Commentary

In My Opinion

See No Evil, Hear No Evil, Speak No Evil

The art of discourse is alive and well in the theater. Producers and directors and actors develop new productions of old classics; some of these productions work and some fail. The audiences and the critics publicly debate what is good and what is not, and they interact with the creators as they do so. Everyone learns from the process, and the theater continues to grow.

Not so in mathematics. Many mathematicians will not offer public opinions about mathematics; other mathematicians are disinclined to listen to such opinions or seem to prefer an artificial conformity of opinion. All these practices reflect an unwillingness or inability to exercise critical thinking skills. Consider three examples of these phenomena:

1. In the 1970s there was a fad of catastrophe theory. It was claimed that catastrophe theory could be used to predict election outcomes and to analyze prison riots and to understand the temperaments of dogs. The subject of singularities of C^∞ functions (the math behind the hype) is excellent mathematics having interesting applications. By contrast, fitting a cusp to a finite set of experimental data is about as sophisticated and insightful as fitting an N^{th} degree polynomial to $N + 1$ data points; yet few mathematicians of the time questioned the more improbable applications.

2. For the past fifteen years we have been hearing that chaos and cellular automata *might* provide paradigms for the way the world works. These theories *suggest* the mechanism by which protoplasm multiplies or the manner in which weather systems move and change.

   But they might not provide any of the claimed insights; nobody knows whether they do or not. There is not one example of any scientific problem that has been solved (not just *described*) using these theories. Still—both in the media and in science—chaos and cellular automata continue to flourish.

3. In the October 1996 issue of the *Bulletin of the AMS* Irving Segal gave a review of A. Connes's book *Noncommutative Geometry*. Regardless of what I think of Segal's ideas, I consider his review to be a sterling piece of scientific exposition. Near the end of his piece Segal offered a few mild criticisms of the tract under review, taking particular note of the book's repeated imprecision with respect to physical applications. The response was mass outrage and the writing of several "counter-reviews"; two of these appeared in the August 1997 issue of these *Notices*. The counter-reviews endeavored, without saying so, to answer questions that were raised by Segal. Neither cited the Segal review to which it was responding. It is typical, but disheartening, that the counterreviewers left it to the reader to figure out what they were *really* talking about.

My first two examples are of opinions that could have been expressed, but which generally were not; my third is of a nice, crisp opinion that was indeed expressed, but which few people heard or appreciated. Because our subject does not have a healthy marketplace for opinions, we suffer from an embarrassing myopia. I know of mathematicians who have quit mathematics altogether because a piece of their work received a negative review. Were we more accustomed to discourse, these mathematicians might have taken the criticism in stride.

Because we do not have a vigorous discussion of ideas, passing fads and mathematics of inflated value sometimes stand shoulder to shoulder with deep subjects that have withstood the test of time. Mathematicians today have paid too much attention to their beloved specialties and not enough to good writing, good exposition, incisive judgment, and the overall health of the discipline.

The common wisdom among mathematical mandarins is that mathematics is a process that tends to work itself out: in the end we all know who did what and what is of value. Woe betide that intrepid soul who actually calls into question a piece of ongoing research. It is all right to criticize *The Bible Code*, because that does not pretend to be mathematics done by mathematicians. But suggest that Fields Medalist A fails to live up to the usual standard, or hint that Theorem B of mathematician C should not have appeared in the *Annals*, or imply that mathematical subject D may be just so much doubletalk, and you had better look out.

As Aldous Huxley observed, "That men do not learn very much from the lessons of history is the most important of all the lessons that history has to teach." Scholars should fight that trend. We should occasionally step back and take stock of what we are doing. We owe it to ourselves, we owe it to our subject, and we owe it to future generations of mathematicians.

—Steven G. Krantz
Contributing Editor

Letters to the Editor

Address the Demand Problem

In March 1998 a panel commissioned by the NSF warned that the U.S.'s dominant position in mathematics was threatened. This report is available on the Web at `http://www.nsf.gov/pubs/1998/nsf9895/start.htm`, and it is entitled "Report of the Senior Assessment Panel of the International Assessment of the U.S. Mathematical Sciences".

The report states that "the U.S. enjoys a position of world leadership in the mathematical sciences. But this position is fragile." Concerns are raised that "young Americans do not see careers in the mathematical sciences as attractive [in part because] funding for graduate study is scarce and ungenerous."

The panel recommended that the NSF encourage programs that "broaden graduate and undergraduate education in the mathematical sciences", "provide support for full-time graduate students in the mathematical sciences comparable with the other sciences", and "provide increased opportunity for postdoctoral study for those who wish to become academic researchers as a means to broaden and strengthen their training as professional mathematicians," among other initiatives.

A similar report was released by the NSF in 1986. That report warned of an impending shortage of scientists and mathematicians in the United States, in part due to an expected large wave of retirements. As a consequence of that report, the NSF substantially increased its funding support for graduate students in mathematics and science. This action addressed the "supply" problem in mathematics, but it assumed that there was no "demand" problem.

Most of us know what happened next. By 1990 there were more new Ph.D.s in the job market than there were jobs for them, particularly in academia. One could blame the economic slowdown at that time for the lack of jobs. One could also cite the end of the Soviet Union as leading to an increase of those searching for jobs. However, the problem has continued into the later 1990s, even as the economy has grown and Eastern Europe has stabilized. They say in the new report that "young Americans do not see careers in the mathematical sciences as attractive." Since a good explanation has not been given as to why the future will be different from the past, it is understandable why young Americans feel this way.

