Commentary

In My Opinion

Publishing on the Internet

How will the Internet affect the publication of mathematics? It is not possible to predict confidently. Very likely we have hardly begun to see what is in store for us.

The most visible effect of the Internet on mathematics, at least for many mathematicians, is increased access to research articles. Most obviously responsible for this is the sheer power of technology. But in the background is something more fundamental, the economics of the Internet. Increased accessibility is just one indication of the drastic rearrangement in the cost structure of publishing that the Internet has implicitly brought about.

One principal feature of this rearrangement is that almost all the publisher's costs arise in initial production. *The marginal costs of distribution on the Internet are close to nil.* This phenomenon also underlies some of the volatility of Internet stocks, and it is not an idea completely new to economics. Some argue that this was the problem with the Great Tulip Crash of 1637, in which fortunes were invested to develop rare tulip bulbs that could be reproduced, alas, for pennies. Nor is the rearrangement of costs of publication new—the introduction of cheap paper to Europe enabled literate persons to be their own scribes, and the invention of printing was largely the invention of cheap reproduction.

The small marginal cost of distribution of information on the Internet is a factor in almost all Internet enterprises, but in the academic world initial production is itself special. A major cost of academic publication is the time and money involved in doing research and writing about it. This effort has to some extent a life of its own, independent of purely economic considerations. Because of the Internet, the two extreme ends of mathematical publication—the production of research and its dissemination—can now be coupled directly. A literate person can be his own press.

Of course the raw, unfiltered transmission of research is not the whole story. Evaluation, as opposed to communication, is among the important components of the current publishing environment. Until now the different functions of research publication have been largely inseparable. For over five hundred years the capital costs and technical difficulties of printing have restricted the business of publishing to a relative few, and economics has been one of the principal motivations for its editorial apparatus. Editors and referees are still important, but their role in the future economics of publishing is not easy to predict.

There are certainly both promises and threats in the "new" economics. Mathematics research journals look particularly threatened. Recent experience leads me to think that the time it takes to get a paper refereed, edited, revised, and finally published even in one of the current high-end electronic journals is not much less than it was for its paper predecessor. Is this mode of publication worth its cost in time and money? For purposes of evaluation, perhaps, but not necessarily for communication. The present situation, especially in view of the rising price of many journals, appears unstable.

Of course there are still many reasons to follow the traditional path in research publishing. How will anyone find an article if it is not prominently published? Will MathSciNet refer to it? Will it still be accessible ten years from now? Financing and indexing research publication on the Internet are two very difficult problems that need to be addressed urgently. Many of the problems raised by technology will presumably be solved by technology, and some sort of cooperative centralization seems inevitable. Exactly how this should come about is, because of the underlying economic consequences, contentious.

The economics of the Internet has lowered the cost of distribution, but it has also intriguingly affected the way in which mathematics can be communicated. Illustrations in a traditional journal are expensive, and the cost of a picture in a book has been, up to recently, unfortunately comparable to that of a thousand words. The cost of storing an image on a computer is still high relative to that of storing text, but both costs are very low. There is no noticeable extra penalty for color or even animation. The Internet has also introduced hypertext, which is arguably more suited to the exposition of mathematics than traditional 'linear' text.

All but one of the current electronic mathematics research journals are straightforward extensions of paper journals, using computers merely to store and distribute articles of an essentially traditional nature. The exception is the MAA journal *Communications in Visual Mathematics*. It is sad to see that it is apparently languishing. It takes a great deal of effort to develop new techniques of exposition, and the best techniques have almost surely not been found yet. In effect, the costs of production in this domain are still high when measured in the currency of time if not money. It is too much to suppose that mathematicians will all turn into artists and programmers, but surely the younger among us should be rewarded generously for experimentation.

All this is bad news for many. The good news is that dealing rationally with the Internet might lead us to much better ways of communicating mathematics.

—Bill Casselman
Associate Editor

Letters to the Editor

Thomas Hakon Gronwall

To accompany an in-depth treatment of some work of the Swedish-American mathematician Thomas Hakon Gronwall (1877–1932), I am looking for information concerning his life and work. In particular any letters, documents, or oral history would be of interest.

