Mathematics in Public

In 1976, after receiving my Ph.D. in applied mathematics from the University of Chicago and after serving on the faculty at the University of Southern California, I left academic life and transitioned into the business world. For the next ten years of a now twenty-eight-year business career, I hid my mathematics background. It was not shame or embarrassment that inspired my actions, as I am quite proud of my achievements in the discipline and feel strongly that mathematics is a major contributor to all of my business accomplishments. No, it was the knowledge, based on experience, that talking about mathematics with those not steeped in the discipline would steer a business conversation away from business and onto an entirely different plane.

What was the conversation? I am sure that you have had it.

Person 1: Dr. Schaar, I appreciated your comment on education policy and the role that corporations can play in planning long-range programs. You seem to have such a deep understanding of what educators want and need. What is your background?

Schaar: I am a mathematician and taught at the university level for several years.

Person 1: Oh, I was never any good in math. Hated the subject actually. I could never figure out how I would use it after school and didn't get along with my teacher.…

I do not have to continue. But over the years I began to realize that there was something hidden in Person 1's remarks. It was an insinuation that Person 1's nonmastery of mathematics was a nonissue. She was a successful business person in spite of it. So there! Her lack of mastery was validated in the business world, and also by her peers, who eagerly confessed their lack of mathematical savvy as if it invited entry into a secret club. These same leaders trumped their abilities to succeed in the business world while downplaying the significance mathematics played in the equation.

What changed in 1987 that caused me to force the conversation into the open?

It was the confluence of two factors. First, I had joined Texas Instruments, Inc. (TI) two years before. It was then and is today a high-tech manufacturer of some of the most sophisticated semiconductor and Digital Light Processing™ devices in the world. The company is populated by engineers, scientists, and mathematicians, and it needs more every day to fulfill its growing needs. Second, it had become obvious to those examining data like the SAT mathematics scores that our school population was declining in mathematical knowledge.

These two factors—an increasing need for high-tech employees and a decline in the ability of the U.S. to produce enough people to staff those jobs—created a personal passion in me to further the debate about the need for technical education whenever, wherever, and with whomever possible.

My business card has had "Ph.D." on it for years in order to stimulate the debate every time I hand one out. Now the discussion goes something like this:

Person 1: Thank you for visiting our manufacturing plant. I noticed from your card that you have a Ph.D. What is it in?

Schaar: I am a mathematician.

Person 1: Oh, I was never any good in mathematics.

Schaar: Well, that is too bad. Were you good in reading?

Person 1: Well, of course I was!

Schaar: Being good in mathematics is equivalent in the twenty-first century to reading in the twentieth century. For your children to do well in the current era, they will have to be knowledgeable of the skills that a mathematics education can provide, like problem-solving skills as well as a lifelong love of learning. The executives in your company and managers in your plant need high-level mathematical skills to ensure that they are making the right decisions with your resources. Without those skills, your company's ability to succeed could be compromised.

In addition to these one-on-one conversations, I have been very fortunate in that I have been able to discuss these issues in the halls of Congress and with larger groups of business people and politicians. And they get it! The recognition is there that mathematics mastery is becoming an issue of national security and corporate competitiveness.

Here are some facts that highlight the criticality of the issue and that have been getting attention:

- While business is willing to train in specialized disciplines like running a semiconductor manufacturing site, the two-year training program requires someone who has skills in solving multistep problems.
- 53% of incoming college students will take remedial mathematics or English courses; over half will never graduate.
- 56% of engineering Ph.D.'s earned at U.S. universities in 2000 went to foreign nationals.
- Between 1995 and 1999, engineering degrees awarded in China increased 37%; in the U.S. they declined 20%.

Finally, just being a well-informed citizen in today's complex society takes more mathematical knowledge and problem-solving skills than ever before. The examples here are numerous and growing. In the area of medicine, with headline after headline on the outcomes of prescription drug studies, what is a person to do? How does one weigh the risks of one medication over another or of doing nothing without understanding the language of the studies? If I am in pain, should I take Celebrex or Vioxx, keeping in mind their heart risks?

