# Interview with Congressman Jerry McNerney

Jerry McNerney, a Ph.D. mathematician, was elected to the U.S. House of Representatives in November 2006 and represents California's eleventh district. McNerney received his Ph.D. in mathematics from the University of New Mexico in 1981 and has been an AMS member since 1977. Before his election to Congress, he worked at Sandia National Laboratories and at US Windpower, and also served as an energy consultant for utility companies. Prior to his election he was chief executive officer of a start-up company that will manufacture wind turbines. In the following article, Congressman McNerney provides written responses to questions posed to him by the *Notices*. Samuel M. Rankin III, director of the AMS Washington Office, helped prepare the questions and facilitated communication with Congressman McNerney.

*—Allyn Jackson*

***Notices:** Tell us about your personal experience in mathematics.*

**McNerney:** Like many mathematicians, my first math experience was with an inspiring teacher. I was a sophomore in high school, and like many young adults at that age, I was a little rebellious. I was taking college prep courses, but on the first day of class the geometry teacher began talking about "mommy and daddy triangles". I immediately transferred to a different geometry class. Ron Black was the teacher. It was in Mr. Black's class that I started to become fascinated by proofs with congruence theorems. My interest was piqued. I just ate the class up, immediately taking to the material. From that point on, math was always an important part of my life. High school science and math classes were a breeze after that.

I didn't take calculus until college. But seeing derivatives and integrals pop out by passing to the limit was mind boggling—the proverbial light bulb turning on in my head. We were using infinity to solve real finite problems.

Of course differential equations and all the undergraduate math courses I took were great, but the next really big thing for me was real analysis in graduate school. Getting into the real basics and proving things with absolute rigor was outstanding to see after years of hearing that the details of the proofs were to be left for later. It became clear in graduate school. I loved the certainty and the beauty of a simple proof and of the concepts involved. I loved the connection to philosophy. I loved teaching and helping younger students. I also loved the community of math. The members of the department at the University of New Mexico and the graduate students were a family.

My father was an engineer and I developed an early interest in applications. In fact, I majored in chemical engineering as an undergraduate, but transferred to the math department as a senior undergraduate. There was an engineering professor at UNM who told me that a mathematician who understood applications would have engineers knocking on his or her door. This made an impression, and motivated me to take physics and keep in touch with applications even though I stayed in differential geometry, a field that many considered to be pure mathematics.

Eventually, I graduated with a Ph.D. and decided to go into industry instead of staying in academia. I felt that several years of applied experience in industry would make me a better mathematician. However, I came to understand later that decision pretty much disqualified me from returning to academia for a number of reasons. The most prominent of those was that while working in industry I didn't publish any research papers in math journals. Also, most mathematics departments want to hire academic postdoctoral mathematicians right out of graduate school or out of other postdoctoral programs. I'm not sure if this is good or bad. There's no doubt that the very top mathematicians should spend their careers in academia. For the rest of us merely good mathematicians, I believe that some outside experience, or perhaps an academic requirement for graduate students to take graduate courses in other areas such as neuroscience or sociology, would be beneficial.

***Notices:** How does your world-view as a mathematician play a role in your work as a congressman—assessing legislation, dealing with constituents, etc.*

**McNerney:** What I love about mathematics is its precision and beauty. But mathematics is about more than just solving problems and proving theorems. It gives practitioners an insight into the relation between the mind and the world. If content and meaning is taken away, becoming abstract, it is possible to find the form of a solution. This gives hope that even the most intractable problems can be approached and that true progress can be made. It means that the struggle in and of itself is worthwhile and that if we can approach problems rationally, we can find solutions and make the world a better place.

***Notices:** Do you think members of Congress understand the value of mathematical research and the role it plays in innovation?*

**McNerney:** Most members of Congress appreciate that mathematical research is important, though some members appreciate it more than others. There is general recognition that increasing scientific and mathematical achievement will help keep the United States competitive internationally. Within the Science and Technology Committee, on which I sit, there is strong support for Science, Technology, Engineering, and Mathematics (STEM) education and for the doubling of the National Science Foundation budget over the next ten years. Though frankly, I think that is too little and over too long a period of time.

