Presidential Views: Interview with George Andrews

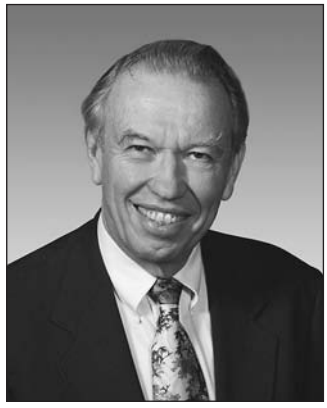
Every other year, when a new AMS president takes office, the *Notices* publishes interviews with the outgoing and incoming presidents. What follows is an edited version of an interview with George E. Andrews, whose two-year term as president begins on February 1, 2009. Andrews is the Evan Pugh Professor in the Department of Mathematics at Pennsylvania State University. The interview was conducted in fall 2008 by *Notices* senior writer and deputy editor Allyn Jackson.

An interview with past-president James G. Glimm appeared in the February 2009 issue of the *Notices*.

Notices: *The AMS is a large organization with many activities: publishing, meetings, public awareness work, science policy work, etc. How do you see the role of the AMS president in this large, diverse enterprise?*

Andrews: Obviously the president plays a role as the public face of the AMS, both to the members of the AMS as well as to the rest of society. So I will be following in the footsteps of my predecessors, presiding at a variety of meetings, assisting with our office in Washington in making presentations to Congress, and attending various policy committee meetings that occur throughout the year. Those are the standard items that involve any president.

When I was first asked to run for the presidency, it came as a great surprise to me, because it was not something I had ever thought of doing. But once I decided to run for the office, I wrote my candidate's statement listing a few things that seemed to me important and that I might concentrate on in the brief period of two years. One of the most important is: How can we better fund the research of younger mathematicians? Now with the economy in such dire straits, this is even more important. In the candidate's statement I mentioned the way research money is awarded by the NSERC [National Science and Engineering Research Council] in Canada; their program seems to be working very well. Unfortunately the National Science Foundation [NSF] does not see the NSERC model as one that they want to follow. I am trying to figure out ways that we in the AMS could approach funding agencies with the universal recognition that it's terribly important to nurture and develop young mathematicians, and concomitantly, there are funding problems that are probably going to get worse rather than better. Something really serious has to be done, including a careful husbanding of money, in order to keep more young people coming into the profession. The funding issue and expanding employment opportunities are most important.



George Andrews

The issues involving mathematics education, stretching from K–12 through undergraduate and graduate school, are things that I also mentioned in my statement. My main interest here is to promote programs that would provide current and future teachers with the mathematics that they need to understand in order to do a good job in the classroom. I would also cast a skeptical eye on a variety of curricular reforms that seem to me very far from the mark in achieving anything and that, just by the confusion that they create, actually turn out to be counterproductive.

Notices: *Going back to the matter of research support, it has often been proposed to the NSF that it could move to the NSERC model of giving smaller grants to more people. However, NSF has not been receptive to this idea and has stuck with giving large grants to a smaller elite of researchers. Is there a new or different way to approach the NSF on this question?*

Andrews: I'm working on that. From my conversations with people at the NSF, I believe they truly appreciate that we are not funding younger mathematicians nearly as much as we should. That was my motivation in bringing up the NSERC grants. The NSF is also deeply concerned about new researchers; so hopefully some new or creative way can be found to improve matters. In other words, I am not wedded to any particular proposal. I am perfectly willing to entertain other ideas—perhaps some sort of large block grant, or a new way of designing an institute, that could be used to obtain the desired results. Obviously it's something that

requires a fair amount of talking and negotiation. The conversations I have had so far make it clear that one cannot just go to the NSF and say, "Let's be like NSERC", because there is an institutional view that that's the wrong thing to do.

Notices: *What do you see as the impact on young mathematicians of the lack of research funding?*

Andrews: What is the point of funding? For administrators, grants produce overhead and cushion the salaries of star researchers. But for a young person who's really dedicated to mathematics, salary is not nearly as important as things like money for computers and computer use, money to bring in visitors, money for travel, money for various peripheral things like books, etc. These items require small amounts of money, and yet they can have a really dramatic impact on one's career.

Notices: *Do you think federal funding of mathematics has emphasized applied areas, at the expense of funding the field more broadly?*

Andrews: I think the NSF has been fairly well balanced. My problem is that the funding is focused on big grants, and a number of good young mathematicians are not getting grants.

