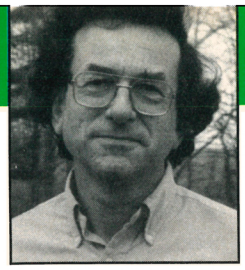

PUBLISHING IN COMPUTOPIA

N. David Mermin

I have just finished writing a short technical article that ties together two old, important and previously unrelated results in a surprising way that simplifies and elucidates them both. It is self-contained and readable, and the formal analysis it employs is extremely simple; it will be cited in textbooks. I make a list of people I think might be interested. The field is a small one, so I start from memory. Next, I go through some conference proceedings I happen to have at hand, to get addresses and catch people I might have missed. I end up with about 50 names and addresses. I fiddle around with the formatting parameters to squeeze the paper into only eight pages, so that my secretary can print it reduced on just two sheets of paper to save postage and copying costs—my grant has been cut. When all the copies are in the mail I return to my computer, unsqueeze the paper, move the footnotes from the bottoms of the pages, where they are easy to read, to the end of the manuscript, as the rules require, and make four more copies that I send off to Physical Review Letters.

What's wrong with this story? What strange, irrational, one might even say unprofessional act have I just described?

Was it wasteful of me to inflict this burden on so many in-baskets, knowing that considerably fewer than half the recipients will look at my paper? Not at all! I will be content if a dozen people take a serious look—that will be enough for my message to propagate—and I have followed the best strategy to bring that about.

Was I, then, foolish to waste paper, postage and secretarial time in this old-fashioned effort at communication, when E-mail would have done the trick effortlessly? Not yet! Not all my correspondents communicate in that way, I lack the electronic addresses of many of those who do, and surely somebody (though I have no idea who) is paying for all those E-mail transmissions, so the monetary savings to society as a whole may be at least in part illusory.

Was it, perhaps, absurd of me to lavish extreme care on these preprints, rearranging the footnotes for easier reading, and even worrying about the proper choice of fonts to convey to my readers as clearly as possible the relations between the tiny sections and subsections? Not a bit, if this makes it easier for a dozen of them actually to read it.

No, the only peculiar step in the entire process—the only one that casts doubt on my judgment, seriousness of purpose and moral integrity—was the last one. Why on earth, having done everything necessary, did I then produce four more copies to be sent to *Physical Review Letters*?

Was it for the benefit of people unknown to me, not on my list? Superficially plausible. If the paper goes to the right referees it will be accepted and promptly appear. But there is a significant chance that three months will elapse, after which it will be rejected. It would then be my duty to the people not on my list to resubmit, with a letter explaining why the referees have missed my point. Failing to enlighten them, after four-and-a-half months I would have to struggle on behalf of those unknown to me, not on my list, by requesting new referees. More likely than not, after six or seven months the paper would be accepted. But perhaps not. Half a year having passed, I would then repeat the process with a journal of lower standards and more sympathetic reviewers, and with any luck the paper would be in print not more than year from my first submission.

During this long interval two or three of the dozen or so who looked at what I mailed them will have mentioned it to others. A few papers will hae been circulated commenting on mine, bringing it to the attention of people on different distribution lists. I will get a few requests for copies and will gladly provide them. I and perhaps some of my readers will give talks about it. In short, anybody with more than the faintest interest in the subject will be afforded many opportunities to learn what I have done well before publication.

Well, if not for the benefit of those not on my list, then why indeed submit to *PRL*? For my own benefit, of course! I have a grant proposal pending on the subject of my article. These days it is the first duty of all program officers to reject as many proposals as they can, and a powerful argument against funding mine is that everything of interest to say on the subject has already been said. Having concrete evidence that *PRL* thought otherwise will be valuable in the resubmission.

Is this, then, an efficient way to marshal evidence in support of grant proposals, appointments, promotions or fellowships? Of course not—it is madness. The time is overdue to abolish journals and reorganize the way we do business.

[Honesty compels me to note that since the above was written *PRL* accepted my paper on the first round and published it promptly, and I received one thank-you note from an enthusiastic reader not on my list. This has no bearing on the points made below. One does not formulate policy on the basis of singular events.]