We need to restore the Office of Technology Assessment, which was eliminated in the mid-1990s. The goal of OTA was to provide members of Congress and Congressional committees with objective and authoritative analysis of complex scientific and technical issues.

***Notices:** How can we better educate members of Congress as to the value of mathematics research and its contribution to innovation?*

**McNerney:** Most members of Congress have constituent meetings of one form or another in their districts and in Washington. Mathematicians should request individual meetings or form advisory groups that meet regularly with their representative. Getting to know your representative is key. Nothing works in politics like personal relationships. When you meet, if it's in an office appointment, take maybe three mathematicians who can effectively convey the message and bring some concrete examples of how their work benefits the member's district. It's important to educate the member how mathematics research will benefit his or her district. I would also emphasize the importance of mathematics and education to the nation's security and prosperity.

If you can't get an office appointment, then go to the member's announced town hall meetings and ask relevant but not embarrassing questions. If you can't schedule a meeting directly with the member of Congress, ask to meet with a member of his or her staff. Don't view meeting with staff as a missed opportunity. Staffers serve as the "eyes and ears" of the member of Congress, making recommendations and providing members with research and information about a wide variety of issues.

**Congressman Jerry McNerney**

***Notices:** What do you consider to be the main national issues where mathematics and mathematicians can make decisive contributions?*

**McNerney:** This is the million dollar question: how can someone or even a group have a positive impact on human destiny? Mathematics has raw power, but to have an impact, this power has to be harnessed and exploited for the greater human good. This is where creativity and real brain power comes into play. Mathematicians have shown they have the brain power, and the next step is to harness this power to do good. Napoleon was a mathematician who used his power to win wars for France, then became the emperor and ultimately found himself exiled for his excesses. One of the best qualities about mathematicians is that, by and large, we are unassuming. This is a quality that people love. We simply have to understand the perils we face and the enormous responsibility we have to use our power to meet those challenges head on.

***Notices:** What contributions can mathematicians make to the debates on global environmental issues?*

**McNerney:** I am, of course, very concerned about global warming. But there are other issues that are equally threatening, such as nuclear proliferation. We can model the climate, and eventually, engineer or control it. Mathematics offers the tools to move forward. We have all studied the achievements of past mathematicians. In the early twentieth century, mathematicians were also engineers, but today, mathematicians are often pure practitioners. This change has certain advantages, but the world is in desperate need of technical guidance at the highest levels. Specialization is not what's needed right now, but people who can bridge the specialties and derive concrete solutions. Mathematicians are well poised to fill this need.

***Notices:** How would you assess the state of mathematics education in the U.S.?*

**McNerney:** Education in the U.S. is in need of major improvement, and mathematics education is certainly not the exception. We have not invested enough in infrastructure and education, and the results will become more apparent as time goes on. Dollars invested in education are repaid tenfold later on. We must make the need to invest in education clear to the American people, and we need to help young people appreciate and take advantage of the educational opportunities being offered to them. Too many young people do not recognize the value of getting a good education. Getting a degree in engineering, science, or mathematics takes hard work that begins well before college, and students may not recognize the importance of making the sacrifice necessary to meet that kind of goal. A good education takes work, but the reward is plentiful. We have to do a better job of helping our young people see the benefit of that work. Some of that responsibility lies at the federal level in helping to set national priorities.

***Notices:*** *Some mathematicians refuse to accept U.S. military funding for research. As both a mathematician and a congressman, how do you look at the issue?*

**McNerney:** Mathematics is an amoral exercise. Moral and ethical considerations are external to real math. But the impact of the math we do cannot be divorced from the research process. I don't judge individuals who choose not to work on military projects, and I do not judge those who accept such assignments. We have to look into ourselves and answer that question individually. I simply ask that we all do take the time to ask the questions.

