
Mathematics People

Chudnovsky and Spielman Selected as MacArthur Fellows

MARIA CHUDNOVSKY of Columbia University and DANIEL SPIELMAN of Yale University have been named MacArthur Fellows for 2012. Each Fellow receives a grant of US\$500,000 in support, with no strings attached, over the next five years.

Chudnovsky was honored for her work on the classifications and properties of graphs. The prize citation reads, “Maria Chudnovsky is a mathematician who investigates the fundamental principles of graph theory. In mathematics, a graph is an abstraction that represents a set of similar things and the connections between them—e.g., cities and the roads connecting them, networks of friendship among people, websites and their links to other sites. When used to solve real-world problems, like efficient scheduling for an airline or package delivery service, graphs are usually so complex that it is not possible to determine whether testing all the possibilities individually will find the best solution in a practical time period. Chudnovsky explores classifications and properties of graphs that can serve as shortcuts to brute-force methods; showing that a specific graph belongs to a certain class often implies that it can be calculated relatively quickly. In an early breakthrough, Chudnovsky and colleagues proved a conjecture offered in the early 1960s, known as the ‘Strong Perfect Graph Theorem’, that identifies specific criteria required for a graph to fall into the ‘perfect’ class. Any perfect graph can be colored efficiently (i.e., no node is connected to another node of the same color), and graph coloring bears a direct relation to finding efficient solutions to problems such as allocating noninterfering radio frequencies in communication networks. Since this landmark accomplishment, Chudnovsky has continued to generate a series of important results in graph theory. Although her research is highly abstract, she is laying the conceptual foundations for deepening the connections between graph theory and other major branches of mathematics, such as linear programming, geometry, and complexity theory.”

Spielman was honored for his work connecting theoretical and applied computing to resolve issues in code optimization theory, with implications for how we measure, predict, and regulate our environment and behavior. The prize citation reads, “Daniel Spielman is a theoretical computer scientist studying abstract questions that nonetheless affect the essential aspects of daily life in modern society—how we communicate and how we measure, predict, and regulate our environment and our behavior. Spielman’s early research pursued aspects of coding theory, the mathematical basis for ensuring the reliability of electronic communications. When transferring digital

information, sometimes even one incorrect bit can destroy the integrity of the data stream; adding verification ‘codes’ to the data helps to test its accuracy. Spielman and collaborators developed several families of codes that optimize speed and reliability, some approaching the theoretical limit of performance. One, an enhanced version of low-density parity checking, is now used to broadcast and decode high-definition television transmissions. In a separate line of research, Spielman resolved an enduring mystery of computer science: why a venerable algorithm for optimization (e.g., to compute the fastest route to the airport, picking up three friends along the way) usually works better in practice than theory would predict. He and a collaborator proved that small amounts of randomness convert worst-case conditions into problems that can be solved much faster. This finding holds enormous practical implications for a myriad of calculations in science, engineering, social science, business, and statistics that depend on the simplex algorithm or its derivatives. Most recently, Spielman has championed the application of linear algebra to solve optimization problems in graph theory. He and his colleagues have offered a new approach to maximizing the flow through unidirectional graphs, promising significant improvements in the speed of a wide range of applications, such as scheduling, operating system design, and DNA sequence analysis. Through these projects and fundamental insights into a host of other areas, such as complexity theory and spectral theory, Spielman is connecting theoretical and applied computer science in both intellectually and socially profound ways.”

Maria Chudnovsky received her B.A. (1996) and M.Sc. (1999) degrees from Technion, Israel Institute of Technology, and an M.A. (2002) and a Ph.D. (2003) from Princeton University. She was affiliated with Princeton University from 2003 to 2006 and was a research fellow at the Clay Mathematics Institute from 2003 to 2008. At Columbia she is currently an associate professor in the Department of Industrial Engineering and Operations Research, with a courtesy appointment in the Department of Mathematics.

Daniel Spielman received his B.A. (1992) from Yale University and his Ph.D. (1995) from the Massachusetts Institute of Technology. He was affiliated with the Massachusetts Institute of Technology from 1996 to 2005. At Yale University he is currently Henry Ford II Professor of Computer Science, Mathematics, and Applied Mathematics in the Department of Computer Science.

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. There are three criteria for selection of Fellows: exceptional creativity, promise for important future advances based on a

track record of significant accomplishment, and potential for the fellowship to facilitate subsequent creative work.