I do want to say one thing about pure and applied mathematics. Surprisingly, all the presidents-elect of the three major organizations are either current or former Penn State-ers. Doug Arnold, president of SIAM [Society for Industrial and Applied Mathematics], David Bressoud, president of the MAA [Mathematical Association of America], and I all taught at Penn State in the early 1990s. The three of us are talking over ways in which we might introduce or at least tentatively begin some sort of reciprocity arrangement that would lower dues for people who are members of 2 or 3 of the organizations—something like, but not exactly like, the way reciprocity arrangements work with foreign math societies. The object would be to encourage a greater intersection of the members of the three societies. This is another way to make sure that there is interaction amongst the various aspects of mathematics.

The problem of course is the finances. If you lower your dues, then you hope that more people who are only in one society will join two or three societies. You could make up your losses if you increase your membership. It is guaranteed that your current joint members will be paying lower dues, but it is not guaranteed that people who are only in one society will think, "Maybe I should join another one, or maybe all three." Such concerns make you fearful, and in straitened economic times, fear is something we have to deal with.

Notices: *I am not sure what the intersection of the membership is.*

Andrews: It's not that high between SIAM and AMS, and consequently the reciprocity discussions there seem easier than with MAA. The AMS dues support a much smaller portion of the overall AMS budget than the dues at MAA—and consequently the MAA's concerns about financial problems are understandably much more serious than those for the other two organizations.

Notices: *You mentioned education as a major concern of yours. The problems here are big, extensive, and multi-faceted. What can the AMS do to help solve them?*

Andrews: Efforts undertaken—not necessarily by the AMS, but perhaps with AMS support—that are designed primarily to assist teachers in enhancing their mathematical knowledge relevant to what they are teaching, are central. It's widely known that I have been extremely critical of many of the curricular reforms that have been proposed and sometimes implemented over the last fifteen years. This is primarily because I do not believe that curriculum is the real problem. I think the curriculum is not close to the main difficulty. It is fairly easy to figure out what a reasonable curriculum should be for K–12. What is needed are people who are really well versed in the mathematics that they are teaching and who are comfortable with it. What one wants to avoid is a curricular fix where technology plays a substantial role. There are huge dangers in introducing technology too soon. The idea that students won't have access to technology is ridiculous. Computers are ubiquitous. What we need to do is to concentrate on students' actual skills in and understanding of mathematics. Technology contributes very little to that whole process, especially in pre-college education.

Notices: *Can you say more specifically where you see a role for the AMS in this?*

Andrews: Obviously the AMS has research as its primary focus. The MAA is devoted to teaching, and SIAM is devoted to applied mathematics. Of course this oversimplified splitting up of the three organizations is unfortunate. We all have great interests in pure and applied math, and we are all teachers. However the activities of the MAA and the AMATYC [the American Mathematical Association of Two-Year Colleges] are much more closely focused on the problems of teaching mathematics. I hope to look at what these organizations are doing, and what we can do to support them. Subsequently if there is something that is neglected, then the AMS might step up. My hope is that we will be able, at least for things outside collegiate mathematics, to support efforts that make good sense. The NCTM [National Council of Teachers of Mathematics], for example, is amplifying its "focus points" brought out a couple of years ago. These are much more sensible suggestions concerning mathematics education in the early grades than any of the NCTM documents that appeared in the 1990s. It is my hope that this trend will continue. If the NCTM continues to concentrate on core mathematics and the actual skills necessary to

do and understand mathematics, that's obviously something we should support.

Notices: *Do you think public understanding and awareness of mathematics have improved in recent years? What more can the AMS do in this area?*

Andrews: The Public Awareness Office of the AMS seems to me to have done a number of interesting things that are about as effective as they can be. The fact that we live in a computer age means that in some real sense mathematics is everywhere. But I don't think that means the public is aware of mathematics. I do believe that the diminution of the average citizen's mathematical facility works against whatever public awareness program is put forward. Any sort of mathematical content at all is difficult to communicate to people lacking facility with mathematics. Overall I am pleased with our public awareness efforts. I believe that in order for them to have a wider audience, we must improve mathematics education.