In a rational world, paper, printing, postage and *PRL* would never have crossed my mind. I would simply have E-mailed my essay to a central clearinghouse for posting on its electronic bulletin board. Readers around the world would peruse this bulletin board, which would be organized by the usual categories that document the fragmentation of human knowledge. After calling up for inspection

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the abstracts of titles that caught their interest, readers could call up copies of entire articles, even printing them out on the rare occasions they promised to repay careful study.

Why don't we do this? Well, not everybody has access to the networks, so it's unfair.

Nonsense! Even fewer people have access to preprints, the current avenue of serious communication; nothing could more unfair than the way we now do business. By the time the information has diffused to those not on original lists—brief as it may be compared with the time to publication—those on the lists have gone galloping off to the next stage, leaving the unlisted only the less exhilarating pleasures of cleaning up the mess they've left behind. In fact the numbers of the electronically unplugged-in are diminishing daily, but to solve the problem of universal and immediate access libraries can, for a tiny fraction of the enormous sums they now waste on journals, set themselves up with terminals for perusing the bulletin board and with printers for producing hard copies at no more expense to users than is currently spent on copying machines. The ridiculous five-step process by which my ideas now end up in the pile on your desk (computer file → printer → keyboard operator → computer file → journal page → copying machine) will collapse to one.

But the papers on the bulletin board would be unrefereed, imposing a new burden on readers.

This is no disadvantage. It would lift an even greater burden from the community of referees, which hardly differs from the community of readers. Truly conscientious referees now have to spend most of their waking hours reading the papers of others, if they are saintly enough to give the job the attention it requires. What would be lost by the disappearance of refereeing? Readers would have to decide for themselves whether a paper was rubbish; that is, they would have to referee (for themselves) only those papers they might really be interested in looking at. Because none of us are saints, current refereeing is so ineffectual that this is already necessary. Under the new system readers would simply have to sift through a somewhat larger pile. Not having to struggle, as an official referee, with many papers one is at best peripherally interested in would more than compensate for this.

What about the validation that publication in a peer-reviewed journal stamps on a paper for those who dispense grants and promotions? Most papers, of course, now have multiple authors, and the particular contribution of any single one is shrouded in obscurity. Nevertheless, authors may legitimately require an official assessment of their product for private purposes, so the professional societies will have to maintain panels of reviewers, just as their journals now maintain panels of referees. Those needing such validation (and no others) would submit their manuscripts to the appropriate panel for a grade: A+, A, A−, ... D−, F. This process of evaluation would be decoupled from any posting of the manuscript on the electronic bulletin board—it would be up to the author to decide whether to post before receiving the grade. There could be one exchange to allow an author to improve the paper for a better grade or to present a case for raising a poor grade. After that the grade would be placed on the bulletin board for public inspection, whether or not the paper was listed, to discourage frivolous submissions to the panel. Reviewing would reimpose on the community some of the odious burden of refereeing, but it would be a much lighter load. Only a fraction of the papers would be submitted for grades, there would be no endless exchanges back and forth, and the reappearance of the same rejected paper at one journal after another would vanish with the vanishing of the journals themselves.

The fact is that journals are obsolete except as archival repositories, and even in this apparently benign role they waste such colossal amounts of shelving that plans are afoot to move them to compact disks. In the meantime we must either live with impossibly overcrowded libraries or devote construction funds better spent on laboratories or classrooms to library expansion.

Our failure to recognize the obsolescence of journals has restricted effective scientific communication to ingroups and cliques and is destroying our libraries. The sooner we get rid of journals, the better. Even the pleasure they once afforded of seeing a typed manuscript with handwritten equations transformed into beautiful fonts with justified margins has turned to ashes. If one has devoted any care at all to the preparation of a manuscript, the published version is now deeply disappointing, being visually less attractive and replete with errors introduced by the unnecessary process of retyping, or at least reformatting, the text to meet the journal's own specifications.

Why do we still live this way? What are we waiting for? ■