Letters to the Editor

Why Don't the Mathematicians Learn to Speak?

The weekly colloquium in a mathematics department is an opportunity for faculty and students to learn about developments in mathematics outside of their own area. Although some colloquia succeed very well in enlightening the audience, all too many fail to do so.

Why is this? The speakers are highly able mathematicians, extremely knowledgeable and enthusiastic about their subject, and yet the audience leaves the lecture disappointed.

The reason is, I think, that the speaker is not addressing the real audience in the room, but an imaginary audience existing in his or her mind. The imaginary audience knows all the terminology of the field, knows all but the most recent results, remembers the meaning of all the symbols introduced (and then quickly erased) by the speaker, and can follow complicated arguments and calculations on the board with ease.

The real audience is different. With luck, it has a general mathematical education (say, one or two years of graduate study in algebra, analysis, geometry, and topology). It really would like to learn something from the speaker. The speaker soon leaves it in his wake and goes steaming ahead for the rest of the hour. An opportunity is wasted.

It does not have to be this way. The particular branch of mathematics is irrelevant to the problem. One can be incomprehensible in any field. One can also communicate successfully in any field with the real audience, sitting there in all its ignorance. Necessary conditions for success are (1) discussion of some simple examples, (2) some explanation of how the problem arises from the classical body of mathematics, (3) avoidance of all but a few key calculations, and (4) ruthless elimination of most details.

I remember a talk I heard as a graduate student. My lack of knowledge of geometry and topology was broad and deep. The speaker was Heinz Hopf, and he was talking about the existence of an almost complex structure on certain manifolds. When he started, I didn't know what a tensor field was, or a complex manifold, or an almost complex structure. Nonetheless, he succeeded in teaching us enough of these things during his hour that it was an exciting and delightful occasion for me.

John Wermer
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Doctor of Arts vs. Ph.D.

In his call for action ("The Most Urgent Problem for the Mathematics Profession", *Notices of the AMS*, **41**:6, July/August, 582–586), Professor Duren gives an historical perspective that led to the current problem of employment in the profession. Put succinctly, the problem is that the supply of Doctors of Philosophy in Mathematics exceeds demand.

Professor Duren points out that this is **not** the same as saying that the supply of "mathematicians" exceeds demand. Quite the contrary. The need for more people with mathematical skills is much greater than the supply—it's just that practitioners of mathematics are usually in fields other than those populated by Ph.D. mathematicians.

He sees an analogy between various professional schools on the one hand (e.g., the J.D. degree in law and the M.D. degree in medicine) and his proposed "Doctor of Arts and Sciences (DAS)".

But I am concerned that his analogy has some rather severe defects.

The professions he lists, and others, have a two-tiered system. First one gets the academic training (e.g., the M.D. degree), and then one goes through a state licensing procedure to certify to the public that the individ-

ual has the skills necessary to practice the profession for the public.

This two-step approach is also found with primary and secondary school teachers, with engineers, and even with plumbers, but it is conspicuously absent in the college ranks. While the Ph.D. is still the "ticket" to the research/teaching profession of mathematics, we apparently do not need to certify in such a public way that our Ph.D.s are skilled in teaching (their skill in research will become relatively self-evident in publications).

The license to practice subsumes the educational criteria, but having the correct courses does not insure that the applicant will be granted the right to practice. This is, of course, to protect a public that on occasion *needs* the services of a professional. (How often is a mathematician needed in the same way?)

In college, and particularly in graduate school, we seem to have it backwards—in many specialties. The capstone of the Ph.D. is the dissertation, and in mathematics it is required that the dissertation be original research. The medical doctor is granted his/her degree with no such requirement—rather, the candidate need only progress through medical school at the expected rate.

In fact, we have tied the Ph.D. so tightly to research that I am sure many feel a career outside of research (such as mine) indicates time wasted in graduate mathematical studies. I assure you that such is not the case and that although I do not use mathematical *facts* on a regular basis, I use my mathematical training (including even category theory!) on a daily basis in ways that contribute substantially to the profitability of my company.

Any "alternative" non-research degree—Professor Duren has suggested the DAS—will always be viewed as an inferior degree to the Ph.D. by the Ph.D.s and probably by academia in general. Moreover, the creation of a "second" doctorate is in sharp contrast to other professions where, for example, an M.D. doing research is still, usually, just an M.D. The distinction is not in the degree held but in function, performance, and job title (professor).

Of course, if we could just increase the status of being a classroom teacher and reclaim all of the undergraduate courses presently being taught by graduate assistants, we might find that the demand already exceeds the supply!

In any case, it seems to be another example of Pogo's "We have seen the enemy and he is us."

James F. Ramaley
Ziff-Davis Publishing Company

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Serving Client Departments

I would like to take issue, at least in part, with the column written by Seymour Lipschutz for the September1994 issue of *Notices* ("This is Linear Algebra?").

The first course in linear algebra is usually taken by students in a large number of client departments: physics, engineering, computer science. I suspect that at most institutions the number of math majors in the course is very much outnumbered by the non-math majors.

