

New York City Programs Provide a Model for National Teaching Corps

Allyn Jackson

When James Simons received his Ph.D. in mathematics in 1962 from Berkeley, he was the first person to finish a doctorate under the National Defense Education Act. The NDEA had been launched just four years earlier and was one of several initiatives taken by the U.S. government after the Soviet Union's launching of the Sputnik satellite. "I was a beneficiary of a program that worked," Simons remarked. Today he is known not only for the Chern-Simons invariants, which he developed in the 1970s with Shiing-Shen Chern and for which he received the 1976 AMS Veblen Prize, Simons has also become well known as an enormously successful financial entrepreneur and the founder of the investment firm Renaissance Technologies. *Forbes* magazine estimates Simons's net worth to be US\$2.6 billion, making him the 278th richest person in the world.

Simons is trying to spur the creation of another government program that would work. He wants to see a government-funded nationwide effort to put teachers with solid mathematics knowledge into the nation's classrooms. As the first step, he created Math for America (MfA), a New York City-based project that could serve as a model for a national program. The main part of MfA is the Newton Fellowship program, which provides teacher education to people with strong mathematics and science backgrounds and gives them a generous salary supplement in return for a four-year commitment to teach mathematics in the New York City public schools. As the second crop of Newton Fellows gets through its first year of teaching in the 2006–2007 academic year, a bill to establish a similar program at the national level is wending its way through Congress.

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Two Curves that Don't Match

About ten years ago Simons began to sense that the nation was not producing enough highly trained mathematicians and scientists. He can observe this phenomenon firsthand at Renaissance Technologies, which hires primarily people with science and mathematics backgrounds, many of them foreign-born. As opportunities for those with good knowledge of mathematics and science have increased, the incentive to become teachers in those areas has continued to diminish. "So you have two curves that don't make any sense: Fewer and fewer people are teaching for a field that wants more and more people," Simons noted. "The economy in the long run is really going to suffer."

So what did he do? Naturally, he played poker. A few years back, as a way to raise money for the Mathematical Sciences Research Institute in Berkeley, Simons organized a charity poker tournament with some of his colleagues from the finance world. Charity poker tournaments have since become commonplace, "but we were the first," Simons said. And it worked: the tournament raised US\$1 million for MSRI. Poker tournaments have also been a main source of funding for the MfA; the most recent such tournament, held in spring 2006, raked in almost US\$2 million. The generosity of Simons's poker buddies shows that they share his deep concern about the poor state of mathematics education in the United States.

The money generated by the poker tournaments goes directly to support the MfA's programs, such as the Newton Fellowships. Funds are also contributed by the Simons Foundation, a philanthropic organization established in 1994 by Simons and his wife, Marilyn Hawrys Simons, to support basic research in mathematics and science (including research into causes of and possible cures for

autism). Through these sources, US\$25 million has been committed to the MfA. The operating expenses of the MfA are paid separately by the Simons Foundation. The small MfA staff of eight people is headed by executive director Irwin Kra, a mathematician now retired from Stony Brook University. Simons was on the faculty at Stony Brook from 1968 until 1978, when he moved into finance. Kra and Simons have known each other for almost forty years. When asked how he got involved with the MfA, Kra states simply, "Jim called me and asked me to get involved."

An Elegant Solution

Kra came on board in November 2003, before the Newton Fellowship program was in place, and he developed the idea together with some other members of the MfA board. Kra called the program "an extremely elegant solution" to the problem of getting people with good mathematics backgrounds into the teaching profession. Step one is ensuring that fellowship candidates really know mathematics through an exhaustive interview and testing procedure that Kra characterized as being "perhaps as rigorous as the admission procedure to any Ph.D. program in the United States." Step two is to pay a stipend and tuition for a masters of teaching program, where the fellows learn about pedagogy. Step three is to supplement the fellows' salaries while they teach for four years in the New York City public schools. Typical starting salaries for the city's public school teachers are in the range of US\$40,000 to US\$50,000. The Newton Fellowship program provides salary supplements totaling US\$62,000 over the four years.

Of course, this simple outline masks many aspects of the program that are critical to its success. One is the choice of the teacher training programs. The MfA has selected a small number of partner institutions where the fellows enter the masters of teaching program; right now the partners are New York University, Teachers College at Columbia University, and Bard College. The partner institutions make a financial contribution by covering part of the fellows' tuition (between 20 and 55 percent), and the MfA pays the rest. By keeping the number of partner institutions small, the MfA can work closely with them to create a course of study that will be challenging and meaningful for the fellows. For example, one requirement the MfA has insisted on is that the mathematics courses the fellows take must be in mathematics departments, not in education departments. Because the MfA pays a sizable chunk of the fellows' tuition, it has some leverage to make demands.

