

Presidential Views: Interview with David Eisenbud

Every other year, when a new AMS president takes office, the *Notices* publishes interviews with the incoming and outgoing presidents. What follows is an edited version of an interview with AMS president David Eisenbud, whose term began on February 1, 2003. The interview was conducted in October 2002 by *Notices* senior writer and deputy editor Allyn Jackson. Eisenbud is director of the Mathematical Sciences Research Institute in Berkeley and professor of mathematics at the University of California, Berkeley.

An interview with AMS past president Hyman Bass appeared in the February 2003 issue of the *Notices*, pages 232–4.

Notices: You are director of a major math institute, you travel a lot, you talk to a lot of mathematicians. What kinds of problems or challenges do mathematicians tell you they are facing?

Eisenbud: One concern is about the flow of young people into the profession. Both here and in Europe people say the flow of youngsters into mathematics has dried up over the last years. There are bright spots and dim spots, and it's very hard to get a good integrated picture. But it seems pretty clear there is a serious problem.

In this country there has been recently a lot of concern about VIGRE [Vertical Integration of Research and Education in the Mathematical Sciences, a program of the Division of Mathematical Sciences at the National Science Foundation (NSF)]. There is also a lot of concern about how people get supported over the long term. We've added a great deal of money for support of young people in recent times, and there is concern that there is no mechanism to follow through for mid-career people.

But the amount of mathematics to do doesn't seem to be drying up, and there are plenty of new opportunities for interactions with other sciences, particularly in biology.

Notices: Do people worry about funding being drained off to applied areas?

Eisenbud: There has been such a shortage of funding for all of mathematics that people worry whenever something new comes under the umbrella. Despite all the talk about interactions with applied mathematics, many mathematicians don't really know how mathematics is involved with other sciences. I think that the connections with other sciences and applications will continue to

develop rapidly and that this is very healthy. If there were a better level of funding overall, it would be easier for people to accept this with confidence.

Of course, NSF math funding has seen wonderful increases lately. But there is a sustainability problem: Much of the increase is gotten on the basis of new activities, and if the increases don't keep coming, the new activities can spell trouble for the existing programs in the short run. That doesn't mean one shouldn't be bold. I think we have to take this risk. Overall, it's very healthy for the profession to have done so. The only way to get out of the hole is to be open to these new possibilities. In the long run I believe that all mathematical activities will profit from this.

I think that the AMS's activities in advocacy for mathematics funding are much more effective than they were. Sam [Rankin, director of the AMS Washington Office] has done a wonderful job, and Monica Foulkes [a member of the Washington Office staff] is terrific. That's an effort that I want to support and encourage. [AMS Committee on Science Policy chair] Jane Hawkins and I have talked about this, and that committee is moving toward a more active stance. I think the committee's contacts in Washington have been useful, and I think it could increase its usefulness by encouraging more "at home" contacts between mathematicians and people in the Congress.

The flow of talent into mathematics is a hard problem to address. The AMS has been actively trying to help with programs like the "Epsilon Program", to which a very large number of AMS members contribute. I'd like to see the AMS do more at the graduate level, too. For example, there are a couple of programs for department chairs (the Chairs' Colloquia [of the National Research Council's

Board on Mathematical Sciences and Applications] and the AMS workshops for new chairs at the annual meetings), and perhaps such things could be done for graduate advisors. The AMS might also help to advertise good practices: both novel ideas for graduate programs and simply things that work well. A lot of what is done in graduate education in mathematics in this country is very good.

The Carnegie Foundation is initiating a major study of the doctorate. One of the essays they have commissioned will be written by Hy Bass, and there have been institutional contacts with the AMS. Perhaps the AMS can play a useful role in the Carnegie study.

Notices: *Looking back over the past couple of decades, what do you think accounts for the slackening off of the flow of talent into the profession?*

Eisenbud: There are surely many causes. It became very popular to make money. Business schools absorbed very talented young people when it seemed they could make a lot of money easily and quickly. We may see some flow back, now that the bubble has burst.

In the seventies computer science became an exciting thing to do—and it's still an exciting thing to do. Some of the people who used to go into mathematics (and the other theoretical sciences) now go into computer science.

Another cause is the unpredictability and big fluctuations of the job market. People don't rush back in as soon as the job market gets better. When youngsters struggle with several postdoc positions in a row, the example is before the students: Those who are struggling are their teachers! It's no mystery that mathematics students today worry about the job market for mathematicians.

Perhaps another part of the problem is the rejection of a culture that favored hard work and deep thought and effort put into scholarly things. Many people prefer to do things that are easy and safe.

Notices: *You got your Ph.D. in 1970. In terms of the sense of idealism or the willingness to work hard, do you think the climate was different then?*

Eisenbud: I do. In my circle of friends we worried about finding a grand dream to pursue, not about making money. There was a sense that the universe was opening up and that science was the great frontier. You couldn't do anything more exciting or more important for society's future. Government support was also very important in this. In the ten years after Sputnik, from 1957 to 1967, money poured into science and science education. It was clear that you would be adequately compensated, and that was enough. That now seems an extraordinary period. It happened that I came of age in that period, so I thought for a long time that it was the norm. But it was not.

Notices: *Many math departments depend on foreign students to keep their graduate programs*

going, and often the foreign graduate students are the best students.

Eisenbud: That's a little unfair. They usually come with at least one extra year's preparation. It is true that they are quite often the best prepared.

Notices: *That's true. But are people in the U.S. concerned about this? It's a delicate issue.*

Eisenbud: Many foreign graduate students become Americans; they are as important a part of the next generation of Americans as they are of this generation. My own feeling is that we should be incredibly grateful that we are sent the best students from other countries. Of course we should do the necessary things to encourage a stronger flow of Americans into mathematics. But we should be very open to foreigners.