As mathematicians we may or may not like it, but most of those client departments are not interested in their students obtaining a deep understanding of linear algebra in all its generality. Rather, they are interested in their students mastering certain skills that are necessary for taking further courses in physics, engineering, computer science, etc. And if we do not properly serve these client departments, then they may take their students out of our courses and begin to offer their own linear algebra. (This has happened with subjects such as numerical methods and engineering mathematics at several schools.) An interesting article on mathematics courses being taught outside mathematics departments appeared in *Notices* a few years ago. In this case, not only do we lose the tuition money associated with those students, but now they are being taught mathematics by non-mathematicians and we have lost all control of the course syllabus. It seems to me that a more politic (and wiser) approach is to work with our client departments in order to at least try to satisfy their needs.

Ironically, where I do agree with Professor Lipschutz is in the teaching of applications in a linear algebra course. While it might be interesting and illustrative to use a Markov chain or Leslie matrix to motivate part of the discussion, our (primary) job as mathematics professors is to teach the mathematics; the applications are what should be taught in the physics, engineering, and computer science classes. Moreover, if we spend less time on applications, we have more time to spend on linear algebra, hence more topics can be included.

Finally, let me add a disclaimer: I actually agree with Professor Lipschutz that even the first course in linear algebra should pay some attention to the notions of abstract vector spaces (spaces other than R^n) and to general linear transformations. I suspect he and I would disagree on the extent to which these topics should be the focus of the course.

James F. Epperson
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National Policy Statement: "Impertinent Preachments"

The "National Policy Statement, 1994-1995" (*Notices*, **41**: 5, May/June 1994,) starts with an effective statement, part I, "Research in the Mathematical Sciences".

However, the remaining portions are assorted indications of what the AMS will "support" or "encourage". These are things the AMS can't do by itself. In almost every case, this amounts to specification of what the AMS members should or ought to be doing. I submit:

IT IS NOT THE BUSINESS OF THE AMS TO TELL ITS MEMBERS WHAT TO DO.

The AMS is there to facilitate those mathematical activities which its members wish to undertake. This applies especially to helping its members to do research. But research is not emphasized. Instead this statement proposes:

"Increased interaction between mathematical sciences research and industry." But industry exists for profits. It is not clear who reaps the profits from such interaction.

In education the report favors a "comprehensive reform of [mathematical] education". But this depends on which reform. Some of these proposed reforms involve dropping the proof of the Pythagorean theorem from high school geometry. Others propose replacing linear transformations by matrix calculations in linear algebra courses in college. These amount to weakening mathematics education— in other words, "dumbing down".

The report promotes the "enrichment of graduate programs in mathematics…especially in pedagogy". This may amount to replacing real mathematics with superficial lies.

The report follows current fashion in speaking of K–12 education and "national standards". These items—especially K–12—have become buzz words. K is not our business.

The report proposes "professional development of pedagogical performance of…faculty". In this slogan it is not clear what "professional" means. If this involves the use of student evaluations, it is likely to serve badly—as a stick with which administrators can beat on teachers.

The report ends with a slogan "Toward the year 2000…the passage of a millenium is an extraordinary occasion." But if one were to count the years to the base 12, then this time might not seem so extraordinary!

All told, this report is full of pious and impertinent preachments with no emphasis on the glory of research in mathematics. It is an ill-considered attempt by the AMS to give orders to its members.

Saunders Mac Lane
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Clarification

To the Editor:

This is to protest the unfair and high-handed way in which I have been treated by the Editorial Committee of the *Notices*.

On September 1, 1992, I submitted a letter to you, the editors of the *Notices*, and sent a copy to Richard S. Palais of the *Bulletin* Editorial Committee. On September 10, Palais reacted by sending me a letter, to which I replied on September 17. In the May/June 1993 issue of the *Notices* you published my letter of September 1, 1994 and appended the letter that Palais had sent to me personally on September 10. You did not publish my reply to Palais, you even failed to honor my request to publish the fact that I had written such a reply. Thus, the readers were left with the impression, very unfair to me, that I had meekly acquiesced to the statements (some preposterous) in Palais's letter.

More seriously, the heading (New Results vs. Exposition) you, the editors, gave to my letter showed that you, as well as Palais, completely missed the main point of my letter, namely that there is more to mathematics than new results and exposition.

In July 1993, I sent another letter to you clarifying and elaborating on this point and also commenting, very lightly, on Palais's letter to me so as to rectify the impression described above. You refused to publish this letter with the argument that I had alrady made my point in the original letter. If that were the case, how come you did not get my point? I cannot believe that you think that the readers of the *Notices* must be so much smarter than you, the editors.

I cannot suppress the suspicion that you refused publication of my letter because it might be embarassing to you.

I hope that you, the editors, at least have the decency to publish this letter in order to let the readers judge for themselves whether my complaint has merit.

Walter Noll
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Editors' Note: The *Notices* Editorial Committee published Noll's original Letter to the Editor and the letter from Palais in an effort to present the views of both sides. The Committee generally follows a policy of not publishing "replies to replies" and, in the case of the Noll-Palais exchange, decided not to publish Noll's letter to Palais. Titles on Letters to the Editor are formulated by the *Notices* staff, not by the Editorial Committee. The staff attempts to formulate short, catchy titles and of course some nuances are occasionally lost.