Letters to the Editor

Electronic Communication Isolates Some Mathematicians

I turned recently to the pages of your *Notices* in order to seek information concerning the forthcoming International Congress of Mathematicians in Berlin. I have previously attended two such Congresses, but I now find that because I have not kept up with the technology, I may never be able to attend another. Indeed, as an independent mathematician, I am not connected to the Internet and still rely mostly on the post to keep in touch. But, alas, nowhere in the information provided by the *Notices* is there any help for those of us not yet connected.

I do not believe I am the sole backward mathematician in the world yet to go electronic, and I am very concerned that the enormous amount of emphasis that is being placed on advanced modes of communication, far from making it easier for all to have access to information, is widening the gap between those who have and those who have not the means, financial and otherwise, to keep up with the technology and hence to keep in touch with the international mathematical community. I worry in particular for young mathematicians in many parts of the world—budding Ramanujans who would like to be part of this community but simply cannot afford the hardware and software now required. In the old days all that was required were a few rupees or pesos for stamps, a post office in the neighborhood, and a friendly and receptive Hardy at the other end. Are those days definitely gone?

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Editor's Note: Dr. Recamán's letter refers to the September announcement in the Mathematics Calendar. The first announcement of ICM98, which appeared in the November *Notices* (page 1392), tells how to register using paper mail.

Reply to *Bible Code* Author

Having recently had the doubtful pleasure of hearing *Bible Code* author Michael Drosnin telling a litany of lies and half-truths to the media here in Australia, it is rather amusing to read his accusation (*Notices*, November) that I am the one perpetrating a hoax.

Take for example his claim to have the "original Hebrew text" of the Bible. Contrary to the very explicit lie made twice in his book, all known manuscripts before the advent of printing differed from one another, often in hundreds of places. A few changed letters are quite enough to destroy his "codes" and those of Rips.

In a similar vein, his "prediction" of the comet collision with Jupiter was made months after it had been announced by astronomers. Even then he got the date in the Jewish calendar wrong due to not knowing that the Jewish day ends at sunset. (However, the Hebrew translation of *War and Peace* gives the right date.)

Just as amazing is Drosnin's claim that I "searched for many past assassinations in many texts" until I "found one random pattern." Drosnin knows full well that he chose *Moby Dick* himself and that I found, not one, but many assassinations. In fact, I can find almost any I look for, including that of Rabin.

The bottom line is that the only thing Drosnin did that I have not repeated in *Moby Dick* is to predict an assassination before it happened. Even that prediction can be best described as a guess, as the words Drosnin claims as "assassin that will assassinate" are from a verse about accidental homicide and can be read in a variety of ways that include Rabin

being the killer or the killer being killed.

On the matter of Ilya Rips, I am sure that he sincerely believes in his "codes", but he has not presented clear evidence that requires a miraculous explanation. Until he does so we are entitled to withhold belief in his claims. Everyone who alleges scientific proof of a miracle should expect the same response.

Readers are invited to inspect a humorous reply to Drosnin and a serious reply to Rips at `http://cs.anu.edu.au/~bdm/dilugim/torah.html`.

Brendan McKay
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Use Uniform Continuity to Teach Limits

In the May issue of these *Notices*, pp. 559–563, David Mumford argues passionately that when teaching calculus to "the millions", the basic concepts should be introduced in an intuitive fashion in terms familiar to the uninitiated. In this spirit Mumford accepts the Harvard Calculus definition of continuity of a function: "the closer x gets to a, the closer $f(x)$ gets to $f(a)$." In the September *Notices*, p. 893, Saunders Mac Lane objects to this definition, because it seems to imply that $f(x)$ approaches $f(a)$ monotonically and also because it fails to say that $f(x)$ gets arbitrarily close to $f(a)$. Therefore, he holds out for the (ϵ, δ) definition of continuity, although he allows the substitution of Latin letters for Greek ones.

In my opinion neither Mumford nor Mac Lane nor Leonard Gillman in a note in the September *Notices,* pp. 932–934, has come up with a definition that is congenial to "the millions". As Gillman points out, the difficulty that students have with the notion of continuity is the number of quantifiers and their subtle placement in the definition: "For any a and for any $\epsilon > 0$, there is a δ depending on a and ϵ such that when x differs from a by less than δ, $f(x)$ differs from $f(a)$ by less than ϵ."

For this reason, but not for this reason alone, I advocate the teaching of uniform continuity; one variable and one quantifier is thereby removed. But it is not enough to rename ϵ and δ; their significance must be illustrated. Here is a natural way of doing this.

A function is a *rule* or *algorithm* that for each input of a real number x in the domain of the function produces a real number y as output. This concept is more abstract than it sounds, because the input x is an infinite decimal; it would take an algorithm an infinite amount of time to process it. To achieve finiteness, we observe that at no time are we interested in the exact value of the output y; we only need to know it within a certain tolerance, dictated by the use to which it is put. The tolerance varies from occasion to occasion; sometimes we need to know y with 2-digit accuracy, sometimes with 6-digit accuracy, but we never need infinitely many digits.

