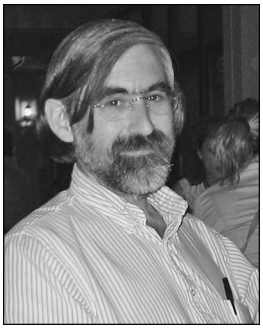
Presidential Views: Interview with David Vogan

Every other year when a new AMS president takes office, the *Notices* publishes interviews with the outgoing and incoming presidents. What follows is an edited version of an interview with David Vogan, whose two-year term as president began on February 1, 2013. Vogan is professor of mathematics at the Massachusetts Institute of Technology. The interview was conducted in fall 2012 by *Notices* senior writer and deputy editor Allyn Jackson. An interview with past president Eric M. Friedlander appeared in the February 2013 issue of the *Notices*.

Notices: *Communication in mathematics is something you are very interested in. What do you see as the challenges here?*

Vogan: There are a lot of wonderful ideas for using new technology to support communication. For example, MathOverflow takes advantage of collective expertise and makes it available to the community in ways that were unthinkable without the technology. It's a powerful way to solicit information widely and at the same time to provide information about the reliability of answers you are getting. A lot of young and not-so-young people are using it very effectively. Some of these things are replacing or supplementing things that the AMS has been involved with, like book publication and MathSciNet. Can we learn from what's happening at MathOverflow and similar places to make books and MathSciNet more useful?



David Vogan

The MathOverflow model is maybe most appealing to me in connection with changes in the way mathematics is taught. Students are taking enormous advantage of information on the Web to learn about mathematics—sometimes just to look up answers to their problem sets, but sometimes to get new understanding. Usually that information does not come with the certification of "this is reliable" that MathOverflow can provide. I've wondered whether the AMS could provide a framework for giving access to online mathematics and somehow accumulating evaluative information, such as: this is a really clear account or this is the right account to read if all you know is beginning linear algebra. MathSciNet indexes the math literature in a fantastically useful way. The literature is being extended by online material, such as the notes we write and post for students in our classes. If that material could be indexed in some of the useful and effective ways that MathSciNet and MathOverflow do, that could be wonderful.

All this is related to the issue of MOOCs: massively open online courses. Whether or not we participate in them directly, they are out there on the Web, freely available to some extent, and our students use them, even in traditional courses. If we can help find ways for our students to use those tools effectively, that's a great thing.

The books that have been written over the past centuries are still a tremendous resource, and they haven't been integrated into the online Web as well as they could be. Some books are out there and possible to get at, legally or illegally. One thing the AMS could think about is how to make the AMS catalogue of books available to be part of the resources that people can get at online. It's easy to make things available for free, and that's not necessarily the right idea for a complicated institution that wants to continue to exist.

Notices: *In contrast to the idea of indexing what is out there on the Web, there have been efforts to collect together essays that cover wide swaths of mathematics. What do you think of this?*

Vogan: It's an interesting idea. Tim Gowers's book[1] was a fantastic achievement in that direction. It's a book, unfortunately, and one that's not easy to carry in your briefcase! It's certainly possible for one

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[1]The Princeton Companion to Mathematics, *edited by Timothy Gowers, was reviewed in the November 2009 issue of the* Notices.

committed person to ask experts in many directions to contribute. That can succeed wonderfully. Twenty years ago I would have said that's the way you ought to go. But I've been amazed at how successful the more democratic, grassroots approaches have been.

Notices: *Are young mathematicians of today working in a very different way from the way people worked when you were starting out?*

Vogan: I think they are. The way they learn about things and what constitutes learning are somewhat different. In the old days, if there was some important bit of mathematics that was hard to find good references for, what was needed was a good textbook that would make the material available to students. Sometimes that's still absolutely the right thing to do. But today, students don't want, for example, the right book about the entire theory of Lie groups; they want the section of a chapter in that book that deals with the problem they need to do right now. That's been an effective way for people to work. Since the AMS is partly in the business of providing information in books, we need to think about how to provide these smaller chunks too.