***Notices:*** *Do you see the recent discussion of immigration affecting the entrance of foreign graduate students and professionals into U.S. mathematics?*

**McNerney:** Certainly. Just the discussion has an impact, not to mention the laws that may get passed. Mathematics does not have political bias. There isn't a Republican or Democratic theorem. There aren't American theorems versus Chinese theorems. Mathematics is a tool for all to use to confront the problems ahead. I would be disappointed to see this country adopt policies that will unintentionally prevent the advance of mathematics.

***Notices:*** *If you could give a mathematical lecture to a joint session of Congress, what would the subject be?*

**McNerney:** There are some pretty good theorems out there, such as the free will theorem, that would be fun to present and would "wow" members of Congress. However, since this is a hypothetical question, I would work with sociologists and other behavioral experts to develop models that accurately predict societal behavior. I would develop present models to provide us rational tools to use in making difficult and consequential decisions, such as accurately predicting what the societal consequences of ignoring global warming will be or the likely outcome of applying military options in a variety of different scenarios.

You often hear the saying, "Do the math." If the mathematics shows a strong result about possible futures, then maybe we could discuss what it would take to avoid catastrophic outcomes.

***Notices:*** *What do you think the future of mathematics will be?*

**McNerney:** Mathematics is an ancient and venerable discipline. It has been shaped by necessity, by people attracted to its challenge, and by its utility and beauty. Human beings have not changed in a fundamental way since the Egyptians used math to build the pyramids. Our civilization is more sophisticated and the challenges have grown. Hard boiled analysis will be needed on many fronts to enable mankind to grow and prosper.

Will the nature of mathematics change? Certainly it will. The change is already under way, from the mathematics of physics to the mathematics of biology, from individuals working alone with pencil and paper to collaborative efforts involving telecommunications and digital computers. Mathematics will change with the needs and with the tools available. New problems will challenge new generations of mathematicians. Mathematics will provide tools to answer questions and will be an integral part of the evolution of society. I believe that mathematics will ultimately be called upon to analyze and understand large-scale social interactions such as war and famine. It will map out the human brain and the universe. Mathematics will be with us and will provide the tools necessary to define our destiny as we move toward an unknown future.

# Bass Receives National Medal of Science

On July 18, 2007, President George W. Bush announced the recipients of the 2006 National Medal of Science. Among the eight medalists is HYMAN BASS, Roger Lyndon Collegiate Professor of Mathematics and of Mathematics Education at the University of Michigan. Bass was cited for "his fundamental contributions to pure mathematics, especially in the creation of algebraic K-theory, his profound influence on mathematics education, and his service to the mathematics research and education communities. With his unique combination of gifts he has had enormous impact over the course of a half century."

President Bush presented the awards to the 2006 and 2005 National Medal of Science recipients in a White House ceremony on July 27, 2007. (Among the 2005 recipients is Stanford University statistician Bradley Efron; an announcement about that award appeared in the September 2007 issue of the *Notices*.)

**Hyman Bass**

The accompanying sidebar provides a brief account of Bass's research in mathematics. He has also worked extensively in mathematics education, primarily in collaboration with Deborah Ball of the University of Michigan. This work has centered on subject-matter knowledge entailed in teaching, practice-based research on teaching and learning, teacher education, reasoning and proof in school mathematics, and analysis of curriculum materials. Bass was a member of the Mathematical Sciences Education Board of the National Research Council from 1991 until

### The Mathematical Work of Hyman Bass

Hyman Bass's wide-ranging research in algebra has featured a conceptual clarity and generality that not only powerfully addressed deep questions but provided the tools and framework for others who followed in his pioneering footsteps. His early work considered commutative rings of finite injective dimension, and his recognition of their "ubiquity" resulted in one of the most often-cited papers in commutative algebra. Bass's interest in projective modules led to his project to systematically translate topological K-theory into algebra, and in particular to the definition of $K_1$ of a ring and the analysis of the latter, including a complete description in the important case of rings of algebraic integers. The answer, as well as the analysis, is connected to the Congruence Subgroup Problem, another area where Bass made fundamental contributions.

