

# MSRI Celebrates Its Twentieth Birthday

The past twenty years have seen a great proliferation in mathematics institutes worldwide. An inspiration for many of them has been the Mathematical Sciences Research Institute (MSRI), founded in Berkeley, California, in 1982. An established center for mathematical activity that draws researchers from all over the world, MSRI has distinguished itself for its programs in both pure and applied areas and for its wide range of outreach activities. MSRI's success has allowed it to attract many donations toward financing the construction of a new extension to its building. In October 2002 MSRI celebrated its twentieth year with a series of special events that exemplified what MSRI has become—a focal point for mathematical culture in all its forms, with the discovery and delight of new mathematical knowledge the top priority.

## The Founding of MSRI

From the 1930s through the 1970s, the only large-scale mathematics institute in North America was the School of Mathematics at the Institute for Advanced Study (IAS) in Princeton. In the 1970s there were discussions between leaders in the mathematical sciences community and the National Science Foundation (NSF) about the need to come up with alternative modes of funding support, including mathematics institutes. The NSF's 1978 call for proposals for alternative modes of support resulted in the funding of two national mathematics institutes: MSRI and the Institute for Mathematics and its Applications at the University of Minnesota. In a recompetition for institute funding held by the NSF in 1997, both IMA and MSRI won

renewed support. Since then, the NSF has launched four more institutes: the Institute for Pure and Applied Mathematics at the University of California, Los Angeles; the AIM Research Conference Center at the American Institute of Mathematics (AIM) in Palo Alto, California; the Mathematical Biosciences Institute at the Ohio State University; and the Statistical and Applied Mathematical Sciences Institute, which is a partnership of Duke University, North Carolina State University, the University of North Carolina at Chapel Hill, and the National Institute of Statistical Sciences.

Shiing-Shen Chern, Calvin C. Moore, and I. M. Singer, all on the mathematics faculty at the University of California, Berkeley, initiated the original proposal for MSRI; Chern served as the founding director, and Moore was the deputy director. In its first year MSRI held two programs, one in nonlinear partial differential equations and one in mathematical statistics. Since then, two to four programs, running over semesters or over the whole academic year, have been held each year. Irving Kaplansky succeeded Chern as director and served until 1992, when William Thurston took the position. The current director of MSRI is David Eisenbud, who started a two-year term as president of the AMS in February 2003 (see the interview with Eisenbud elsewhere in this issue of the *Notices*). While Eisenbud is on sabbatical for the 2002–2003 academic year, Michael Singer is serving as acting director.

MSRI is a large operation, with about 1,300 visitors coming through each year and about 85 in residence at any one time. It is also large in terms of its coverage of mathematics. Over the years it

### David Hilbert: Boy, Did He Have Problems!

As part of its twentieth-anniversary celebration, MSRI held a panel discussion entitled “The Honors Class: Hilbert’s Problems in Perspective”. The panelists were Benjamin Yandell, author of *The Honors Class*, a book about the people who solved Hilbert’s problems; Constance Reid, author of the acclaimed biography of Hilbert; Paul Cohen, a Fields Medalist at Stanford University who solved one of Hilbert’s problems, pertaining to the independence of the axiom of choice and of the continuum hypothesis; and Sir Michael Atiyah, Fields Medalist at Edinburgh University. Organized by MSRI’s associate director for external collaborations, David Hoffman, the panel provided an occasion for some fascinating discussion about the culture of mathematics.

Growing up in New York, Cohen said, he felt very close to European traditions, so “when I thought of mathematics, I thought of Göttingen and Cambridge.” Hilbert was a towering figure in this tradition. Cohen noted that Hilbert’s way of thinking about mathematics was characterized by a freshness and an impatience with any sort of politicking. Hilbert had his finger on all of mathematics, except topology, Cohen said, a feat that would be impossible today, given the enormous growth in mathematics since 1900.

