his key role in the development of combinatorial Floer theory."

GRÉGORY MIERMONT of Université Paris-Sud 11 was recognized "for his outstanding work on scaling limits of random structures, such as trees and random planar maps, and his highly innovative insight in the treatment of random metrics."

SOPHIE MOREL of Harvard University was honored "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."

TOM SANDERS of the University of Oxford was recognized "for his fundamental results in additive combinatorics and harmonic analysis, which combine in a masterful way deep known techniques with the invention of new methods to achieve spectacular applications."

CORINNA ULCIGRAI of the University of Bristol was honored "for advancing our understanding of dynamical systems and the mathematical characterizations of chaos, and especially for solving a long-standing fundamental question on the mixing property for locally Hamiltonian surface flows."

—From an EMS announcement

Pi Mu Epsilon Student Paper Presentation Awards

Pi Mu Epsilon (PME), the U.S. honorary mathematics society, makes annual awards to recognize the best papers by undergraduate students presented at a PME student paper session. This year PME held a session in conjunction with the Mathematical Association of America MathFest in Madison, Wisconsin, August 1–3, 2012. The AMS and the American Statistical Association sponsor awards to student speakers for excellence in exposition and research. Each awardee received a check for US$150. The names, chapters, institutions, and paper titles of the award-winning students follow.

BETH BJORKMAN, Michigan Iota Chapter, Grand Valley State University, "Columnar transposition ciphers"; ASHLEY BROADWELL, California Xi Chapter, Pepperdine University, "A generating function for inversions on pattern avoiding involutions"; NATHANIEL CARD, Wisconsin Epsilon Chapter, Carthage College, "Benford melodies: A senior thesis on stochastic composition"; WILSON CHEUNG, New York Alpha Delta Chapter, SUNY Geneseo, "Contracting and rotating ellipses"; MARISSA CLOUGHER, Illinois Iota Chapter, Elmhurst College, "Universal Niven number representations"; SARAH HELLIG, New Jersey Epsilon Chapter, St. Peter's College, "When prisoners enter battle"; ERIK MILLER, Wisconsin Delta Chapter, St. Norbert College, "From golf balls to airplanes; What are the powers of dimples?"; CANDICE NIELSEN, Illinois Iota Chapter, Elmhurst College, "Vertex polygons"; MARIO SRACIC, Ohio Xi Chapter, Youngstown State University, "Outer Automorphisms of S_6"; and SARAH WESLEY, Illinois Iota Chapter, Elmhurst College, "Niven numbers and cryptography".

—From a Pi Mu Epsilon announcement