What are the issues surrounding the current debate on social security? When, if ever, is the fund going to run out of money? What do the proposed ideas mean with regard to benefits now and in the future? These are massive issues that will affect everyone at some time in their life. They need to be critically understood.

The steps in this understanding are ones that are familiar to us:

1. Develop a clear understanding of the question.
2. Translate the question into one that is precise and can be answered.
3. Choose and use appropriate tools to answer the precise question.
4. Evaluate the solution in terms of the original question.

These are the steps of mathematical problem solving, and the importance of these steps needs to be emphasized at every opportunity.

—Richard Schaar
Texas Instruments, Inc.

Letters to the Editor

History of Mathematics from a Mathematician's Vantage Point

The AMS, one of the most important mathematical organizations in the world, has recently put its imprimatur on a shoddily written and ineptly plagiarized version of Morris Kline's *Mathematical Thought from Ancient to Modern Times*. This ostensibly new book is entitled *History of Mathematics from a Mathematician's Vantage Point*. Nicholaos K. Artemiadis claims to be the author.

I will provide one specific example of plagiarism for the sake of those fortunate enough not to have wasted fifty dollars on this book. Consider the striking thesis that Artemiadis propounds at the conclusion of his chapter on the history of abstract algebra (pages 377–8):

"We can say that abstract algebra in a sense 'undermined' its own role in mathematics. The various notions and principles were introduced in it, in order to unify the apparently different situations. This was achieved by group theory. But after the formulation of the abstract theories, mathematicians gradually distanced themselves from the concrete structures and concentrated their research on these abstract structures. Hence, with the introduction of hundreds of particular notions, the object of study was divided into other more specific activities, which were more or less independent from one another and were not related to the concrete areas that were considered initially. In other words, the unification mentioned above was followed by diversification and specialization. Hence we have reached the point where many who work in the area of abstract algebra ignore the tools of the abstract structures that they study and furthermore they are not interested whether the results have any applications in concrete areas."

Indeed, the thesis is a bit too striking; rather like a playwright whose character muses, "Shall I live, or shall I not live? That is the problem." The original passage occurs on page 1157 of Kline:

"However, abstract algebra has subverted its own role in mathematics. Its concepts were formulated to unify various seemingly diverse and dissimilar mathematical domains as, for example, group theory did. Having formulated the abstract theories, mathematicians turned away from the original concrete fields and concentrated on the abstract structures. Through the introduction of hundreds of subordinate concepts, the subject has mushroomed into a welter of smaller developments that have little relation to each other or to the original concrete fields. The unification has been succeeded by diversification and specialization. Indeed, most workers in the domain of abstract algebra are no longer aware of the origins of the abstract structures, nor are they concerned with the application of their results to the concrete fields."

These two paragraphs are isomorphic. Artemiadis has not merely summarized Kline's thought without citation, he has copied it line by line. Differences in word choice are merely the inevitable product of translating Kline into Greek and then translating the translation back into English.

In a single hour I located a dozen or so such "borrowings" before putting Artemiadis's book away in disgust. Sentences, paragraphs, even whole pages of "his" text are stolen from Kline. Readers with access to both works who are skeptical of my claims may wish to compare, for example, Artemiadis's chapter on topology (pp. 345–56) with Kline's chapter entitled "The Beginnings of Topology" (beginning on page 1158). Such a comparison reveals that Artemiadis stole almost every sentence in his chapter. Or compare Artemiadis's take on Omar Khayyam and Arabic mathematics (page 163, beginning with the second paragraph, "Even though the solutions…") to Kline's treatment of the same topics (page 193, beginning with the third paragraph, "Though the Arabs gave algebraic solutions…"). The next page or so of the two texts will be found to be nearly identical, right down to the diagrams and the labels thereupon. On page 143 of Artemiadis's book he writes, "We present some of the problems considered by Diophantus." As one might expect, that plural pronoun "we" is not mere scholarly convention. Rather, the Diophantine problems selected by Artemiadis are exactly the same as those selected by Kline for page 142 of his book. One can also find bits of Carl Boyer's history in Artemiadis's text as well, the most obvious example being the idiosyncratic chronological table which appears in an appendix.

