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Editorial

Scientific publishing—an evolving beast

Communication of peer-reviewed research in scientific journals has been an essential element of scholarship since at least the 17th century. Functioning of the scientific process requires scientists to publish and other scientists to access this information. Research is not really complete until it is published. Standing of scholars has traditionally been measured by the quantity and quality of their publications. An extensive publication record in refereed journals is taken to indicate a high research productivity. Usefulness of research is increasingly judged by the citation ratings of publications. Quality of a publication is often inferred from the impact factor of the journal in which the paper appeared. Publication and citation records of individuals and institutions can now be accessed easily using the various online sources of archival information.

Clearly, the scientific paper is an important feature of scholarship and its assessment. For the first time in the long history of scientific publishing, the dissemination of research is undergoing a radical change. While the fundamental character of a scientific paper remains, in many cases the cherished paper is no longer a hardcopy but a virtual document. An increasing number of journals are being published electronically; however, for the moment, most journals continue to retain a parallel traditional format printed equivalent. Encyclopedias and reference texts are rapidly moving to online publishing and undergraduate textbooks are not far behind.

Locating and accessing information is vastly different today compared to only a few years ago. The Internet has greatly impacted the publication process. Increasingly, information can be searched freely using Internet-based search tools such as MEDLINE and SCIRUS (<http://www.scirus.com>). Most publishers and academic societies provide free access to the contents pages of their journals and abstracts of articles. Full documents can be retrieved electronically by readers from the subscribing institutions.

Speedy publishing at reduced cost and rapid access to a greatly expanded database of records continue to drive the electronic transformation of publishing. Electronic publishing can provide instant online access to publications from any Internet-linked office. In addition, the electronic format allows for easy searching within a document and hyper-linking to electronic files of the cited references. Unlike the traditional printed documents, online publications can make effective use of video, audio, interactive learning tools, and working models to enhance communication. Online publishing allows extensive use of color graphics that are expensive to produce in the traditional printed format.

Not only have the journals gone electronic, the process of science publishing is itself changing. Many journals now accept manuscripts electronically. The refereeing process is

paperless and the proofs of the final accepted articles are transmitted to the authors electronically. In some cases, the uncorrected proofs are available to subscribing readers before the corrected article actually publishes. With the online availability of all future publications and scanned copies of ancient manuscripts, the traditional library is set to become virtual. Compared to the conventional operations, a virtual library should be less expensive and it could provide rapid access to more records than are typically held in most major institutional libraries today.

Change, of course, is inevitable, but the pace of change has never been faster. Is the research community ready for these changes? Certainly, the IT-literate younger researchers are quite at ease with the electronic transformation of publishing. In contrast, experience at several research universities worldwide reveals that the midcareer and older researchers are distinctly less comfortable with the electronic retrieval and dissemination of knowledge. This inertia is barely affecting the transformation underway, as the drivers for the change are too powerful to resist.

While the scientific community has scarcely complained about the ongoing change, points of concern remain. Who will control the access to information? Will access be available always and to subscribers everywhere? Are the electronic archives sufficiently backed-up for availability in the distant future? An archive at a single geographic location and under the control of one owner cannot be considered sufficiently protected or available for future use. Perhaps the publishers should be required by national and international laws to provide immediately on publication the full electronic content to several geographically dispersed government-backed repositories of information. Knowledge held in trust at these repositories could become available publicly directly from the repositories only after a designated period, to protect the business interests of the publishers. This will also safeguard against inadvertent loss of accumulated knowledge because of natural causes, accidents, sabotage, political interference and a publisher's inability to remain in business. In our knowledge-based world, access to information and its protection are everyone's business.

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