

# Current Comments

## Alternative Forms of Scientific Publishing: Keeping Up With The Evolving System of Scientific Communication

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Some time ago, I expressed some opinions on the future of the scientific journal.<sup>1</sup> The primary point I made was that the medium in which scientific articles appeared might change, but the contents would be essentially the same. Much has been said in recent years about the "paperless revolution."<sup>2,3,4</sup> But Joshua Lederberg, president of Rockefeller University, seems to have synthesized it all in a paper which I expect will have wide impact.<sup>5</sup> While communications and information scientists have grasped the technical significance of the electronic publishing revolution, Lederberg, as an accomplished user, appreciates the impact a little more than most of us. Hence the title, 'Digital Communications on the Conduct of Science: The New Literacy.'

Lederberg wrote his paper at the invitation of the IEEE for a special issue of their *Proceedings* devoted to packet communications. Lederberg suggests that electronic communications will not only speed up scientific information exchange, but the new medium will also affect the quality of the messages conveyed.

Lederberg's EUGRAM system involves a network of interconnected computers. The individual scientist pre-

pares a scientific communication on a text-editing display terminal. Once the paper enters the system, it is immediately retrievable by other scientists with terminals. Instant refereeing of papers is possible because you can send your EUGRAM to selected colleagues or referees. This combines the features of an electronic mail system with Selective Dissemination of Information (SDI).

The system seems to resolve some problems associated with today's printed journal. These problems include the spiraling cost of printing and the ever-increasing number of scientific papers vying for limited space. Presumably, the electronic system will cost less than print journals, and we can assume that eventually more papers could be stored electronically than can now be published economically. Since all papers entered into the system would be retrievable by any scientist, scientific papers in the future might receive more interdisciplinary exposure than they do today.

It is tempting to contemplate in detail what Dr. Lederberg says. I suggest that the interested reader write for a reprint, especially since the paper was published in a journal that is not immediately accessible to most of you.

The main point of my essay is to describe several new types of scientific journals which typify the rapidly changing scene in the evolution of the journal.

At IST® we are constantly evaluating journals. It is a strenuous but essential task. It is especially challenging because in spite of our comprehensive coverage, we must be selective. During the past six months alone, we've evaluated and re-evaluated more than 1,000 journals. The result of all this work is only partially reflected in "journal coverage changes."

All this activity reflects one of the major quantitative consequences of big science. Science is big not only because there are large projects which produce papers with a dozen authors. Science is big because it is omnipresent, international, and still growing. It is inevitable that new journals proliferate like big science. But there is also a need for new kinds of journals. Some satisfy the special intellectual requirements of big science. Others reflect the quantitative needs.

The latter category of need has led to alternative publication media such as microforms or miniprint, which reduce the amount of print space used in publications. The former category includes those journals that present scientific knowledge in new editorial styles.

Since the electronic journal is still some years away, for the present, many journal publishers are turning to alternative media to cope with increasing costs. Publication in microform is one option pursued by journal publishers for some time now. The journals *Wildlife Disease* and *International Microform Journal of Legal Medicine* have published exclusively in microform since the mid-1960s.<sup>6</sup> Today, many print-journals also publish a microform edition for libraries with limited space.

However, most of these are not intended to serve as an alternate means of original publication.

The obvious advantage of microform is simply that more papers can be published in less space and at less cost. However, microform journals have not gained wide acceptance within the scientific community. "The advantages [of microforms] all appear to be for libraries," says L.A. Page, treasurer of the Wildlife Disease Association and past editor of *Wildlife Disease*. In contrast, "most authors want to have their work in readily readable form."<sup>7</sup> You simply cannot browse through microform as you can with printed journals. Moreover, the reproduction quality of microform readers has not been very good, though it is improving.

It remains to be seen whether microfiche in particular will become a major medium of scientific publication before, during, or after the electronic revolution has arrived. One idea that seems to be catching on is the synoptic/microform journal. These journals only print synopses or summaries of scientific papers. The full papers are published simultaneously in a microfiche edition of the journal. This approach to journal publishing is similar to an idea suggested by Watson Davis as far back as 1933.<sup>8</sup> He proposed that synoptic journals be published by a central agency that would provide the full papers on demand—just as reprint requests are handled now.

A prime example of a synoptic journal which appears to be a successful experiment is the *Journal of Chemical Research*, which was started in 1977. Under the aggressive leadership of Dr. Helmut "Joe" Grunewald, this journal has been able to publish an average of 240 papers a year. The new journal caused some problems for us here at

ISI. The synopsis for each article includes only the key references cited. The complete bibliography is only available in the microform or miniprint edition. Eventually, ISI and The Chemical Society, London, which publishes the journal, worked out a solution. It is now possible for us to process all cited references. Recently, the journals *Studia Biophysica* and *Bulletin of the Geological Society of America* switched to a similar format. As in the case of the *Journal of Chemical Research*, the printed summary sections do not contain all the references to the full articles. We are now working on arrangements which, with the cooperation of these journals, will allow us to pick up these lost references.

In a previous essay I discussed the use of miniprint as a cost-cutting alternative for journal publishers.<sup>9</sup> The *Journal of Chemical Research* publishes a miniprint edition which it offers as an alternative to microfiche. However, not all publishers who have tried miniprint were satisfied with the results. In the early 1970s, the American Institute of Aeronautics and Astronautics considered publishing its journals in miniprint and offered sample miniprint articles to its readers. The Institute abandoned the idea, however, when a sizeable minority of the readership responded negatively to the miniprint samples.<sup>10</sup> Similarly, the *Canadian Aeronautics and Space Journal* used to print synopses in normal type size, but the full articles appeared in miniprint at the back of the journal. This practice was discontinued about six years ago.