—Alan Gluchoff
Department of Mathematical Sciences
Villanova University
Villanova, PA 19085-1699
E-mail: alan.gluchoff @villanova.edu

(Received March 2, 2000)

Communicating Mathematics to the Public

Mark Saul approaches the controversy of how to make mathematics and the people who do it popular. I am a mechanical engineer (more accurately, a computational multibody dynamicist) but love the math that supports physical theory. I've always been good with mathematics, but many others are not. Unfortunately, it is the many others who run our country, our papers, our media, our companies, and our universities. People in science, math, and engineering take a back seat to most activities in the wide expanse of humanity, and we retract to our comfortable positions of knowledge. This is not acceptable today. The Internet has opened avenues to thought, and people in science, math, and engineering must make huge efforts to make their subjects understandable. America is declining in these particular arenas as many students find it easier and financially sound to pursue medical, law, and business degrees. One reason for this is the lack of input by the science, math, and engineering community to popularize many of the concepts. True, many people are less capable of elucidating complex ideas, but it is imperative that someone make the effort. Not all of us are introverted nerdy dorks, and many of us are capable of finding the proper analogy or metaphor to describe what we are doing. This should be addressed to our local media, giving them something more to report than people shooting other people with guns. And truthfully, we scientists, mathematicians, and engineers owe to the world a clear explanation of what we know in order to pass on to future generations the continuity of creative knowledge. We may not be able to describe how we arrived at the concepts, but the results must be made comprehensible; otherwise our efforts are lost, ignored, and our time on this planet wasted. If individually we are unable, we must search out those who can communicate. It is our duty as intelligent seekers of truth. But finding the truth is just half the process; having it understood and appreciated is the other. Civilized cultures embrace great thinkers. Einstein was lauded throughout the world because he could voice his opinions and make an effort to simplify the ideas of his great works. I feel more great scientists, mathematicians, and engineers must do the same. We must put aside haughty arrogance and selfish vanity and open the mental vaults to the general public. We may attract curious, youthful adventurers and pass the baton on. This exchange must not stop. However, making our voice loud and clear must begin now. That's how I see it.

—Allen P. Kovacs
Ypsilanti, MI

(Received March 24, 2000)

Location of Joint Meetings

There was a certain irony in A. W. Goodman's letter criticizing the selection of Washington as the site for the annual meeting (*Notices*, April 2000).

Many of us remember being unable to walk a half block from the hotel in Atlanta in 1988 because an inch of polished ice remained on the sidewalk throughout the entire four days of the meetings. A friend of mine suffered a hiatal hernia in a fall while attempting to cross an Atlanta street. In 1996 many found it difficult to walk anywhere at all in warm but automobile-obsessed Orlando. Yet these are two of the "appropriate" locations about which Goodman wishes to refresh our memory. It is true that unusual snowfall made the trip to the Omni Hotel difficult. Yet the streets and sidewalks were at least passable, and recall that storms this January nearly shut down other cities as far south as Georgia. Many potential meeting sites do not offer the selection of inexpensive ethnic restaurants in a relatively short walk to Washington's Adams-Morgan neighborhood, safe and convenient public transportation like the DC Metro virtually adjacent to the hotel, or the attractions of Rock Creek Park. I like eating outside in San Antonio in January as much as the next person, but as a department chair who encourages attendance at the Joint Meetings, I also appreciate an occasional year in which the meetings are closer and there are no $400 airfares to pay.

—David Carothers
James Madison University

(Received March 27, 2000)

Teaching Euclid

I read with great interest Robin Hartshorne's article "Teaching Geometry According to Euclid" in the April *Notices*. I also have the pleasure of teaching Euclid, both in our College Geometry course and in our Logic, Problem Solving, and Geometry course, which is primarily for education majors.

Euclid's *Elements*, after being the standard geometry textbook for more than two thousand years, was abandoned by our public schools largely at the urging of mathematicians, who were aware of flaws, especially involving the problem of continuity. The result has been a hodgepodge, where some entering college students have excellent training in geometry and others do not know the formula for the area of a rectangle.

There is a lot to be said for a revival of Euclid.

—Rick Norwood
East Tennessee State University

(Received March 29, 2000)