Commentary

In My Opinion

Freeware or Vaporware?

My first computer, acquired in 1983, was a TRS-80. The codes were stored on a portable cassette tape recorder which used a proprietary protocol for sequencing and storing data. Had I written up my proof of the Riemann hypothesis in STI or TEX on the TRS-80 and stored it on tape, how would I read it today? If I spent time refining my proof and then stored it on a Bernoulli cartridge (twelve-year-old technology—now dead) or on a SyQuest cartridge (five-year-old technology—now dead), how would I read it today?

Data from the first Voyager mission (early 1970s) are now lost because they were stored on electronic media: the Jet Propulsion Lab has the media, but they can no longer read the data. Much of the old National Aeronautics and Space Administration data has been lost because it was stored on tape that has deteriorated. The Internal Revenue Service (IRS) had to borrow a computer from the Smithsonian Institution in order to read 1950 records stored on UNIVAC tapes—the IRS's blueprint for technology updates had gone awry.

What about the Web? The Web is a great means of dissemination, but the worst possible for archiving. Web sites come and go, and what the Web surfer sees depends on the browser used: most Web browsers skip (with *no error message*) any code that they do not understand. The Web still has not come to grips with mathematics; there is an international standard, called ISO, for some mathematics in HTML and SGML, but most browsers do not implement it or recognize it. *If you want your mathematics to last, do not depend on the Web.*

Of course I am a forward-looking and technologically savvy person. If I proved the Riemann hypothesis today, I would store it in LATEX on an RW CD-ROM (even though many CD-ROM formats are incompatible, and some CD-ROM drivers will say a copy has been made when it has not.) But how would people fifty years from now read it? In fifty years there will be no Windows, no CD-ROMs, and perhaps no TEX.

Some will say that I describe a problem that does not exist. One just builds 5 percent into the budget to cover the cost of data transfer: every time a new technology comes along, the data gets moved to the new format or medium. What nonsense. Who knows how to transfer an ASCII file from an eighteen-year-old Sinclair computer to a Linux system? Also, it is one thing to convert one's personal 100 megabytes of data to a new format; try converting an entire library, with many different works stored on different media in different formats. A recent National Academy of Sciences report describes the Library of Congress's mighty struggle with archiving electronic media.

Go to CompUSA and look at all the different mass storage devices. These range from discs to tapes to various types of cartridges. Iomega alone has four different formats, with different physical media for each; the company is still marketing technologies that it phased out a year ago. If one decided to spend the 5-percent budget line and update to a new form of media, how would the choice be made? And how long would it last? Transferring data to new media is chancy, costly, time-consuming, prone to error, and frequently skipped or deferred. If one later finds that the data transfer failed, it is usually too late to fix it.

Electronic media speed publication, and they make distribution of our writings easy, accessible, and often nearly free. But electronic media are *flawed as archiving devices*. Printed books and journals are costly and cumbersome, and they take up space. They are subject to fire, acid in the paper and binding, worms, weevils, rodents, floods, and theft. But they have worked for centuries to archive our ideas. Write a book, print a thousand copies, and distribute them to a thousand locations. The probability that all these copies will disappear is virtually nil. By contrast, write a book, store it on electronic media, and make a thousand copies. In five years the hardware to read the media may be unavailable, or the search engine or operating system may no longer be supported, or the media itself may have deteriorated, or sunspots or cosmic rays could have erased every single copy. With hard-copy archiving, each individual copy is *stable*; with electronic archiving, each individual copy is *unstable*.

This op-ed piece is not intended to turn people against electronic media, but to encourage them to find ways to make the media more reliable and durable. In debates at the AMS Publications Committee about electronic journals, some have argued that it is not the responsibility of the promulgator to archive the product. For shame! We produce new mathematics and new ideas because we want to teach mathematics to others and we want the ideas to last. The archiving problem is one that we all share and that we must solve together.