Atiyah spoke of one of Hilbert’s great contemporaries, Henri Poincaré, thereby reopening a perennial debate over the relative importance and influence of the two. Without denying Hilbert’s great achievements, Atiyah seemed to believe Poincaré was the more creative and visionary. He summed up the heritage of the two: “The most famous disciple of Hilbert, I think, was Bourbaki, and the most famous disciple of Poincaré is Arnold....The two are very controversial!” Cohen by contrast said he feels a “closer kinship” to Hilbert and expressed awe at, for example, Hilbert’s rigorous proof that the Dirichlet principle is correct. This proof took care of what was one of the dominant problems of nineteenth-century mathematics. “When I look at [Hilbert’s] achievements, the raw brain power is overwhelming,” Cohen said.

Reid noted that Hilbert always referred to Poincaré as “the greatest mathematician of his [Poincaré’s] generation”; this statement neatly sidesteps a comparison of the two, for Poincaré was eight years older than Hilbert. Reid said she once asked Richard Courant who was the greater mathematician, Hilbert or Poincaré (Courant was a student of Hilbert’s). Courant replied that there was no question it was Poincaré. Reid’s book on Hilbert quotes Courant as saying: “But you cannot compare him with Hilbert. He did not have the intensity that radiated from Hilbert and which was so wonderful. If he had had that...”

The good-humored sparring over Hilbert and Poincaré was mixed with discussion of problem solving versus theory building in mathematics. Cohen said he feels particularly close to Hilbert, because “he loved problems. He thought about mathematics in quite a similar way to how I do.” Atiyah pointed out that there is no real dichotomy between problems and theory. “No theory is any good unless it solves problems, and no problem is really good unless it leads to a theory,” he said. Wiles’s solution to Fermat’s Last Theorem was important because it emerged as part of a much larger and richer theory, Atiyah noted, whereas the proof of the four-color theorem did not. Said Atiyah, “It’s like a mountain. Until you get to the top, you don’t know whether it was important to climb that mountain.”

—A. J.

has hosted programs in mathematical economics, mathematical biology, string theory, and statistics, as well as in a wide variety of areas in pure mathematics. Indeed, Eisenbud notes that a distinctive feature of MSRI in the world of mathematics institutes is its combination of pure and applied areas. As he puts it, “We have continued to have a fundamental emphasis, and we mix it with applied areas.” Perhaps the closest cousin in this regard is the Isaac Newton Institute in Cambridge, England, but there the emphasis is more strongly in applied areas.

Another hallmark of MSRI is the way it promotes collaboration. Even the building, with its atrium design in which three levels of offices open onto the central lobby, is intended to get people to interact. By contrast, places like the IAS or the Institut des Hautes Études Scientifiques in Paris have a more monastic feel. “MSRI tends to be much more collaborative” than those institutes, Eisenbud says. “You can get away by yourself, but those who are happiest here are interested in collaboration.” Some visitors find the rather bustling atmosphere distracting, while others thrive on it.

MSRI is a nonprofit corporation separate from the University of California, but the ties between the two are close. There is plenty of interaction between the university’s mathematics department and MSRI, as the two are only about ten minutes apart by shuttle bus. One of the great attractions of MSRI is its location, perched on a hillside with commanding views of the San Francisco Bay Area. But the location also has its drawbacks: cost of living is high in Berkeley. MSRI does not have its own housing, though it does provide extensive help for visitors navigating the area’s tight housing market. Pay for visitors is adequate but not lavish, and MSRI has sometimes had difficulty attracting well-paid senior mathematicians. This difficulty has an impact on MSRI’s postdoctoral program, which attracts twenty to thirty young people each year and which has sometimes suffered from a lack of mentors for the postdocs. “This is something we struggle with each semester,” Eisenbud remarks. “[Senior] people have to make sacrifices to come to MSRI—it’s sad, but true.” This problem has been eased to some extent in recent years through visiting professorships paid for by Hewlett-Packard and by the mathematician and philanthropist James Simons. Hewlett-Packard and Microsoft also sponsor postdoctoral appointments, and UC Berkeley sponsors a one-semester visiting professorship.