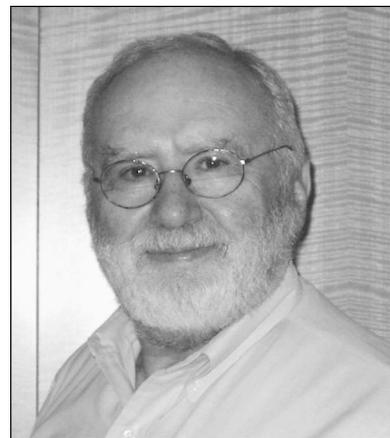
Because the Newton Fellows are clustered together in the teacher training programs, they form a peer network, and the MfA reinforces the group's closeness with monthly meetings and social events.

The meetings continue after the fellows start teaching, with discussions shifting to professional development topics such as classroom management, lesson planning, educational technology, and so forth. According to MfA associate director Dawn Techow, "These meetings are an essential element of the design of the program, because we feel that building a community of math educators who can learn from and support each other is key to retaining them."

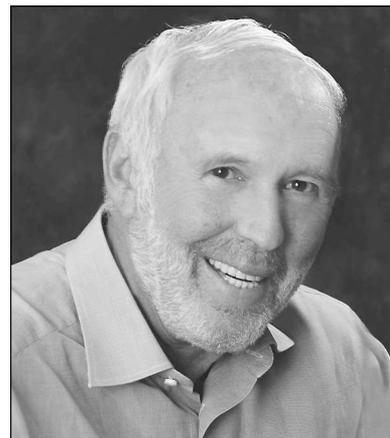
The MfA pays close attention to where the fellows get their first positions. On the one hand, as Kra explained, "We try to have a program for all schools, so our fellows may not teach in the elite schools," meaning those with entrance examinations, such as the Bronx High School of Science or Stuyvesant High School. On the other hand, as first-time teachers, the fellows should not plunge immediately into the most difficult classrooms. "We do not want our fellows to work in schools where 90 percent of their time will be devoted to discipline problems rather than teaching," Kra said. Even with these constraints, the fellows have all found suitable jobs, and most have had two or three offers.

What do these special job requirements for Newton Fellows mean for the MfA's relations with the New York City Board of Education? "It's a complicated situation," Kra acknowledged. "Clearly we are making more work for the Board of Education. They have to think of us as a new idea. . . . However, they are getting a product that they are very happy with." Teachers' unions, which ordinarily might balk at extra pay for a special coterie of teachers, have reacted positively to the MfA's programs, because the source of the extra pay is private money, not money from the coffers of the Board of Education.

In 2005 the MfA received about one hundred fifty applications to the Newton Fellowship program and chose forty fellows. In the current academic year, there are eighty Newton Fellows teaching in New York, and forty are in masters of teaching programs in the partner institutions. About half of the 2005



Irwin Kra



James Simons

Newton Fellowship applicants were from New York State and the rest from across the nation. Those from elsewhere might very well leave New York City at the end of their teaching commitment, and Kra said, "We have no problem with that." The MfA sees the Newton Fellowship program as addressing a national concern. "We want to help New York City tremendously, we are all committed New Yorkers," he said. "But our program is national, and if someone leaves and teaches in San Francisco or Idaho, fantastic."

In addition to the Newton Fellowships, which are aimed at recent mathematics and science graduates and career-changers, the MfA has the Newton Master Teachers program. This program is intended to support people who are already teaching and who have shown themselves to be outstanding in what they do and to have the potential to become educational leaders. The MfA has designated twenty Newton Master Teachers in New York City, providing them with a US\$50,000 award spread over four years as well as support for professional development activities. One of the roles of the master teachers is to help the Newton Fellows who are in their first year of teaching. "They are helping to change the atmosphere in the schools," Kra said of the master teachers. "We have extremely high expectations for them, and we want to have as few demands as possible. . . . So far the master teachers have exceeded our expectations. They have organized seminars, they have organized presentations for each other and for other teachers, they are working on curricular material—they are really involved."

A Classy Enterprise for Brainy People

Talking with some of the Newton Fellows, one gets the impression that they see the program as an elite, classy enterprise for brainy, high-powered people. David Griswold was an undergraduate in computer science at Caltech when he gradually came to the realization that he did not want a career in research and academia but wanted to teach high school. Up to that time he had always thought he would teach school only after retiring. "I realized that the only reason I had decided that I wanted to teach when I retired was because. . . high school teaching is a looked-down-upon profession," he said. "It's a low-status job." When he finally did commit to the idea of becoming a teacher, he applied to masters in teaching programs in New York City and found out about the Newton Fellowship program when the MfA contacted him. He finished his teacher training in the summer of 2006 and is now in his first teaching job. "It has been a fantastic program," he said. "I love the fact that I got here and immediately had a peer group of people like me. . . who are very interested in math and also very interested in the teaching." He plans to keep a foot in the door of

computer science by doing programming during the summer.