Notices: *One difficulty with VIGRE is that the students supported have to be American.*

Eisenbud: At the beginning of VIGRE I was very worried about this, but I've come to think I need not have been. There are statistics showing that the number of foreign graduate students studying here has increased under VIGRE, along with the number of American students. Even if a new source of support is entirely directed to one group, it may help other groups by relieving older sources.

I would like to comment on the importance of the AMS data collection efforts. Take the question of whether the number of foreign graduate students in mathematics has gone down because of VIGRE. That's something that only the AMS is studying. Mathematicians are particularly aware of, interested in, and sensitive to data of that kind. The articles in the *Notices* that give data on the state of the profession are excellent, but I think that the data could be made more accessible. I could imagine having the data available online in a cumulative form that would allow one to search and make one's own table of numbers of, say, Ph.D.'s in algebra each year since 1975.

Notices: *Some years ago the issue of women and minorities in mathematics was very big. This issue seems to be much less at the forefront now. Why has this changed?*

Eisenbud: I also see a diminution in official expressions of interest in this issue. I think this comes partly from the political climate. For example, the University of California is forbidden to use affirmative action in deciding which students to admit. A number of states have such laws. Some people don't want to take strong public stands, because they think it might be counterproductive in the present climate.

The AMS is sensitive to the issue of underrepresentation, and the number of women and minorities speaking at the meetings, for example, has increased quite a bit over the last fifteen years. The AMS has done a pretty good job in making sure that there are women on committees



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and involved in many other ways with the work of the Society. Still, the improvements are not uniform, and I think even more can be done.

The problem of minority involvement is a bit different from that for women, because the absolute number of minority mathematicians is still tiny. I'm proud that the first CAARMS [Conference of African-American Researchers in the Mathematical Sciences] conference was held ten years ago at MSRI; there have been CAARMS conferences annually ever since. A big focus for CAARMS and for organizations like SACNAS [Society for the Advancement of Chicanos and Native Americans in Science] is on getting undergraduates in science to go on to graduate school.

I think the AMS should not be discouraged by the fact that the government is in some sense moving out of this arena. Our involvement is important. One of the ways the AMS president can influence the organization is through appointments to committees. I plan to pay close attention to such appointments.

Notices: *What about electronic publishing and things like the Digital Math Library. Are you interested in these matters?*

Eisenbud: Yes, very interested. I think John [Ewing, AMS executive director] is a great resource for this activity, and he will play a significant role. But the issue is not at all confined to the AMS! For example, the CEIC [Committee on Electronic Information and Communication of the International Mathematical Union] has a lot of energy right now.

It seems clear that something must change. There is practically *no* really complete mathematics library anymore. Perhaps there is no library on the face of the earth that has all the mathematics journals reviewed in *Math Reviews*. I'm lucky to live near pretty big libraries, and I find most papers I need, but in the last five years half a dozen times I have tried to find articles that are not in any University of California library. And if it's hard to get journals here, it's much harder in many other places. This means that mathematics is fragmenting. The published literature is supposed to be an accessible repository for what we know. If I publish in a journal you can't get, I might as well have not published, as far as you are concerned.

Notices: *Mathematical Reviews gets everything. If library collections continue to worsen, tools like MathSciNet will become even more important.*

Eisenbud: That's true. And the number of institutions that can now access MathSciNet has increased a lot because of the AMS's consortium pricing policy. MathSciNet has figured out a way to make its information available to many, many more mathematicians. I think people are not aware how important this step has been elsewhere in the world.

If I had to name the tools that changed my research life the most in the last ten to fifteen years, they would be: some of the computer algebra systems (Macaulay and Macaulay2 in particular), the arXiv, and MathSciNet.

Notices: *Do you think the arXiv is a threat to the AMS?*

Eisenbud: No. In what way?

Notices: *It could cut into the journal revenues.*

Eisenbud: I think no one knows how this will play out. First of all, the arXiv's coverage is far from universal. At the moment it is just wild fantasy to think that it could take over. But I could imagine a future in which that would become true. Things journals do—the sorting of good papers from bad, the refereeing process, the stamp of approval, the role in career advancement, their longevity—are not trivial at all. We should all be concerned about keeping those functions healthy as the system changes. On the other hand, some publishers have raised prices too much. I think the AMS has been very good about its journal pricing, but that's not universal.

Libraries are in real trouble. The status quo, with prices increasing exponentially and library budgets being slashed, just cannot go on. I feel sure that twenty years from now things will be different in some major ways.

Speaking of publishing, I am enthusiastic about the AMS book publishing [program]. Some time ago it was seen as a rather stodgy program, with poor distribution, but that has changed. The AMS is now one of the top math publishers. It seems to me that the AMS can be a very good steward for the publishing needs of mathematicians.

We are living at a time when there is a lot of public awareness of mathematics, as witnessed by the many plays, movies, books, and popular press articles about mathematicians and mathematical subjects. It's a time when individual mathematicians or mathematics departments can do more in public outreach. This can be extremely useful in continuing the momentum for increasing mathematics funding that we have at the moment.

Let me say that I am extremely impressed by the multitude of AMS activities and the professional way that they are handled. I think John Ewing is terrific and runs a very tight and functional ship. The office in Washington has been a big success. Bob Daverman and the associate secretaries, backed up by a great staff, do a remarkable job with the meetings. The network of committees for journals, prizes, professional issues...functions amazingly well. There is a lot going on.