Commentary

In My Opinion

The Birth of an AMS Meeting

The AMS is a multifaceted organization. In my opinion its most important role is to facilitate communication between mathematicians and to disseminate mathematics. It does this mainly through its publications—the AMS is one of the major mathematical publishers—and through the meetings and conferences that it organizes. For the past few years I have been an associate secretary of the AMS, with the responsibility for overseeing the organization of AMS meetings in the Central Section of the U.S., occasional joint international meetings, and one in four annual meetings. Perhaps you, as a member of the AMS, might be interested in knowing a little about the process by which a sectional meeting is organized and how you might become personally involved.

Several years before a meeting is scheduled, the organizational process for a sectional meeting begins with the selection of a site for the meeting. Sometimes a department contacts the associate secretary and offers to host the meeting; sometimes the associate secretary makes the suggestion; often it is an informal combination of the two processes. In selecting the site the associate secretaries consider a number of factors, including geographical distribution of meetings, facilities at the host institution, accessibility of the university, number of local mathematicians who will provide a "core" for such a meeting, and enthusiasm of the potential local organizers.

Hosting a sectional meeting is an easy way for a department to host a major mathematics meeting, since much of the work, such as advertising and scheduling, is handled by the AMS. The host department commits to providing classrooms for the Special Sessions (at least fifteen, seating at least thirty people) and a large lecture room for the invited addresses. Volunteer "people power" is needed to help with details like registration, local information, etc. I urge you to consider the possibility that your department host an AMS meeting. If discussions with your chair and your colleagues suggest that your department wishes to host a meeting, then contact the associate secretary for your section. There are four of us, and our names and addresses can be found at the back of every issue of the *Notices*.

Once a site has been selected and approved by the AMS, the meeting is announced in the *Notices* and on the Web. At least a year before the meeting, mathematicians start to propose Special Sessions for the meeting. This is done by sending an e-mail to the relevant associate secretary with the title of the session, the names and addresses of the organizers of the session, and a one-paragraph description of the topic of the session. It also helps to give a short list of mathematicians who might be invited. This information gives a "flavor" of the proposed session, which allows the program committee to approve the session. If you are interested in proposing a Special Session at any of the forthcoming meetings, do send an e-mail message to the appropriate associate secretary. The list of all meetings and much other information can be found at `http://www.ams.org/meetings/`. Your responsibility in organizing a Special Session is essentially to invite the speakers and to make sure that your speakers send their abstracts to the AMS by the specified deadline. The AMS does not pay any expenses either to the organizers or to the speakers of Special Sessions. This is a uniform policy adopted to ensure that the registration fees at the meetings can be kept as low as possible. Despite this policy, most Special Sessions have interesting lectures which are well attended: people wish to be part of the high-quality, cutting-edge mathematics that is presented at Special Sessions at sectional meetings. It is a strong endorsement of these sessions that so many people are willing to spend their own money to participate.

In the previous paragraph I mentioned the program committee. Each section has a program committee appointed by the AMS president. It consists of four mathematicians: two appointed each year for 2-year terms plus the associate secretary. This committee is responsible for the scientific quality of the meeting, and it is this committee which selects the four invited speakers at each meeting. The invited speakers are very important to the success of the meeting. They are chosen both to recognize their excellent mathematics and to be keynote speakers at the meeting, where ideally their lecture will attract a general audience of mathematicians. If you would like to recommend a potential speaker who is both an excellent mathematician and a good lecturer, please send an e-mail supporting your recommendation to an associate secretary, who will then pass it by the program committee at the time of its deliberations.

The AMS sectional meetings are in a very real way the meetings of the grassroots members of the Society. I urge you to participate and to consider the possibility of organizing a Special Session or an entire meeting.

—Susan Friedlander
Associate Editor

Letters to the Editor

Teach Calculus for Full Understanding of Concepts

On April 26, 1999, CNN reported on yet another study showing a 5 percent decline in the number of degrees in engineering, mathematics, physics, and computer science between 1990 and 1996, with the same trend continuing in 1997 and 1998. This is not the first study on the subject; however, what I found interesting in this brief report was a remark from a freshman student. He said he would not take science or mathematics courses because *he is interested in examining more abstract ideas*; so *he would choose humanities, history, or political science*.