Jesse Johnson studied mathematics and film-making at Hampshire College and after graduating worked for three years in film schools. She had considered teaching but had not committed to it as a career choice. After a year in the Newton Fellowship program she has no doubts that she made the right choice. "The prestige of the fellowship and the ease of being able to get so much support made it easy to decide to do it," she said. And the financial benefit "makes it easy to stay committed." One impression she had after completing her first year in the program was a lack of interaction with mathematicians. "That is a call that I want to put out," she said, "that I want to know more mathematicians. . . . I want them to be involved in curriculum change and policy, but also to be informed by having put some of their time and energy into finding out what it is like to be in [school] classrooms." She said that the MfA could help to stimulate such interactions, because the Newton Fellows come primarily from backgrounds in academic mathematics, giving them natural points of contact with college and university mathematicians.

Going National

In February 2006 bills were introduced into the U.S. Senate and House of Representatives to establish the Math Science Teaching Corps, known by its acronym MSTC, pronounced "mystic". The basic aim is to create a cadre of outstanding mathematics and science teachers by giving them extra pay and support, much as is done in the MfA's Newton programs. In fact, the main goal behind the establishment of the MfA was to provide pilot projects that could serve as a model for a national program. The bill was sponsored in the Senate by Charles Schumer (D-NY), a longtime friend of James Simons, and in the House by Congressman Jim Saxton (R-NJ). The bill is now in committee: the Health, Education, Labor, and Pensions Committee in the Senate, and the Education and the Workforce Committee in the House. Exactly when Congress might act on the MSTC bill is difficult to predict, but in any case it is unlikely the money would be appropriated in the current fiscal year.

And serious money is involved. The aim is to have about 20 percent of all secondary mathematics and science teachers be members of the corps, so that MSTC would at any given time have about 80,000 members. The program would ramp up to that number, and in the steady state the estimated yearly cost would be US\$1.75 billion. The bill spells out a proposed structure for the program, including requiring MSTC candidates to pass a standardized test that would be approved and reviewed periodically by the National Academy of Sciences. "It's

a fairly complicated program,” Kra said, “but we think it needs to happen.”

Kra compared a teacher becoming a member of MSTC to a mathematician receiving a grant from the National Science Foundation (NSF). Mathematicians apply to the NSF for grants for a fixed term, and the most outstanding get funded. They can also reapply. In the same way, teachers could apply to become MSTC members and receive a salary supplement for four years. At the end of that period, they can reapply to MSTC. Thus the MSTC stipends are not a permanent addition to salary, just as summer salary on an NSF grant is not permanent. MSTC teachers must perform at a high level to be readmitted. As Kra explained, “We expect the corps members not only to be superb teachers but also to be leaders in the field, mentor other teachers, work on curricula if necessary, influence boards of education, and so forth.”

Support of the major teachers’ unions, such as the National Education Association and the American Federation of Teachers, is sure to be a major factor in getting the MSTC bill passed. Kra said that the MfA has been talking with the unions about the bill, and while the unions have suggested some modifications, these have not affected the main principles of the MSTC program. Another important factor will be whether the MSTC bill fits in with the educational agenda of the Bush administration, noted Samuel M. Rankin III, director of the AMS Washington office. “Whether the president would sign such a bill depends on many issues,” he said, “for example, the budget deficit, whether or not he sees this as a complement or an intrusion to NCLB [Bush’s “No Child Left Behind” agenda], whether or not other bills are introduced regarding K-12 education that would compete for new funds, and whether or not this would help him or the Republicans holistically.”

The United States has a strong tradition of local control of education and a concomitant suspicion of big national educational programs, so there could be some opposition at the local level to MSTC. “Our counterargument to that is, we are not mandating anything,” Kra said. “We are not insisting that anyone become a member of the Math Science Teaching Corps. Teachers would be foolish not to try to become members, because it gives them lots of benefits, but it is a completely voluntary thing. We are not insisting that school districts hire these members of the corps. They would be foolish not to hire them if the corps really produces better teachers.”

Good Teachers Rise above the Curriculum

Regardless of the fate of the MSTC bill, its introduction into Congress has highlighted a growing recognition that teacher content knowledge is the

key to improving mathematics and science education. This recognition has come in the wake of a wave of educational reform efforts that tended to emphasize curricular change over teacher qualifications. Several recent reports, such as *Rising Above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future*, issued in 2006 by the National Academy of Sciences, have strongly emphasized the need for science and mathematics teachers who really know their subjects. Indeed, many of the recommendations in the NAS report express the same principles embodied in the MfA’s programs and the MSTC bill.

Simons put it this way. Suppose you wanted to learn to fly an airplane and your instructor tells you that he is not really a pilot, but he knows how to take off and land. You would say no thanks, even if he told you he would be using the most up-to-date flight school curriculum. “If you have a person who does not know mathematics, I don’t care what the curriculum is, the person is not going to do a very good job of teaching,” Simons remarked. “But if you have a person who does know mathematics, then he or she has a reasonable chance of imparting some of that knowledge to the students, no matter what the curriculum is.” The MfA is banking on the idea that better pay will attract such people. It’s not a bad bet.