Suppose now that our function has the following property: To compute the output y with 2-digit accuracy, we need to know the input x with, say, only 3-digit accuracy; to compute y with 6-digit accuracy, we may need to know x with, say, 9-digit accuracy. In general, in order to compute the output with k-digit accuracy, we need to know only a finite number, say n, digits of x. This property of a function is called *uniform continuity*.

Since a continuous function on a closed interval is uniformly continuous, our students encounter mostly uniformly continuous functions. There are other reasons for preferring uniform to pointwise continuity: it trains the mind to think of a function, not as the conglomeration of its values, but as a thing in itself. This is of great help even at the introductory calculus level—for instance, in grasping the idea of the definite integral, in discussing uniformly converging sequences of functions, and in many other contexts.

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Benefits of Electronic Journals

Despite the many benefits of electronic publishing of mathematical research journals, Steven Krantz's editorial (in the September 1997 *Notices*) chose to highlight and exaggerate some potential drawbacks without discussing the actions that are widely taken to address them. I wish to help inform *Notices* readers about those actions, so that we can all participate to help direct this inevitable change to our profession.

Most of the e-journals that currently exist (such as those published by the AMS) hold to the same editorial and ethical standards as mainstream paper journals—a paper is submitted to an editor and then anonymously refereed by one or two suitable peers. No big difference there from paper journals. Why should there be? It is a system that has worked well for a long time.

However, an enormous difference between paper and e-journals is the time lag between acceptance of a paper and publication. Paper journals often have backlogs of two years or more; no e-journal leaves a paper in final form waiting for more than a couple of months. Another big advantage of e-journals is that authors and readers can subsequently append (edited and refereed) notes to the paper so that future readers can follow later developments in the subject.

Krantz voices the popular fear that "deans" will not "count" papers in refereed, respected e-journals for promotion and tenure decisions. Why shouldn't they? Why would a poorly edited paper journal be worth more to a dean? On the contrary, most university administrators are keen to encourage electronic journals, since they appreciate the potential financial benefits.

Krantz worries about the archiving of mathematical material; he believes that as new media for storing data emerge, the technical world will not be willing to find a way to move current data to the new media. Why wouldn't businesses and governments want to find a way to restore their old data? Does Krantz think they won't share that technology? In fact, sev-

eral nonprofit corporations and leading academic libraries are currently engaged in making old, important (paper) science literature available online, despite the difficulties of doing that. They believe that this is a more accessible yet cheaper way to store important older work—check out `http://www.jstor.org/` to find excellently scanned copies of the *Annals*, the *Journal* and *Transactions of the AMS*, and *Math. Comp.*, every article from every issue up to five years ago. Moreover, most of the leading presses are making all of their current paper journals available in electronic form; they recognize the benefits of presenting academic work in this medium.

This all seems to suggest the exact opposite of Krantz's fearful predictions!

Krantz makes the (correct) point that e-journals are not "free". Indeed, the hours of editing, refereeing, typesetting, and the cost of buying computers all add up, though this is the case whether the journal is on paper or electronic. For years mathematics professors have been donating their time by serving on editorial boards, yet nobody previously included this time in the costs of producing a journal; indeed, most publishers have long exploited such contributed services yet valued them at next to nothing.

Krantz fears that e-journals will be of lower visual "quality". However, I didn't find this when comparing the most recent issues of the *Electronic Research Announcements* and the (on-paper) *Bulletin*. Indeed, after learning from some initial mistakes, e-journals look quite similar to paper journals, while allowing "search" and other advantageous electronic features.

Publishing is going to change in the next few years whether mathematicians like it or not. We are best off being in the vanguard of the revolution, helping to make these changes acceptable to our needs. We will surely benefit from the enormous financial savings (universities will probably pay about a tenth as much for e-journals as for paper journals), and we can also benefit academically from some of the added features. Indeed, anyone who has discovered how easy it is to research references on a given topic in the electronic *MathSciNet* will not be easily persuaded to go back to browsing through endless issues of *Math Reviews*. Moreover, the top researchers in certain areas of mathematics and physics (combinatorics and stellar modelling) now publish much of their most important work in electronic journals.

The main commercial publishers are eagerly changing with the new technology. The AMS has invested many of its resources into electronic publishing (after a slow start) and is now working through many of the trickier issues. Unfortunately, there are still a few loud voices in the mathematical community, such as Krantz, who cannot look forward and seem unable to embrace or even acknowledge the benefits of electronic publishing. Rather than fearing what is to come, we must shape these changes to support mathematics so that the inevitable transition to e-publication is valuable to everyone interested in mathematical research.

Andrew Granville
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Departments Should Provide Manuscript Typing

I am in strong agreement with almost all of Steve Krantz's editorial in the September 1997 *Notices*.