—Steven G. Krantz
Associate Editor

Letters to the Editor

An Example of Undue Dependence of Universities on the NSF

I wish to support by evidence the opinion about the undesirable dependence of university research on external funding that Andy Magid expressed in his "Commentary", "The Triumph of Research", in the August 1999 issue:

> I want to acknowledge that the rosy picture being painted here [about university research] has some shadows. Some of the impetus to support and emphasize university research in recent years stems from a desire by university administrators to collect the financial benefits of external funding.

Dr. Bernard R. McDonald, executive officer, Division of Mathematical Sciences, NSF, acting on behalf of NSF, has rejected a proposal to unify hyperbolic and Euclidean geometry on the grounds that the benefit of such a unification to the mathematical sciences is equal to the benefit that would result from the unification of (i) the theory of combustion and (ii) phlogiston theory. His decision is based on the following review of a proposal to unify Euclidean and hyperbolic geometry:

> In the past there have been many attempts to "unify" two distinct but both accepted theories. In a sense, in the 1916 general theory of relativity was an already unified theory of gravitational and electromagnetic fields. However, Einstein sought an elegant new theory in which gravitational fields and electromagnetic fields would enter in the same way. Elegant as his later fabrications were, none passed the tests posed by nature.
>
> People can argue whether the efforts Einstein made were worthwhile or not, but at least he was not attempting to "unify" an accepted physical theory, special relativity, with a rejected physical theory, classical mechanics. To attempt to do this, it seems to me, is similar to attempting to "unify" the accepted theory of combustion with the rejected phlogiston theory. By changing our language a great deal, it might be possible to "unify" these theories, but why obfuscate the differences between accepted and rejected theories. I don't see the point of such an exercise.

Responding to an obvious appeal that explains that mathematical standards should not be affected by analogies with phlogiston theory, Dr. McDonald gave his opinion: "The points raised in the reviews are thoughtful and have merit." Furthermore, he emphasized that "Further communications, while always welcome, will not change my conclusion." Clearly, in this phlogiston theory case, both Dr. McDonald and his anonymous reviewer evaluate the needs of the mathematical community by methods which are not acceptable among mathematicians.

Yet in some advertisements for associate and full professorship positions at highly ranked U.S. universities, candidates are requested to hold a research grant. In most areas of pure mathematics in the U.S., NSF is the only source of external financial support. NSF thus indirectly shapes the mathematical leadership of the U.S. I thus share with Andy Magid my concern about university research and recommend that no university position in mathematics be restricted to grantholders.

—Abraham A. Ungar
North Dakota State University

(Received July 1, 2000)

Editor's Note: The preceding letter was printed in the October issue with incorrect formatting that distorted its meaning. It is being reprinted here in full with the formatting corrected.

Ostrowski or Mahler?

In the September *Notices* on p. 761 of Allyn Jackson's article on Oberwolfach, you identify the person in the photo to the left of Erdős's photo as Alexander Ostrowski. I didn't know Ostrowski, but I think the person in the photo must be Kurt Mahler. Could there be a misidentification?

—John Brillhart
University of Arizona

(Received August 3, 2000)

Editor's Note: Allyn Jackson replies: "After John Brillhart wrote to me about this, I asked a number of people who knew Mahler and/or Ostrowski. The responses I received were contradictory. I then wrote to the administration of the institute at Oberwolfach, which was the source of the photograph. The reply I received stated that the person in the photo is Ostrowski and is not Mahler. Furthermore, in June 1964, the month in which the photograph is supposed to have been taken, Ostrowski signed the guestbook at Oberwolfach, but Mahler did not.

"After receiving this information from Oberwolfach, we decided against running a correction at this time. However, those who have information that might shed new light are welcome to write to me (`axj@ams.org`). Also, on the same page as the photograph in question, there is a photograph, in the upper left-hand corner, that has a missing identification. I would be grateful to hear from someone who can identify the person standing between Jean-Pierre Serre and Jean Braconnier."

