Letters to the Editor

Comment on Davis's Letter

A letter from Chandler Davis, "Forgive, But Don't Forget" in the *Notices* for June 1995, vigorously opposed Nazism, but does this in connection with attention to the 1998 ICBM scheduled for Berlin. I regret this connection.

I would join in the denunciation of Nazism—and of present-day neo-Nazis and Holocaust denyers (in whatever country). But the German mathematicians who collaborated with the Nazis in 1933 will not be on hand in 1998. Davis is uncomfortable about the Germans as hosts of our Congress; I am not.

In the 1930s some German mathematicians did collaborate with Nazis, but in very different degrees. Hasse collaborated in order to rebuild the Mathematics Institute in Göttingen. Another talented co-student of mine in Göttingen came there as a very naive young man; he collaborated because he had no perspective and was swamped by propaganda. My good friend Gerhard Gentzen (who helped me translate my thesis into German) went along and became a professor at the German University in Prague. He disappeared there in 1945 when the Russians arrived.

Nazism is evil. Restraint in judgement of our fellow mathematicians is good. Berlin with long mathematical traditions (Dirichlet Weierstrass, Schur) is a great location for a Congress.

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The Relation of Teaching and Research

I would like to write about the relationship between teaching math and knowing math.

For thousands of years, when people wanted to learn a subject, they would hire an expert to teach them. The greater the expertise in the subject, the greater the demand for the teacher. For example, Alexander the Great was tutored by Aristotle. This system has worked very well, producing astounding intellectual achievements.

This correlation between expertise and teaching is the motivation for the modern research university. The theory is that one who is doing or has done research in a given subject is most likely to have expertise in the subject, hence is most likely to teach it well.

Of course there are other factors involved in being a good teacher, although people are grossly overconfident about their ability to measure these factors. But expertise in the subject is certainly necessary. The first step in communicating effectively is to have something to communicate—it's a necessary first step. One should be on top of the subject rather than submerged in it.

For a specific example, consider freshman calculus. Very few people learn calculus when they take it (I didn't). First, one takes a class in freshman calculus, then sees it used in classes such as differential equations; then it's relearned in undergraduate real analysis, then in graduate real analysis, then in functional analysis. Each step improves one's understanding; Taylor polynomials, for example, are best understood as approximations in a Banach space. It's not that I necessarily use terminology like "Banach spaces" when teaching freshman calculus, but it affects how I present the subject: what to emphasize, in what order, how to answer questions, how to simplify, how to extract the essence of an idea, what to put off saying, "asides" that I make that may not appear on tests but affect the student's understanding.

I have taught or tutored calculus between taking each class in the sequence I just described, and I can tell you from experience that my teaching improved immensely as a result of each class. Similarly, subsequent research in analysis has further improved my teaching of calculus.

A solid foundation of knowledge, extending far beyond what is being spoken of at the moment, is essential to one's presentation. This foundation is like the roots of a tree. You don't see the roots, but they determine the health of the tree. Shallow roots make a sickly tree.

The anonymous letter in the June 1995 *Notices*, signed "Worked Hard for My Ph.D.", was excellent and raised many good points which were not really answered in a rebuttal in the August 1995 issue. Implicit in the rebuttal was the unfortunate concept of "educator" as being disjoint from "researcher".

The rebuttal letter did raise the question of what should be done with teaching assistants (T.A.s); more precisely, it offered T.A.s as a counterexample to the assertion that only

people with Ph.D.s should be teaching college-level classes. The responsible way to deal with T.A.s, both for the T.A.s' sake and their students' sake, is to have them start with grading and tutoring; then, after they've passed their qualifying exams and begun research, have them teach sub-college-level classes, first under supervision for a year or two, then, their last year, have them teach sub-college-level classes entirely on their own.

College-level classes—by these I mean precalculus or higher—should be taught by Ph.D.s in math. As the June 1995 letter said, it is possible that people with less mathematical background can teach these classes; it is possible that someone who is taking freshman calculus for the first time can teach it while taking it, for example. Perhaps some will do a good job, but it is less likely, in general, that it will be done as well. If we want to get teaching that is as good as possible, we should require Ph.D.s in math for college-level classes. With the current surplus of unemployed math Ph.D.s, there's no excuse for doing otherwise.

Ralph deLaubenfels
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On Typesetting Preferences

Recent articles and letters in the *Notices* have promoted particular opinions regarding typesetting. There seems to be very little to be gained by arguing that others should learn to share your tastes.