There have been a lot of discussions on *how* to improve the way we teach; there has been much less discussion in recent years about whether we should change *what* we teach. Most of the current changes concern integrating more direct computational applications, with the (applied) calculus sequence as the unquestionable cornerstone of any undergraduate mathematics curriculum. Since I personally never experienced a calculus course during my university education, I was quite surprised by the idea when I first came to the U.S. Initially, I thought that the instructors were supposed to provide a deep understanding of all of the concepts in a calculus book and that computation was only an illustration of these profound ideas. This also was the official explanation I got from the chair of the department when I was first assigned to teach such a class. Soon I learned that not only was the explanation false, but nobody really believed it. In many colleges a mathematics student is expected to take three calculus classes, then a course in logic and proofs, another advanced calculus course, and finally a real analysis course. But if the students were supposed to really understand the material in the calculus sequence, then why do they need all the rest?

It is impossible to provide a really deep understanding of all of the calculus concepts in a typical class. The problem may be less clear in a few top, more selective universities, but it is quite obvious in a typical college. We see the problem, but at the same time many of us believe that there is no other choice. As the applied power of calculus is obvious, we try to bring more students into the sequence with more and more computational applications. It seems that the approach is failing. It is hard to imagine an Applied English Literature course devoted to writing business letters and reports. We believe that English literature has its own intrinsic value and we do not have to justify an English class with such applications; being able to write a good business report is important and should be taught, but not as the major justification for English literature. What message do we send to the students, most of whom do not know what mathematics is about, when we focus so much on applications? Calculus is one of the great achievements of our civilization and should be presented as such, not just as a tool.

Most of us are attracted to mathematics by abstract ideas and problems, precision of thinking, proofs, and the challenge of deeper understanding of the methods behind all the computations, certainly not by the computations themselves. Perhaps this is also what can attract others; it may compel more students to enroll in mathematics courses and may consequently increase the number of mathematics majors as more students find mathematics a worthy, intellectual challenge. Let us reverse the typical sequence, let us arrange the undergraduate curriculum around courses in logic and proofs, and let us cover only as much calculus as we can cover with full understanding of the concepts discussed (we may even call this Introduction to Real Analysis). One could argue that this

- would hurt our students, who would get fewer marketable skills; and
- would not attract new students, as, unlike in the case of English literature, the intrinsic value of mathematics is practically unknown outside mathematics departments.

As for the first argument, graduates of high-tech education are valued more often for their ability to think in a logical and analytical fashion than for their ability to integrate $\cos 3x \cdot \sin 2x$. The second argument proves that we have been increasingly successful in presenting to generations of students mathematics as only another engineering tool. We need to break the circle.

—Krzysztof Jarosz
Southern Illinois University at Edwardsville

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Jesse Douglas

May I ask anyone with information about the distinguished American mathematician Jesse Douglas (1897–1965), and in particular anyone with letters or other information documenting his career, if they would consider contacting me? I am writing a study of his work on minimal surfaces and would like to know more about him, with a view to writing an accurate biography.

—Jeremy Gray
Faculty of Mathematics and Computing,
Open University, Milton Keynes, MK7 6AA, United Kingdom
j.j.gray@open.ac.uk

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The WZ Method and the Alternating Sign Matrix Conjecture

In our article "How the Alternating Sign Matrix Conjecture Was Solved" (*Notices*, June/July 1999), we tried to concentrate on the mathematics of this problem and its ultimate solution, but there are other aspects of the story that may be of interest to mathematicians. One of these is the rise of computer-generated proofs via the WZ method. Another is the role of computer algebra in Zeilberger's discovery of the proof of the alternating sign matrix (ASM) conjecture. A third is the very unconventional method by which his paper "Proof of the Alternating Sign Matrix Conjecture" (*Electron. J. Comb.* **3** (2) (1996), Research Paper 13) was refereed.