The journals discussed up to this point all use alternative media to cope with the rising cost of publication. Some journals, however, are experimenting with new ways of presenting scientific knowledge. These experiments are at-

tempts to cope with other problems inherent in the journal system of scientific communication.

One type of scientific literature has been described by Senders as "fugitive" literature.<sup>10</sup> It includes papers of merit that are not suited for core journals because of their length or because they report so-called negative results. The American Psychological Association (APA) is coping with the growth of fugitive literature through its quarterly *Catalog of Selected Documents in Psychology*. The *Catalog* publishes abstracts of unpublished papers that would otherwise be lost to the scientific community. The APA offers reprints of the full articles to readers who request them. The cost of the reprint varies with each article.

Another experiment in scientific publication is the International Research Communications System (IRCS) established in 1973 by David F. Horrobin, University of Montreal; John Paul Eakins, of Imperial Chemical Industries; and Michael S. Buckingham, now managing director of IRCS. IRCS has reduced the lag time in communication to four weeks from the submission date of a manuscript until its publication, inclusive of refereeing by largely UK referees. Research findings are published as brief, 500-word notes.

Each article in the IRCS system appears in one or more of 32 print journals. Each journal or section covers a different medical specialty. IRCS also publishes three "key" journals, which present those articles from the entire compendium considered most important by the editors. All of the articles published in the 32 sections appear in a microfilm *IRCS Medical Science Library Compendium*.

One of the major problems in gaining acceptance with these new experiments

is the unwillingness of leading scientists to publish their best works as brief communications or in microform. It becomes difficult for *Current Contents*® (*CC*®) to justify coverage until the quality of the material is on a par with the journals we now cover. This vicious circle may only be broken by testing out some of this material in *CC*.

The examples cited so far are journals which attempt to solve the space problem. If science is democratic, then everyone should at least have a chance to get in his or her 500 words! But this does not deal with the fundamental intellectual problem of science which frequently pushes in the opposite direction. There ought to be a way to foster more detailed discussion, especially when a problem is of vital interest to many people. A pioneering step in this direction was taken by the journal *Current Anthropology* in 1960. This journal fosters a system of open peer commentary. It anticipates in slower print form the "instant" peer interaction of Lederberg's *EUGRAPHY*.

The newest journal to use open peer commentary is *The Behavioral and Brain Sciences*, published by Cambridge University Press. This journal is the brain child of Stevan Harnad, formerly of the Rutgers Medical School, who is now the journal's full-time editor. Harnad consciously modeled *The Behavioral and Brain Sciences* after *Current Anthropology*.

Each issue presents about four "target" articles. Each article is accompanied by about 35 commentaries contributed not only by members of the immediate invisible college but also by outside peers. Authors who have written on subjects related to the target articles are prime sources of commentar-

ies. They are identified through the use of such current awareness tools as the *Science Citation Index*® (*SCI*®) and *Chemical Abstracts*.<sup>11</sup> Care is taken to insure that the commentaries represent a sampling of opinion from scientists throughout the world. Through open peer commentary, the knowledge imparted by the target article becomes more fully integrated into the entire field of the behavioral and brain sciences. This contrasts with the provincialism of specialized journals.

The commentaries or critiques presented in *The Behavioral and Brain Sciences* are not short quips—they average about 1,100 words. (Target articles average about 13,000 words.) Furthermore, the target author's response to the collective critique averages about 8,300 words!

Harnad's enthusiasm for *The Behavioral and Brain Sciences* is infectious. "Peer interaction is the real medium for the self-corrective aspect of science," he writes.<sup>12</sup> This belief is not unique, but the new editorial style makes it a reality. Indeed, most scientists are aware of the large number of errors even in the most prestigious journals.<sup>5,13</sup> The first words I stated in print about the *SCI* concerned the problem of corrections of all kinds which remained buried in the literature for lack of a means to bring them together with the original errors.<sup>14</sup>

In the case of *The Behavioral and Brain Sciences*, open peer commentary does not replace the traditional refereeing procedure. On the contrary, papers submitted to the journal are reviewed by about eight anonymous referees. Usually, three of the referees are experts in the field of the target article. The other five are experts in related

fields who check manuscripts to verify interdisciplinary interest and intelligibility.

The most noticeable drawback of open peer commentary is the amount of time required for a submitted target article to be published. After the article is received, it must be sent to referees. Some rewriting is usually necessary after this has been done. Next, commentaries must be solicited and received. Then, the target author must write his response. Until now, this process has taken up to a year to complete. Harnad expects the time to be reduced to eight months once authors become more familiar with the journal's style.

ISI is now covering *The Behavioral and Brain Sciences*. The open peer commentary feature presented us with a real problem. How does one treat the commentaries? Are they part of the tar-

get article? If so, what does one do with the references found in the commentaries? Should we include the names of all 35 authors involved on the contents page? In the end, we decided to treat each commentary as an article in its own right.

All of the innovations described above are harbingers of significant changes on the horizon. As the price of paper and postage increases while the cost of computer storage goes down, we approach a critical point in the history of science. How many journals survive and for how long is an interesting problem for futurists to tackle. In the meantime we at ISI will continue to deal with each new innovation with an open mind. As you have seen, some innovations can disrupt our system temporarily, but we still encourage creative experimentation.

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