One of the techniques used in the Congruence Subgroup Problem led to the consideration of groups acting on trees and generalizations and in turn to considerations of locally compact automorphism groups of trees and the lattices in them. As with algebraic K-Theory, Bass's work not only solved basic problems in the theory of tree lattices but formulated the foundations for the subject. Along with his genius for setting the stage and systematizing subjects, Bass has many technically demanding achievements, including subtle and significant examples delineating the boundaries of the representation theory of finitely generated groups.

No brief summary can do more than suggest the range of topics on which Hyman Bass's work has made an impact. For a fuller account covering Bass's work up to 1997, we refer the reader to [1].

*—T. Y. Lam, University of California, Berkeley*
*and*
*—A. R. Magid, University of Oklahoma*

### Reference

[1] *Algebra, K-Theory, Groups, and Education*, Contemp. Math. **243** (1999), Amer. Math. Soc., Providence, RI.

2000 (chair, 1993–2000). From 1998 until 2006 he was president of the International Commission on Mathematics Instruction, which operates under the auspices of the International Mathematical Union.

Born on October 5, 1932, in Houston, Texas, Hyman Bass received his Ph.D. from the University of Chicago in 1959 under the direction of Irving Kaplansky. Bass was on the faculty of Columbia University before moving to the University of Michigan in 1999. He has held numerous visiting positions, including at the Institute for Advanced Study in Princeton, the Tata Institute for Fundamental Research in Mumbai, and at the Institut des Hautes Études Scientifiques in Paris. He has served on the AMS Council and on many AMS committees, including the *Notices* Editorial Board. He was president of the Society during 2001 and 2002. His honors include the AMS Cole Prize in Algebra (1975) and the Gung and Hu Award for Distinguished Service to Mathematics of the Mathematical Association of America (2006). Bass was elected as a member of the American Academy of Arts and Sciences (1980), as a fellow of the American Association for the Advancement of Science (1980), and as a member of the U.S. National Academy of Sciences (1982). He was an invited speaker at the International Congress of Mathematicians in Moscow (1966) and in Vancouver (1974), and he delivered a plenary address at the International Congress on Mathematical Education in Copenhagen (2004). He was a member of Bourbaki from 1970 until 1982.

The National Medal of Science is the country's highest distinction for contributions to scientific research. According to a news release from the Office of Science and Technology Policy, "The National Medal of Science honors individuals for pioneering scientific research in a range of fields, including physical, biological, mathematical, social, behavioral, and engineering sciences, that enhances our understanding of the world and leads to innovations and technologies that give the United States its global economic edge." The National Science Foundation administers the award, which was established by the Congress in 1959.

*—Allyn Jackson*

# Mathematics People

## SIAM Prizes Awarded

The Society for Industrial and Applied Mathematics (SIAM) awarded several prizes at recent meetings.

The SIAM Conference on Applications of Dynamical Systems was held in Snowbird, Utah, from May 28 through June 1, 2007. LAI-SANG YOUNG of the Courant Institute of Mathematical Sciences, New York University, was awarded the AWM-SIAM Sonia Kovalevsky Lectureship for her fundamental contributions in the field of ergodic theory and dynamical systems. Her pioneering research has had a significant impact in the investigation of dynamical complexity, strange attractors, and probabilistic laws of chaotic systems. The lectureship is intended to highlight significant contributions of women to applied or computational mathematics.

SALVATORE TORQUATO of the Princeton Institute for the Science and Technology of Materials, Princeton University, was awarded the Ralph E. Kleinman Prize for his contributions to the modeling, analysis, and computational study of heterogeneous materials.

ANDREW STUART of the University of Warwick received the J. D. Crawford Prize of the SIAM Activity Group on Dynamical Systems (SIAG/DS) for his contributions to the fields of stochastic ordinary and partial differential equations, including mathematical theory, algorithm development, and the application of stochastic differential equations to physical models and the dynamics of inertial partials in random fields. The prize is awarded for recent outstanding work on a topic in nonlinear science, including dynamical systems theory and its applications, as well as experiments and computations/simulations.