It took a long time for the WZ method, due to Wilf and Zeilberger, to achieve its full, eventual measure of fame. The reason was that the proofs it generates tend not to be the kinds of proofs mathematicians like: WZ proofs are long on computational tedium and short on clever ideas. That is, all the clever ideas are embodied in the method itself rather than in the proofs of individual propositions that it generates. Perhaps another reason was that the theory did not emerge fully grown to solve a formerly intractable problem. Instead, Wilf and Zeilberger (mostly the latter) spent years building up the method, starting from classical identities on binomial coefficients and then tackling successively harder problems, including genuine research problems posed by colleagues within and outside of combinatorics. Soon Zeilberger had automated the proof of hypergeometric formulas to such an extent that he had even written a computer program that, if fed a conjectural identity, would generate not just a proof but a journal-ready article containing the proof written by one "Shalosh B. Ekhad". (Zeilberger chose the name of his electronic collaborator as a literal translation into Hebrew of the designation "3B1" on his AT&T UNIX PC 3B1 computer.)

While the WZ method did not play a role in the original proof of the ASM conjecture, Zeilberger used his experience with Maple in a fundamental way. He came up with proof strategies, while "Shalosh", using Maple programs that have been collected under the file name `ROBBINS`, took care of tactics. Almost every lemma, sublemma, subsublemma, etc., in the proof was first conjectured with the aid of Maple. The result was a proof that was elegant in its concept but very messy in its details.

The manuscript that Zeilberger was to submit to the *Electronic Journal of Combinatorics* was 94 pages of difficult calculations. It was more than he could expect any individual to want to slog through. His novel idea was to have it pre-refereed by a "tree" of referees, each responsible for verifying that one sublemma did in fact follow from its subsidiary sublemmas. On November 11, 1994, he sent out an e-mail message to over a hundred colleagues with the subject line `Re: Invitation to be a checker of one of the many (sub)î-lemmas of my paper 'Proof of the ASM conjecture'`. He gave two basic reasons for why invitees might want to say yes: they would be doing him a personal favor, and they would get credit for having contributed to the solution of an important problem.

Over eighty mathematicians accepted Zeilberger's invitation, and their joint efforts led to the creation of the final version of the article. A reason for this decision was Zeilberger's belief, stated in Opinion 3 on his Web site, `http://www.math.temple.edu/~zeilberg/`, that anonymous refereeing is immoral and that referees (or, as he would prefer to call them, "checkers") should be nonanonymous individuals appointed by the author. Under such a system, checkers would put their reputations on the line, though not as much as an article's author(s), by vouching for the accuracy of the article.

The extensive use of computers in the discovery and proofs of the ASM formula may be a harbinger of future trends both within and beyond the theory of determinant evaluations. Zeilberger envisions an age in which the work that was done by his troupe of hand-picked referees will be done entirely by computers; computers will take over nearly all the tedious parts of mathematics, freeing human mathematicians, and perhaps a few artificially intelligent electronic colleagues, to spend their time in the more creative side of the enterprise. (For more information on Zeilberger's vision of the future of mathematics, see his polemic in these *Notices* **40** (1993), 978–981, and George Andrews's reply in the *Mathematical Intelligencer* **16** (1994), 16–18.)

—David Bressoud
Macalester College
James Propp
University of Wisconsin

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Support for Krantz's View

Regarding Steven Krantz's commentary "Ask and You Shall Receive" (*Notices*, June/July 1999), I would like to point out how comforting it was to read that at least one senior mathematician believes that "Good mathematics is not the sole province of the Group I math departments." For many of us at non-Ph.D.-granting institutions there is often a sense of our mathematical contributions being dismissed based on our affiliation, without regard for the mathematics itself. Even at conferences, many mathematicians are blatant in their dismissal of those they consider to be unworthy of their attentions.

Perhaps we should not be so quick to judge. The job market of the 1990s has changed the dynamics of academia. It is time to acknowledge this and use the change to our advantage.

—C. Maeve McCarthy
Murray State University

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Teaching Methods May Make Immigration Necessary

A short and very partial answer to Damon Scott's article on immigration (*Notices*, August 1999):

Let consumer satisfaction guide us (teaching evaluations). Let us continue entertaining our students with multimedia presentations and gimmicks such as undergraduate research (enthusiastically supported by NSF!), and we will keep hiring scientists seriously trained abroad.

—Jean-Pierre Rosay
University of Wisconsin, Madison

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