As in 1986 the "supply" problem has been raised as the main issue, without much focus on the "demand problem". So how does more federal money for mathematics address the problem that research departments of mathematics have not been replacing their retiring mathematicians, leading to disappearing tenure-track positions?

It is not the case that universities have grown less willing to make a lifelong commitment to a mathematician simply because the NSF has been less generous. There are other reasons (e.g., tight funding from state legislatures and a new focus by some universities on undergraduate education) that have made administrations less likely to hire permanent research positions. If the U.S. is to retain its leadership in mathematics, then there need to be more tenure-track positions in universities. More money for graduate students might attract more young Americans to a career in mathematics, but these people need permanent jobs after they complete their Ph.D.s. This is what the NSF should be addressing if they wish to promote mathematical research in the U.S.

As we should be learning from the engineering profession, an abundance of well-paying jobs, more than anything else, will attract young Americans to mathematics.

—Edward Aboufadel
Grand Valley State University

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Editor's Note: Aspects of the report mentioned in the above letter are discussed in the article "Reports Assess U.S. Standing in Mathematics" by Allyn Jackson in the August *Notices*, pages 880–882.

Mathematicians May Not Always Know Best

I salute Warren Page and Mark Saul for their astute commentary "Collaboration and Respect" in the June/July 1998 *Notices*. They ably delineate many of the distinctions between mathematical and educational research.

I take partial issue, however, with their statement that "mathematicians are our best source of information about what should be taught and with what emphases." Although many mathematicians may know best what mathematics a future research mathematician should learn, not all may be well informed on what mathematics the average citizen needs to know, or even on what is needed by people working with mathematics in a professional setting other than mathematics research, and hence they may not be "our best source of information" in as broad a way as Page and Saul's statement might suggest. Certainly mathematicians have much to contribute to the discussion of what should be taught and with what emphases, but their perspective, as with that of any specialist, can fail to take into account all the dimensions of these questions.

So while I welcome the increased involvement of mathematicians as participants in the making of educational decisions, I think we need to recognize that the subject-matter expert does not always know best.

—Dan Fendel
San Francisco State University

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Teaching or Cheating?

In his article "It's WHAT they teach, STUPID!", John Elson writes in *Time/the Princeton Review* (Spring 1997), p. 14:

> In a new book called *Generation X Goes to College* pseudonymous author Peter Sacks tells of quitting his job at a newspaper to teach writing at a suburban junior college. What he found was discouraging: intellectually incurious students and time-serving professors

who cynically condoned grade inflation to please administrative bureacrats. The result, charges Sacks, is the classroom equivalent of consumer fraud.

This paragraph reminded me and a few colleagues of mine time and again of many cases or many actions of mathematics administrators which seem to border on cheating. Let us omit a long list of their strange actions in this category.

But I will mention one example which goes beyond any anecdotal evidence and provides statistics with thousands of students involved: In the years 1995 and 1996 at the start of a quarter at Ohio State University (OSU), the Math-148 class's students went to the President's Building (or other COPEZ locations) and paid $1.06 for a special booklet (a good value for $1 spent!). This booklet listed the problems which would be offered (with slight variation: Terry's typing service becoming, for example, Rose's catering services) on their three midterm tests and final exam. It was not a collection of 200 or 300 exercises to practice before tests; no, just 10 or 12 problems for each midterm and final —neither more nor less.

Is this testing system

(a) a smart pedagogical method to focus students' attention on important concepts and skills,

(b) an institutionalized fraud (in a system closely coordinated by the administration, without any participation of regular faculty) which cannot be tolerated any more,

(c) something else?

To make this question and answer easier, I will give more information. Under pressure from some faculty, in winter 1997 the Midterm-1 set of exercises was different from the booklet's; students were told in advance about this change.

The table below, formed from data obtained from the OSU Mathematics Department Course Office, gives the (ranges of) results of Midterm-1 in AU'96 quarter (Column (1)) when the assignment followed the booklet, and in WI'97 quarter (Column (2)) when the assignment followed the syllabus, the material taught in the previous weeks, and the stated course objectives as required by the OSU Bylaws, Rule 7-19—but not the booklet.

	(1)	(2)
Quarter	AU'96	WI'97
A	16.38%	0.44%
B	20.09%	2.73%
C	20.01%	7.21%
D	16.75%	12.02%
E	26.76%	77.60%
Number of Students	1,349	915

Did the Mathematics Department administration set up the Math-148 instruction and grading in 1995 and 1996 as—in John Elson's and Peter Sack's terminology—"the classroom equivalent of consumer fraud"?

—Boris Mityagin
Ohio State University

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Math Education Is Not Mathematics

I am canceling my membership in the AMS immediately. Some administrators of the AMS have decreed that math education is a branch of math which should have major input in teaching matters. They further decreed that no questioning of this premise would be permitted (see *Notices*, February and August editorials and the June/July "Commentary").

In requesting discussion about educational matters, with the restriction I mention above, the AMS is in the position of the lawyer who asks, "When did you stop beating your wife?" Sometimes an assumption implicit in a discussion needs to be questioned.

—Ralph deLaubenfels
Scientia Research Institute

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The *Notices* invites letters from readers about mathematics and mathematics-related topics. Electronic submissions are best. Acceptable letters are usually limited to something under one printed page, and shorter letters are preferred. Accepted letters undergo light copyediting before publication. See the masthead for electronic and postal addresses for submissions.

About the Cover

Mission Concepcion, San Antonio, Texas. San Antonio is the site of the 1999 Joint Mathematics Meetings, January 13–16. Photograph by Doug Wilson, courtesy of the San Antonio Convention and Visitors Bureau.