There is one point, however, in which I believe he is mistaken. He writes: "We are slowly being co-opted by electronic media: (i) our papers used to be typed for us, but now we do it ourselves…." Actually, this trend significantly predates electronic media, and the AMS shares part of the blame for it. It began when the AMS started encouraging authors to submit their papers in TEX, thereby shifting typesetting, traditionally the job of the publisher, to the author. Other publishers soon followed. (I found it ironic that this occurred around the same time the David Report appeared. That report remarked that mathematics departments willingly took on themselves burdens they should have sought support for, and here was the AMS shifting another burden onto them.)

Of course there still remains the question of exactly where the responsibility for typing papers lies. A number of my colleagues prefer to do it themselves, but I most certainly do not. I regard manuscript typing as an absolutely essential service my department provides for me. Some departments, however, are cutting back or entirely eliminating their manuscript-typing positions, thereby forcing mathematicians to type their own papers. This is a continuation of the trend of assuming burdens that are not our responsibility and is to me an alarming development. I would like to rally my colleagues against it.

Steven H. Weintraub
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Use of the Overhead Projector

At professional meetings the overhead projector is probably one of the most valuable aids for successful communication. For the most part, its use is ineffective and an embarrassment to the lecturer, an observation that spans invited addresses to presentation of 10-minute papers. It is absolutely thoughtless and a total disregard to the audience not to utilize the overhead to the fullest. This is especially true at international conferences. Recently an outstanding individual from a distinguished American university presented an invited hourly address by reading from the overlays before him while all but the very top of the screen was blocked by his body. In meeting rooms presenters read from the screen with their backs turned to the audience. The puzzling aspect is that today the overhead projector is considered to be an integral part of American classroom instruction. That experience should be transferable.

Examine the presentation of a "short" paper. Most of the contents can be condensed, organized, and prepared from the article itself on a word processor with font size at least 18 pt. The number of overlays required relates to the length and the style of presentation, under the assumption

that time will be permitted to let the audience assimilate each overlay. This is particularly important for a descriptive portion. For the presenter to read an overlay is distracting to an audience that is capable of doing and will attempt to do the same if given sufficient time. Presenting need not imply speaking.

If there is a reason to either expand on or to highlight a point, place a pencil at the line in question on the overlay or use a pointer. Face the audience and speak clearly; some read lips. Glance at the screen occasionally to assure that the exposed part of the overlay and the lecture correlate. Being nonchalant, folksy, or "cute" diminishes the value of the investigation under discussion—it is an impedance to those who are impaired by either hearing or lack of fluency in English, the accepted professional language. In order not to block the view, examine the room prior to speaking; the rooms are usually open at an early hour. A small room may require one to sit beside the projector. The lecture is a communication, and presumably the topic and the contents are sufficiently important to engage the audience's time and to either challenge its intellect or be of value as a body of knowledge. In brief, if one's work is important enough to be accepted for presentation, this should be reflected in the delivery itself.

These same observations apply to an hourly presentation. Often in this case the overlay serves as an organized set of notes, each point of which will elicit more elaboration directed toward the audience by the speaker. Sometime prior to the delivery it is essential to walk through the auditorium or banquet hall in order to understand how best to either position oneself or to rearrange the stage setting in order to avoid blocking the screen. During the delivery have someone sit within the first few rows to signal adjustment of the overlay should that be necessary.

The local chairperson in charge of arrangements should keep all of the above in mind as the projectors are positioned in each room and auditorium. For example, is the lectern really needed, particularly if it blocks the view for those seated in the first few rows? These members of the audience may be there because of either the impairments noted above or an inarticulate speaker.

There is one other helpful suggestion. If it is possible to have screens pivot from the bottom as they move forward and down from the top, one eliminates the "v-ing" of the image whenever the screen is upright.

So with forethought and prior planning a presentation accompanied by an overhead projector can reflect a professional maturity compatible with the occasion.

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About the Cover

The computer-generated image of the "Singly Periodic Genus One Helicoid" was made by James T. Hoffman of MSRI. It is a picture of a complete minimal surface that is singly periodic (invariant under a vertical translation), free of self-intersections (embedded), and asymptotic to the helicoid. The quotient of this surface by its translational symmetries is a surface of genus one. Like the helicoid, it contains a vertical axis. Modulo vertical translations, it has two parallel horizontal lines crossing the axis. It was discovered by Fusheng Wei (Virginia Tech), Hermann Karcher (U. Bonn), and David Hoffman (MSRI) (*Bulletin* of the AMS **29**(1) (1994), 77–84). The proof of its existence and embeddedness appears in a soon-to-be-published article—named after the surface—in the *Comment. Math. Helvet.* This surface played an important role in their discovery of the "genus one helicoid", a complete minimal surface asymptotic to the helicoid, which is not periodic and has infinite total curvature. (See "The genus one helicoid and the minimal surfaces that led to its discovery", *Global Analysis and Modern Mathematics*, (K. Uhlenbeck, ed.), Publish or Perish Press, 1993, pp. 119–170.)

For a survey of the theory of "Complete embedded minimal surfaces of finite total curvature", see the article with this title in the recently published Volume 90 of the *Springer Encyclopaedia of Mathematical Sciences*, edited by Robert Osserman, pp. 5–95.

—David Hoffman