Notices: *But mathematics is certainly more visible in the popular culture, in the public eye. It has been a theme in movies, television, plays, and novels.*

Andrews: Two or three years ago, Penn State invited John Nash to give a series of lectures. The person who was to be his host had a family crisis, and as a result I was host of John Nash for three days and spent a lot of time with him. The thing that I remember most vividly about this charming gentleman is that after he gave a talk on relativity that must have been way over the heads of the 1,300 undergraduates in the audience, there was a line that snaked all the way around the auditorium. The students in line were holding their VHS tapes of *A Beautiful Mind* that they wanted him to sign. That dear sweet man sat there and signed every single one of them. I loved that movie as did the students, but the problem in making a movie about mathematics is that oftentimes what's focused on is not the mathematics, but the dramatic lives of the mathematicians who are being portrayed. Is the public more aware of mathematics? Or is the public is more aware of the fact that some mathematicians have led eccentric lives? I suspect the latter.

Notices: *One last question, not related to the AMS. You were the first person to realize the importance of what is now called Ramanujan's "Lost Notebook", and you have spent decades studying it. What is the mathematical personality that emerges from those pages?*

Andrews: That's an interesting question, because certainly the "Lost Notebook" is a perplexing collection. It was written during the last year of Ramanujan's life, when he was dying, and it was probably his personal notes—not at all something that he thought of publishing. Consequently, there are very few words, there are pages that are just chaotic, there are pages with formula after formula—sometimes the formulas are related to one another, and sometimes they aren't. Sometimes two or three on a page are related and then there is a fourth one that is completely unrelated. So in terms of gaining a sense of personality, what it might call to mind is the dramatized picture that Eric Temple Bell portrayed of Galois on the night before he was to die in a duel, scribbling his thoughts in a very hurried and chaotic way. With Ramanujan, it was a year rather than a night. But he was lying ill in India for a year at the end of his life, and according to interviews with his widow he was always doing his mathematics because it helped him to forget the pain. So I do get the feeling of hurriedness.

Penetrating how he actually thought about things is something that I still have not managed. Ramanujan is what Mark Kac would have called a "magical genius". Kac described the world as having two types of geniuses. There are the geniuses who are just ten times smarter than I am, and if I had had more time and a few more points in my IQ, I'd have been able to do what they do. Then there are others who do things that make you think: "Wow, where did he come up with that? This is just beyond belief!" And that's the way I feel about much of what Ramanujan did. Bruce Berndt and I are bringing out our edited version of the "Lost Notebook" in four volumes—we have one out, one in press, and two more volumes to do to fully give proofs of everything in the "Lost Notebook". But just because we can prove something does not mean at all that we understand Ramanujan's motivation or how he came up with these things.

Notices: *So they seemed to come out of nowhere. It's hard to tell what was going through his head.*

Andrews: Obviously lots was going on in his head; I just don't know what it was. F. H. Jackson, one of the British amateur mathematicians who was around at the time of Ramanujan, sent one of his reprints to Ramanujan. I once saw another copy of this reprint in which Jackson had written to someone else, "In 1920, I wrote to Ramanujan three weeks before his death (I did not know of his illness) pointing out that there was some connection with his theorems. He wrote me a long letter in reply showing how he came to guess his theorems." That letter would be the only document where Ramanujan explained how he found something out, and we have no idea where that letter is or if it still exists.

Donald McClure Named AMS Executive Director

Allyn Jackson

Photograph by John Abramowski, Brown University.

Donald McClure

In January 2009, the AMS Council approved the appointment of Donald E. McClure of Brown University as executive director of the Society. He succeeds John H. Ewing, who has held the post for the past thirteen years and who is now president of Math for America, a program that aims to attract mathematically talented young people to teach in the nation's schools.

McClure's background and experience make him an ideal candidate for the executive director position. He has a deep commitment to service on behalf of the mathematics community—a commitment that has led to him play a variety of roles in Society leadership, from hands-on tasks for the Data Committee and the Board of Trustees, to high-level work on policy committees. He has an impressive research background as well as experience in academic administration, including helping to run a distributed mathematics institute for more than a decade. He also has developed considerable business savvy, having founded and run a consulting business with a colleague at Brown University. On top of all this, he is geographically a good fit, for the AMS headquarters office is located in Brown's home city of Providence, RI. As McClure put it, "Here's a tremendous professional opportunity within walking distance of my house."