Notices: *A very general question: How would you assess the overall health of the mathematics profession today?*

Vogan: I think it's very good. But there are also enormous problems. A great deal of what we are about is conveying mathematics, as opposed to creating it. Conveying mathematics is some of the greatest work mathematicians do. Nevertheless, it's clear that there is a fairly widespread perception that we are all terrible at it. This perception leads to difficulties: difficulties about funding within universities and from the federal government, difficulties with respect to bringing people into the field. Mathematics is both growing in its internal wonderfulness and growing in the ways that it interacts with the rest of science and the world. Those are great things and very healthy. We need to work on not looking at our shoes as much and explaining to people how great these things are.

Notices: *How did the perception develop that mathematicians are terrible at communicating?*

Vogan: The easy answer is that it's hard stuff. If you want to understand modern biology, you can spend most of your time on things that have been done in the last eighty years. If you want to learn enough mathematics to be an engineer, you have to understand work that was done over a period of thousands of years. Mathematics has a hierarchical character, and it is deep. If there is any piece of it that you don't get straight in your head, that makes it difficult or impossible to understand the pieces that come after that. It's very demanding material that we're trying to get across to the world.

Notices: *What can the AMS do to help?*

Vogan: All the things that we are already doing are wonderful. MathSciNet makes it possible, at least for us experts, to find material in this impenetrable mass of the journal literature. The hour lectures at the meetings of the Society make serious and difficult mathematics accessible to a lot of people. Sometimes that succeeds brilliantly, sometimes less than brilliantly. But I think everybody involved is working hard on doing it as well as we can.

Notices: *And how about reaching out beyond the world of mathematicians?*

Vogan: I went a week or so ago to one of the congressional briefings that Sam Rankin [director of the AMS Washington Office] organizes in Washington. It's for members of Congress, but in practice it's mostly for their aides. Sam does a great job at finding bits of mathematics that are accessible and appealing and giving hints of what the subject is about. Some things the AMS has had nothing to do with are quite amazing. For example, the play *Truth Values*, by Gioia De Cari,[2] is, among many other things, a beautiful window into what mathematics is like.

The physicists do a great job of making people feel the excitement of the exploration that they do. Lots of people were excited to hear about the Higgs boson without knowing anything about it. The physicists showed that this is unexplored territory and has new and wonderful things. There is a lot of mathematics that is like that too. We can do a better job of writing adventure novels about it.

Notices: *You were involved in the great public interest that developed around* E_8.[3]

Vogan: That was a confluence of many happy accidents. I think in fact that the most important feature was a beautiful picture that Coxeter dreamed up from his work on geometry. Another mathematician, Peter McMullen, managed to draw this picture, and it appeared in some of Coxeter's books and papers. Then mathematician John Stembridge took that old black-and-white, pen-and-ink drawing and made a Postscript file. Then he could make the black lines whatever colors he wanted. The result was just gorgeous. A lot of media outlets, especially online ones, were happy to pick up this story that came with a gorgeous picture. If you just get people's attention, they are happy to hear an adventure story.

Notices: *Do you have thoughts about the situation for federal funding of mathematics?*

Vogan: There is a great deal of strong mathematical research in the United States that is not supported by the funding agencies. One big reason is limitations on how much money is available. But there have also been disagreements about the way the available money should be spent. There

[2] *"The mathematical dramatist: Interview with Gioia De Cari", by Julie Rehmeyer, appeared in the June/July 2010 issue of the* Notices.

[3] *See "The character table for* E_8*", by David Vogan,* Notices, *October 2007; and the April 2007 installment of the column "Tony's Take", by Tony Phillips, on the AMS Math in the Media website,* `http://www.ams.org/news/math-in-the-media`.

have been efforts through the AMS over the years to try to push the National Science Foundation to consider funding some smaller grants. I think this is a conversation worth continuing. Certainly it is valuable to provide a large grant that can support several graduate students, travel, etc. But if there is a limited amount of money, one has to ask whether a large grant is more valuable than providing a little support for work of several people. Those are always complicated questions, but I think maybe the prejudices of the funding agencies have been a little too much in the direction of large grants.

