Notices

of the American Mathematical Society

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ABOUT THE COVER

Sieves in computational number theory are used to separate a regular sequence of integers into two classes based on the prime factors of the various integers. Familiar to most is the sieve of Eratosthenes, which separates the primes from the composites in an initial segment of the natural numbers. The fanciful sieve on the cover is taking the numbers near 1,000 and separating them into two classes: those divisible by a prime factor larger than 13 are allowed to pass through, and the "13-smooth" numbers (those that have no prime factor >13) are retained. Such sieves have proved to be very profitable in the factorization of large numbers. See the article "A Tale of Two Sieves" on page 1473. Cover illustration by Sandra Bruce.

Differing Viewpoints on the Teaching of Mathematics

This editorial is a request to colleagues interested in mathematics instruction to give more attention to accommodating differing points of view. Mathematics is an exact science with provable truths—theorems and formulas—and exact methods of analysis and proof. On the other hand, the teaching of mathematics is a very inexact human endeavor involving a variety of interpersonal skills and a good intuition about human nature. Current arguments, at times passionate, about what constitutes good instructional style and good curriculum in the *Notices* and other publications are evidence of this inexactitude. Indeed, when many of us start to discuss teaching, the very intuitive, hard-to-quantify aspects of human nature that are central to communicating and motivating mathematical reasoning to our students can become a liability. They can cause us to feel a strong, personal involvement in validating viewpoints we espouse and an equally strong compulsion to attack and invalidate viewpoints which antagonize us.

In pushing our viewpoints, it is human nature to upgrade personal preferences and opinions to the status of facts. For example, instead of saying, "I am not comfortable with the absence of epsilon-delta proofs in calculus reform texts," it is easy to find one's self saying, "Calculus reform is wrong-headed, because it omits epsilon-delta proofs." It is common to see such statements expanded to become, "Calculus reform is very dangerous, because its lack of rigor and logical reasoning totally misrepresents what mathematics is all about."

The new approaches to teaching calculus give a classic example of how personal preferences, actually the preferences of a group of people, have been upgraded to the level of fact. The very word *reform* in the phrase calculus reform is a big mistake. (Ron Douglas, father of the current movement to rethink calculus instruction, told me that he repeatedly tried to keep people from using the word *reform*.) Reform has a connotation of being progressive and improved. Someone who does not feel comfortable with *reformed* calculus is implicitly *unreformed*, a word with quite negative connotations. When someone labels me unreformed, I am going to have trouble not wanting to fire back in fairly aggressive language.

Unfortunately, there are times when it is very hard to avoid turning opinions into facts. In a large freshman calculus course with dozens of sections, it may be imperative that a common text be used in all sections. In states like New York with its statewide Regents Exams (which lead to college scholarships), great commonality is imposed on course syllabi in all high schools. In these cases, some committee of people will make their opinions about what is a good curriculum into fact. In schools, the need to coordinate the overall curriculum over a dozen years along with the uneven preparation of teachers makes it essential that external bodies of "experts" develop curriculum standards. Such situations guarantee outcomes that are going to leave many thoughtful people upset.

The challenges we face in providing the best possible mathematics instruction for our students at all levels are daunting and too important for divisive infighting. I wish that the mathematics community would devote more effort to looking for ways to work together as harmoniously as possible while respecting the inevitable conflicts that our differing opinions will create.

—Alan Tucker