The main emphasis of McClure's AMS service over the years has been on professional issues. During the 1980s and early 1990s, he served as an AMS representative on the Data Committee, a joint committee of several mathematics organizations that each year produces the Annual Survey of Mathematical Sciences. As chair of this committee from 1991 to 1993, McClure led the computerization of the data analysis, ushering in the use of statistical software that greatly expanded the kinds of analysis that could be done with the survey data. Also in the early 1990s, he served on the Task Force for Employment, and he designed a targeted survey to examine the difficulties young mathematicians were having in finding jobs. The recommendations of the task force influenced many universities to expand the number of postdoctoral positions available to young mathematicians. These positions not only eased the immediate employment problem, but, after the job outlook improved, they helped provide more secure career paths for young people. McClure also served on the Committee on the Profession from the time that committee was started in 1993 until 2002 and served two years as chair. He was also a member of the Task Force on Excellence, which produced the 1999 AMS report *Towards Excellence*.

McClure was elected to the AMS Board of Trustees in 1995 and served on the board until 2000. His service included stints as chair of the board and as liaison to the AMS Publications Division. From 2003 until his appointment as executive director, McClure was AMS associate treasurer. Through serving on the board and in the treasurer position, he has come to understand many of the practical aspects of running the AMS and has a sense of the scope of its programs and publishing business. One of his main goals is to keep the business side running strong. "The AMS has for years been a very successful publishing business, and I want to assure that it stays that way," he said. In particular, he noted, it is important to continue investment in the Society's most important product, MathSciNet. "I want to continue to find ways to make MathSciNet the very best database it can be to serve the community," he said. The book program, which has expanded in the last several years, could be vulnerable to the recent economic downturn, he noted, and so the AMS might face challenges in this area.

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One immediate challenge McClure sees on the horizon for the mathematical community stems from the pressure the current economic climate is putting on college and university budgets, which in turn affects the mathematics job market. "We are going to see a difficult time for new Ph.D.'s again," he said. "We don't have data yet to back this up, but the forces that affected the condition of the market in the early 1990s are all being applied in the same direction that they were then—reduction of tax revenues for states and great pressure to reduce state budgets. I think this is going to have an impact on higher education, and colleges and universities are figuring out ways to cut their budgets." Drawing on its experience with the job market difficulties of the 1990s, the AMS can consider various ways to help ease the situation, such as doing a targeted survey of new doctorates and facilitating the advertising of positions that open up late in the hiring season.

McClure received his bachelor's degree in 1966 from the University of California, Berkeley, and his Ph.D. in applied mathematics in 1970 from Brown University, where his advisor was Ulf Grenander. McClure has spent his entire career at Brown, starting as an instructor in 1969 and rising to the rank of professor in 1982. He has advised fifteen Ph.D. students. McClure's research concerns the formulation of probabilistic models for images and the design of algorithms based on those models and classical statistical principles. The research is motivated by the areas of image processing and computer vision, ill-posed inverse problems, and analysis of image sequences such as those occurring in film or progressive video. In early work in nonlinear approximation theory, he developed characterizations and very sharp asymptotic results for convergence of optimal approximations by variable knot splines. In the area of ill-posed inverse problems, McClure and his Brown colleague Stuart Geman were the first to propose and analyze Bayesian methods for computed tomography. There is now a vast literature in this area.

In 1986 McClure was part of a group that applied for and received a major grant through the University Research Initiative of the Department of Defense to launch a distributed mathematics institute, the Center for Intelligent Control Systems. The center ran for fifteen years and involved twenty-five to thirty faculty members at Brown, Harvard University, and the Massachussetts Institute of Technology, as well as many graduate students and postdoctoral researchers. As associate director of the center, McClure ran the center's node at Brown, which was concerned primarily with computational vision and control theory. The center received three grants from the DoD and was phased out when the last one ended in 2001.

In 1981, together with Geman, McClure founded a consulting company, which initially focused on design of statistical methods for large-scale clinical trials. The company later expanded its work to algorithm development for vision software for semiconductor manufacturing equipment. In 1993 the company received a grant through the Advanced Technology Program of the National Institute of Standards and Technology and moved into automation of methods to remove damage and restore digital film and video. This is the main focus today of the company, which has about twenty employees and offices in Providence and Hollywood. "[Geman and I] still get involved in thinking about how to formulate the problems and design algorithms for them, but we don't sit down and write the code!", McClure remarked. "We have a great group of software developers" who understand both the mathematical and the programming sides.

With his research accomplishments, experience in both business and academic administration, and extensive knowledge of issues facing the mathematics profession, McClure brings a wealth of assets to the executive director position. "I am really excited about the new position," he remarked. "My responsibilities and efforts will be guided by the Society's mission to further mathematics research and scholarship. The AMS has a very positive impact on mathematics worldwide. I look forward to working with the staff and leadership to continue and expand the AMS contributions."