—*From a MacArthur Foundation announcement*

Levin Awarded Knuth Prize

LEONID LEVIN of Boston University has been awarded the 2012 Knuth Prize “for his visionary research in complexity, cryptography, and information theory, including the discovery of NP-completeness.” Working in the Soviet Union at the same time as Stephen Cook in the United States, Levin made his discovery of NP-completeness, the core concept of computational complexity. He also developed the theory of “average-case NP-completeness” for problems considered intractable on average. He has also done significant work on the PCP theorem, the cornerstone of the theory of computational hardness of approximation, and in cryptography theory.

The Knuth Prize, named in honor of Donald Knuth of Stanford University, is given every eighteen months by the Association for Computing Machinery (ACM) Special Interest Group on Algorithms and Computation Theory (SIGACT) and the Institute of Electrical and Electronics Engineers (IEEE) Technical Committee on the Mathematical Foundations of Computing. It carries a cash award of US\$5,000.

—*From an ACM announcement*

Parimala Awarded Noether Lectureship

RAMAN PARIMALA of Emory University has been named the 2013 Noether Lecturer by the Association for Women in Mathematics (AWM). She was honored “for her fundamental work in algebra and algebraic geometry with significant contributions to the study of quadratic forms, hermitian forms, linear algebraic groups and Galois cohomology.” She will deliver the lecture at the 2013 Joint Mathematics Meetings. The Noether Lectureship honors women who have made fundamental and sustained contributions to the mathematical sciences.

—*From an AWM announcement*

Australian Mathematical Society Prizes

The Australian Mathematical Society has awarded several major prizes. ANTHONY HENDERSON of the University of Sydney and STEPHEN KEITH of the Macquarie Group have been awarded the Australian Mathematical Society Medal for 2012. The medal is given to a Society member or members under the age of forty for distinguished research in the mathematical sciences.

ROSS STREET of Macquarie University and NEIL TRUDINGER of the Australian National University were

awarded the 2012 George Szekeres Medal for outstanding contributions to the mathematical sciences in the fifteen years prior to the year of the award.

AKSHAY VENKATESH of Stanford University has been awarded the Mahler Lectureship for 2013. The lectureship is awarded every two years to a distinguished mathematician who preferably works in an area of mathematics associated with the work of Kurt Mahler.

IMAM TASHDID UL ALAM of the Australian National University received the Bernhard Neumann Prize for an outstanding talk presented by a student at the annual meeting of the Australian Mathematical Society.

The Australia and New Zealand Industrial and Applied Mathematics Division (ANZIAM) has awarded its ANZIAM Medal to ROBERT MCKIBBIN of Massey University for outstanding achievement in applied and industrial mathematics in Australia, and MATTHEW SIMPSON of Queensland University received the ANZIAM J. H. Michell Medal for outstanding new researchers.

—*From Australian Mathematical Society announcements*

AAAS Elects New Members

The American Academy of Arts and Sciences (AAAS) has chosen 202 new fellows and 17 foreign honorary members for 2012. Following are the names and affiliations of the new members who work in the mathematical sciences or whose work involves considerable mathematics: BONNIE BERGER, Massachusetts Institute of Technology; JOAN S. L. BIRMAN, Barnard College, Columbia University; RUSSEL E. CAFLISCH, University of California Los Angeles; THOMAS M. LIGGETT, University of California Los Angeles; BAO CHÂU NGÔ, University of Chicago; JUDEA PEARL, University of California Los Angeles; BJORN M. POONEN, Massachusetts Institute of Technology; STEVEN H. STROGATZ, Cornell University; and RICHARD L. TAYLOR, Institute for Advanced Study. Elected as a foreign honorary member was LOUIS BOUTET DE MONVEL, Université Pierre et Marie Curie, Paris, France.

—*From an AAAS announcement*

Royal Society of Canada Elections

The Royal Society of Canada has elected two new fellows who work in the mathematical sciences. ANNE CONDON of the University of British Columbia is a researcher in computational complexity theory and algorithms. JEFFREY S. ROSENTHAL of the University of Toronto has made “profound and deep contributions to probability and statistics, including highly original and influential results on the mathematical analysis of Markov chain Monte Carlo methods.” He is the author of the popular book *Struck by Lightning*.

—*From a Royal Society announcement*