Notices: *Are there specific projects you hope to work on as president?*

Vogan: I would certainly like us to think about changes in teaching. These changes are taking place at every university, one course at a time, with a lot of individual mathematicians just having good ideas and making things happen. That's the best way for those changes to go forward. The big role of the AMS is to make sure these local things are visible so that when somebody sits down in a committee in Washington to think about whether mathematics education is a complete failure and is the reason for the bust in 2008, they are aware of all the good stuff that goes on. The AMS can also help with making mathematicians aware of good ideas that have been tried in institutions other than their own.

What the AMS is doing about electronic publishing and access with respect to journals is fantastic. The AMS is on top of that and staying ahead of the curve as much as possible. I think with respect to books, we're not so successful. The people in the AMS who are thinking about this understand what the difficulties are—and there are huge difficulties. But we haven't succeeded as well as we've got to. I've learned enough to know that I don't know exactly what should happen with electronic books. I've seen some other big mathematical publishers completely screw up electronic books. Some have put books on the Kindle, for example, without understanding mathematics, and the result was very poor. The AMS has not made those mistakes, which is wonderful. But we need to find a way to *do* something and not make mistakes. I'd be happy if we could do better with electronic distribution of books than we have.

I am also very concerned about archiving, about the library of books and journals that has existed on paper in university libraries. For that material to be useful, more and more of it needs to get into an electronic format that can evolve with technology. These are really complicated problems. Again, the AMS and the mathematical community in general have done wonderful things with electronic archiving for journals. But with books, we are not there yet. I think the AMS could be a part of that, because the AMS publications people are so good at everything they do.

Notices: *Is there anything else you wanted to talk about?*

Vogan: One issue which many people have thought about is what happens to the membership of the AMS in the future? The membership has declined slowly, although the mathematical world is still growing quite seriously. The reason the membership declines, I believe, is that some of the best things the AMS does are either freely available to everybody or at least easily available to anybody inside a university. Most young mathematicians understand very well that they need MathSciNet to live—more than they need air—but they don't have to belong to the AMS to get it. I don't want to change the fact that you don't need to be an AMS member to get MathSciNet, but I would like young mathematicians to understand that joining the AMS is their civic duty. It would be good if they also understood that joining the AMS has a lot of tangible benefits for them. There are a lot of ideas out there for addressing this. One good change is that the meetings of the AMS have become much more useful and accessible for students. At the Joint Meetings in Boston in 2012, there were huge numbers of undergraduate as well as graduate students, and I think they had a great time. I am not sure how we translate that into actual membership, but it is certainly a step in the right direction.

Notices: *One last question. What was the experience of running for AMS president like for you?*

Vogan: The running part is kind of surreal. The great thing about the experience of becoming president, especially in the last year as I have been sitting on some committees, is learning about what people are up to and how things are going. It's fascinating. My most serious involvement with the AMS previously was in the 1980s. That's when I knew more about the organization. And it was a very different organization then.

Notices: *What is the difference?*

Vogan: It's hard to say. In the 1980s the biggest thing the AMS did was Math Reviews. It's still true now that the biggest thing the AMS does is MathSciNet. And yet these feel like very different operations. Younger people are much more involved in the AMS than twenty or thirty years ago. A lot of the big policy committees of the AMS are run by fairly young people, and the membership involves lots of fairly young people. These young people are tremendously sophisticated in their understanding of the work they are doing. When I was involved in the past—well, it was a bunch of smart old people who were running everything. I like the picture of smart young people better.

Notices: *That seems to give a lot of hope for the future of the organization.*

Vogan: Absolutely.