One of the biggest changes in MSRI in recent years is the growth of its fundraising activity. Two years ago MSRI hired its own full-time development officer; currently 25–30 percent of MSRI’s budget comes from non-NSF sources. Right now MSRI is in the midst of a capital campaign to raise

the remaining \$1 million needed to finance a \$7.3 million extension to its building. The initial \$6.3 million was donated by foundations and private individuals. Construction will begin in fall 2003 and is scheduled to be completed a year later. The extension will double the capacity of the library and add new seminar rooms plus a common room and a large lecture hall. The addition of a professional kitchen should provide much needed relief for the food service quandaries that arise from MSRI's somewhat isolated location, far from the many restaurants for which the Bay Area is so famous. Because the amount of office space will remain the same with the extension, MSRI's policy of having visitors share offices will not change.

### Celebrating Twenty Years

"Brainiacs heat up screen at Cinemath", reads a headline in the October 2, 2002, *San Francisco Chronicle*. The article described a mathematics film festival called Cinemath held in celebration of MSRI's twentieth anniversary. It was organized by the Pacific Film Archive in Berkeley and by Robert Osserman, MSRI's special projects director and professor emeritus at Stanford University. Among the films were  $\pi$  (Darren Aronofsky, 1998), *Death of a Neapolitan Mathematician* (Mario Martone, 1992), *Drowning by Numbers* (Peter Greenaway, 1988), and a biographical film about Paul Erdős called *N Is a Number* (George Paul Csicsery, 1993). Most of the films were accompanied by talks by mathematicians, including Osserman, Dave Bayer of Barnard College, Keith Devlin of Stanford University, and Ronald Graham of the University of California, San Diego. Osserman reported that Cinemath attracted mathematicians and non-mathematicians alike.

The film festival is very much in keeping with the tradition of outreach activities begun by Thurston, who served as MSRI director from 1992 to 1997 and is now at the University of California, Davis. This part of the MSRI agenda got an enormous boost from the success of the 1993 "Fermat Fest", a celebration of Andrew Wiles's proof of Fermat's Last Theorem, which combined brief talks by mathematicians with lighter fare such as songs by mathematician-songwriter Tom Lehrer. Held in a science museum in San Francisco, the Fermat Fest sold out the 1,000-seat auditorium. Among the other MSRI outreach programs are the Journalist-in-Residence program, occasional lectures for the general public, and sponsorship of the Bay Area Mathematics Olympiad. One of the most unusual activities is a series of "conversations" in which Osserman discusses mathematics with artists, writers, and performers whose work has touched on the field. The most recent conversation, with the comedian Steve Martin, was held in December 2002. As these activities have become more prominent,



Photograph by David Zetland.

**Cutting the birthday cake, left to right, David Eisenbud, Michael Atiyah, and Robert Bryant.**

there has been concern that they could overshadow MSRI's core mission of mathematics research. "They could," Eisenbud said. "One has to be vigilant and keep the balance right. The truth is that we have such good mathematics and such a good structure that we are not in danger. The quality of the mathematics programs remains our first priority."

In addition to the film festival, the MSRI birthday celebration included a colloquium lecture by Sir Michael Atiyah and a panel discussion about Hilbert's problems (see sidebar). There was also a public lecture by Atiyah, presented on a sunny Saturday afternoon to an audience of about 300 people assembled in a lecture hall on the Berkeley campus. The lecture, entitled "Geometry and Physics from Plato to Hawking", made the point, as Atiyah put it, that "mathematics is the creation of people, not of a machine." He discussed the symmetry of the Platonic solids, tracing a thread of ideas from Kepler's incorrect model of the solar system as nested polyhedra, to the connections between the Platonic solids and the exceptional Lie groups. One of these groups, which is connected to the icosahedron, turns out to play a role in string theory. Although Kepler's model of the solar system was wrong, his intuition about a deep connection between the Platonic solids and physics has proved to be essentially correct. This shows, Atiyah said, that "a good idea lives on to fight another day." And MSRI, as good an idea today as it was twenty years ago, lives on to provide a place where mathematics can flourish.

—Allyn Jackson