A Second Nontraditional Electronic Journal

In the "Commentary" published in the June-July issue of the *Notices*, Bill Casselman pointed out:

> All but one of the current electronic mathematics

research journals are straightforward extensions of the paper journals, using computers merely to share 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.

We would like to mention that the International Society for the Interdisciplinary Study of Symmetry (ISIS Symmetry) and the Mathematical Institute (Belgrade, Yugoslavia) are publishing the electronic quarterly *VisMath* ("Visual Mathematics"), which one can find at the address `http://members.tripod.com/vismath/` or `http://www.mi.sanu.ac.yu/vismath/`.

From January 1999, when the journal started, 43 papers and 18 math-art exhibitions have been published. The next issue will be published at the end of September 2000. We hope that *Notices* readers will view *VisMath* as a nontraditional electronic journal that is not languishing.

—Slavik Jablan
Belgrade, Yugoslavia (Serbia)
—Dénes Nagy
Melbourne, Australia

(Received August 15, 2000)

Preserve and Disseminate *Notices* Articles

I would like to make a suggestion pertaining to articles that have appeared (and those that might appear) in the *Notices*.

Although I am technically retired and my work has moved more heavily into statistics, applied statistics at that, I frequently take time to read articles that appear in the *Notices*. In catching up on my reading, I found the article about Hilbert's problems and the one about Oberwolfach (August 2000) especially interesting. I often tear out such articles before disposing of the issues. Unfortunately, this leads to a rather messy collection of stapled packets.

My suggestion concerns these articles that are a facet of the history of mathematics that is unlikely to reappear in a history book. Because of the nature of the *Notices* being strongly a journal of record (meeting notices, abstracts, job advertisements, book advertisements, announcements pertaining to NSF and other government agencies, etc.), it is unlikely that one would keep them for the same reason that one would keep one of the "regular" journals. It seems a shame for these historical and broad perspective contributions to disappear so easily. Might there not be a way to collect them periodically into a book or some other more permanent form? Perhaps also they might be collected into an archive on the the AMS Web site. While there are many graduate students who are members of the AMS and will receive the *Notices*, it is more likely that they will become members after they complete their degrees. These articles represent a historical perspective and research perspective that need to be brought to the attention of graduate students more forcefully and made available to them over a longer period of time.

I urge that the AMS consider some scheme to preserve and more widely disseminate these.

—Donald E. Myers
University of Arizona, Tucson

(Received August 24, 2000)

The *Notices* invites letters from readers about mathematics and mathematics-related topics. Electronic submissions are best. Acceptable letters are usually limited to something under one printed page, and shorter letters are preferred. Accepted letters undergo light copyediting before publication. See the masthead for electronic and postal addresses for submissions.

About the Cover

A *minimal surface* is a surface that is locally area-minimizing; that is, a small piece has the smallest possible area for a surface spanning the boundary of that piece. Soap films are minimal surfaces. Minimal surfaces necessarily have zero mean curvature; i.e., the sum of the principal curvatures at each point is zero. Particularly fascinating are minimal surfaces that have a crystalline structure, in the sense of repeating themselves in three dimensions—in other words, of being *triply periodic*. Many triply periodic minimal surfaces are known.

The cover shows one such surface, Schoen's Manta Surface of Genus 25. The cell that is repeated periodically is a cube. Within that cube the fundamental region for constructing the surface is a tetrahedron that occupies 1/96 of the cube. The first image shows two fundamental regions whose appearance is the source of the name "manta". The second image shows twelve fundamental regions in a cube. The third image is the full cubical unit cell.

These images were made with a program called Surface Evolver, which can be downloaded for free at `http://www.susqu.edu/brakke/`. The surfaces are generally made by defining and evolving the fundamental region of the surface, which is usually very simple due to the high symmetry, and then displaying many copies of it, suitably transformed.

More surfaces of this kind, together with their source files, may be obtained by starting from the above Web address.

—Kenneth A. Brakke
Susquehanna University