HARRY L. SWINNEY of the University of Texas, Austin, was awarded the Jürgen Moser Lectureship of the SIAG/DS for his elegant and incisive laboratory experiments that have elucidated the nonlinear dynamics of systems far from equilibrium.

The SIAM Conference on Control and Its Applications was held in San Francisco in July 2007. HÉCTOR J. SUSSMANN of Rutgers University was awarded the W. T. and Idalia Reid Prize for his fundamental contributions to nonlinear control, especially in the area of differential-geometric control theory. The prize is awarded for research in or other contributions to the broadly defined areas of differential equations and control theory.

MURAT ARCAK of the Rensselaer Polytechnic Institute received the SIAM Activity Group on Control and Systems Theory Prize for his fundamental contributions to the study of large networked systems and for his accomplishments in developing a novel passivity approach to large-scale networks, such as communication, power, and biological systems, and deriving fundamental results for increasing their robustness and performance.

*—From a SIAM announcement*

## Prizes of the London Mathematical Society

The London Mathematical Society (LMS) has awarded several prizes for 2007.

BRYAN BIRCH of the University of Oxford has been awarded the De Morgan Medal in recognition of his influential contributions to modern number theory. Birch worked with Peter Swinnerton-Dyer of the University of Cambridge to create a new area of arithmetic algebraic geometry, formulating the Birch–Swinnerton-Dyer conjectures. These conjectures are among seven classic unsolved mathematical problems identified by the Clay Mathematics Institute in Cambridge, Massachusetts, for proofs of which the institute is offering US$1 million prizes. In addition, Birch's work on Heegner points has led to huge advances in the arithmetic of elliptic curves.

BÉLA BOLLOBÁS of the University of Cambridge has been awarded the Senior Whitehead Prize for his fundamental contributions to almost every aspect of combinatorics. He has written a large number of research papers and influential textbooks, many of which have defined or redefined whole areas of research.

MICHAEL GREEN of the University of Cambridge received the Naylor Prize and Lectureship in Applied Mathematics in recognition of his founding work in superstring theory, which has dominated theoretical physics over the past twenty years. His contributions to the subject have profoundly influenced both pure and applied mathematics.

Four Whitehead Prizes were awarded. NIKOLAY NIKOLOV of the University of Oxford and Imperial College, London, was recognized for several important advances in group theory, especially in profinite groups and asymptotic aspects of arithmetic groups and finite simple groups. OLIVER RIORDAN of the University of Cambridge was honored for his contributions to graph polynomials, random graphs, extremal combinatorics, models of large-scale real-world graphs, and percolation theory. IVAN SMITH of the University of Cambridge was recognized for his work on symplectic topology, in which he often blends ideas from algebraic geometry and topology in novel ways. CATHARINA STROPPEL of the University of Glasgow was honored for her contributions to representation theory, in particular in the framework of categorifications and its applications to low-dimensional topology.

*—From an LMS announcement*

# Royal Society of Canada Elections

The following mathematical scientists have been elected to the Royal Society of Canada: DAVID C. BRYDGES, University of British Columbia; WALTER CRAIG, McMaster University; and LISA JEFFREY, University of Toronto at Scarborough. Chosen as a Specially Elected Fellow was PETER HACKETT of the Alberta Ingenuity Fund.

*—From a Royal Society of Canada announcement*

# News from the IMA

The Institute for Mathematics and its Applications (IMA) has announced the appointment of Fadil Santosa of the University of Minnesota as its next director. His appointment will begin on July 1, 2008. He will replace Douglas Arnold, who has been director since 2001 and who will remain a professor of mathematics at the University of Minnesota.

Santosa has taught at the University of Minnesota since 1995. He previously held positions at Cornell University and the University of Delaware. He currently serves as director of the Minnesota Center for Industrial Mathematics. He was associate director for industrial programs at the IMA from 1997 until 2001 and deputy director from 2001 to 2004. His research interests are in the areas of photonics, inverse problems, optimal design, and financial data analysis.

*—From an IMA announcement*