I could cite further examples, but in classic mathematical tradition, I will leave this as an easy exercise for the interested reader.

Since the AMS is one of the largest and most visible organizations of mathematicians in the United States, the books it publishes ought to be distinguished by high standards of writing and editing. It is hard for me to believe that Artemiadis's book was edited for style or content at all. Understandably, an editor may not have time to scrutinize each and every page of a manuscript that ends up on his desk, but surely it isn't too much to ask that he will at least examine the first page of chapter one. This page, in Artemiadis's book, contains the following paragraph:

"'Moscow's Papyrus' dates back to 1850 B.C. The most interesting result included in this papyrus is the calculation of the volume V of a truncated square pyramid. If $b = 0$, then this formula gives the volume of the square pyramid."

In this passage, a completely superfluous symbol (V), never subsequently referred to, is introduced, while a mysterious quantity (b), never previously defined, plays a vital but necessarily incomprehensible role. Did the editors decide that these compensating errors somehow nullified one another and could therefore remain in the book? Had the editors paid enough attention to notice such shoddy writing, they might have noticed the rampant plagiarism as well. Artemiadis should bear the heaviest share of the guilt in this case, but the editors have a lot to answer for as well.

—Seth Braver
University of Montana

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Reply to Braver

The American Mathematical Society views plagiarism with the utmost seriousness. When Braver brought this matter to our attention, we immediately ceased all sales of the book, reviewed the evidence he had presented, and gathered further evidence of our own. Based on that review, we decided to discontinue publication of the book permanently.

Artemiadis has had a distinguished career as a mathematician in Greece. When his book was put under contract for the Society's English-language edition, it existed only in the original Greek. The accusation that the editors failed their duty by not combing his manuscript for errors or plagiarism is not realistic. Scholarly publishing, like many aspects of academic life, necessarily rests on a foundation of trust towards authors.

The Society promotes high standards of academic integrity and regrets having participated, however inadvertently, in a project that did not live up to those standards.

—John Ewing
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Conditions Facing Israeli Universities

We believe comment is due on Professor Mumford's article on mathematics in the Near East (May 2005), since he did not elaborate on the peculiar conditions facing Israeli universities.

Despite repeated wars by neighboring countries to destroy Israel, Israeli universities have built a vibrant scientific environment in which Arab and Jewish Israelis—and Palestinians like Iyad Suwan—can study. Israeli universities have successfully educated hundreds of thousands of Jewish students whose parents were Jewish refugees from Arab countries.

In conjunction with Professor Mumford's remark on a meeting at Bir Zeit about Palestinian prisoners in Israeli jails, it is worthwhile to point out that the same university's students staged a televised reenactment celebrating the Sbarro restaurant bombing.

Security restrictions such as checkpoints and the security barrier have been necessitated by repeated suicide bombings. Victims of those attacks have included university students and staff—for example, the bombing at the Hebrew University of Jerusalem.

Professor Mumford seems to neglect Israel's grave security concerns. For instance, just north of densely populated Tel Aviv, Israel is less than ten miles wide and is overlooked by the hills of the West Bank.

We hope for a peace in which the security fence can be removed. Its temporary nature has been repeatedly emphasized, just as security measures elsewhere can be relaxed when the threat disappears.

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What Summers Said

In the May 2005 issue of the *Notices*, Judith Roitman and Carol Wood write: "The president of Harvard stands up in a room full of women scientists and says that maybe women can't do first-rate science and math for genetic reasons." Of course, Lawrence Summers made no such statement. Those interested in reading what he actually said can find it at www.president.harvard.edu/speeches/2005/nber.html. For an intelligent debate on some of the issues in his speech, see www.edge.org/3rd_culture/debate05/debate05_index.html.

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Submitting Letters to the Editor

The *Notices* invites readers to submit letters and opinion pieces on topics related to mathematics. Electronic submissions are preferred (notices-letters@ams.org); see the masthead for postal mail addresses. Opinion pieces are usually one printed page in length (about 800 words). Letters are normally less than one page long, and shorter letters are preferred.