In part, I am referring to the letters (Hastings, Isbel, McCarthy) who complain about the new design of the *Notices*. (Am I the first person to write in saying that I *do* like the new design?) However, I am also referring to the article "Writing in the Age of LaTeX" by Hwang. Consider his point 4, on which we are in complete agreement. Like him, I prefer the use of numbers in square brackets as bibliographic references. On the other hand, I do not share Hwang's dislike of the blackboard bold font. I prefer the use of this font in denoting the usual sets of numbers, finding it both attractive and not at all "inconvenient".

As an author of a TeX package which is used for typesetting professional journals, proceedings, and textbooks, I have seen that the tastes of authors vary greatly. For example, some authors prefer the use of initials for bibliographic references with the same conviction that Hwang prefers numerals. (In fact, some authors refused to use my package until the ability to use initials for references was added.) I don't believe that there exists a single "correct" opinion on issues such as these, nor is there a single typesetting style which will suit everyone's tastes.

Perhaps one advantage of electronic publishing will be that readers will be able to determine the appearance of every article they read. Until then, it is a decision of the editor. As a result, anyone with strong opinions—such as myself—will probably find that they like some typesetting and dislike other typesetting of articles they wish to read.

In conclusion, experience has led me to believe that there is a minority of mathematicians who *only* like the mathematical typesetting done by LaTeX's style files and find anything else offensive. Furthermore, although this minority seems to believe that the majority of mathematicians agrees with it, I have found that most mathematicians don't care how it is typeset as long as they know what it means.

Alex Kasman
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Creativity in Mathematics

In the article "Myths in Math" on pp. 875–877 of the August 1995 *Notices*, Charles Mannix and Kenneth Ross present a perceptive discussion of the shrinking job market facing new mathematics Ph.D.s with traditional training. The authors conclude that we face "the necessity of reexamining the size and content of our graduate programs". I agree fully with their conclusion.

A start on the discussion of how to modify graduate education in mathematics is made by Hugo Rossi in an editorial in that same issue of the *Notices*. He suggests creating two types of math Ph.D.s, one the familiar, traditional sort, and one in interdisciplinary research. This idea is worth exploring. However, if it is to be implemented successfully, it will require eliminating some of the biases against interdisciplinary work that are common in the mathematics community. Such biases are widespread and even crop up in Rossi's editorial. For example, Rossi writes that in the interdisciplinary program, "ability and flexibility in the application of mathematics to the problems in the other discipline are to be stressed in the thesis stage," while in the traditional mathematics program, "stress is on mathematical creativity." The imputation is that real mathematical creativity is associated only with the traditional mathematics thesis. That seems a very misleading and damaging view. Interdisciplinary work often involves a high degree of mathematical creativity. It is true that usually it does not have the same mathematical depth as pure mathematics research. There are no applied results that compare to Fermat's Last Theorem in both the sophistication of the tools used in the proof and the definiteness of the results. However, interdisciplinary research does require a high degree of creativity to figure out what the mathematical essence of a complicated problem is and to find (or, often, to invent) the right tools and then evaluate whether they give a meaningful result. Such research is not just useful and a source of jobs, but is also intellectually challenging.

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Erratum

The author of the article "The Graph of the Truncated Icosahedron and the Last Letter of Galois" (pp. 959-968, September *Notices*) wishes to correct two instances of erroneous mathematics. On page 967 (beginning on

the fourteenth line from the bottom, first column), the correct math should read "noting that $\{x^4\}^3 = x$ and $\{x^5\}^9 = x$". On page 968, second column, the tenth line from the top should read "$\{x, x^3\}$ and $\{x, x^4\}$ and the unique hexagonal".

Reference number [7] in the same article should have read M. S. DRESSELHAUS, G. DRESSELHAUS, and P. C. EKELUND, *Physical properties of Fullerenes*, Academic Press, New York, 1995. The publication date was incorrectly listed as 1974.

Editors' Note on *Notices* Submissions

The editors of the *Notices* encourage readers to submit material for possible publication.

Articles should have content of significant interest to mathematicians and be from 2,500 to 6,500 words long. Articles on current mathematical research are particularly encouraged. Submission of articles (in ASCII or a TeX format) should be made by mail or e-mail (preferably both). Articles of shorter length can be submitted for consideration for the "Communications" section. Reviews, letters to the editor (specifically intended for publication), announcements, and materials for the departments should be sent to the Providence addresses below.

Submissions can be made to the Providence office (The *Notices*, American Mathematical Society, P. O. Box 6248, Providence, RI 02940; e-mail: notices@math.ams.org), the editor's office (Hugo Rossi, Department of Mathematics, JWB 210, University of Utah, Salt Lake City, UT 84112; e-mail: rossi@math.utah.edu), or through any of the associate editors.