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.