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# ELECTRONIC JOURNALS

Scholarly journals, which include substantive research articles and other materials, including letters to the editor, book reviews, and announcements of meetings, trace their origins back to 1665, with *Les Journal des Scavans* (trans., "Journal of the experts") in Paris and *Proceedings of the Royal Society of London* in London. These journals developed to share scientific discoveries among interested parties and to establish who was first to have made a given discovery or to have advanced a given theory.

Peer review is an important part of publication in scholarly journals. It is a system whereby scholars who are experts in the same field as the author (the author's peers) read, comment on, and recommend publication or rejection of an article. This process is usually single-blind (the author does not know who the reviewers are, but the reviewers know who the author is) or double-blind (the author does not know who the reviewers are and the reviewers do not know the identity of the author), which gives both readers and authors increased confidence in the validity of the published articles. Although it has been criticized from time to time, peer review remains one of the most valued aspects of publication in scholarly journals, which are also referred to as peer-reviewed journals, scholarly journals, or refereed journals.

## Status of Electronic Journals Today

Today, according to *Ulrich's Periodicals Directory*, there are approximately 15,000 peer-reviewed journals actively published in all fields. (This number should be considered approximate, as new journals are constantly being launched and old ones constantly ceasing publication. In addition, journals sometimes change their titles, making it difficult to arrive at an exact figure.)

Beginning in the 1960s, the first attempts were made to convert scholarly journals or articles from journals into digital format. As information technologies and telecommunications infrastructure developed, digital, or electronic, journals have become a viable alternative to print. As of 2003, over 80 percent (approximately 12,000) of peer-reviewed journals are available in some electronic form

*Fulltext Sources Online,* published twice a year by Information Today, Inc., lists by title the scholarly journals, magazines, newspapers, and newsletters that are available in some digital form. The number of listings in *Fulltext Sources Online* grew from about 4,400 in 1993 to over 17,000 by the end of 2002. The formats of electronic journals (or e-journals) vary considerably, however.

## Electronic Journals: Journal Focused or Article Focused

E-journals can be categorized as either journal focused or article focused. Journal-focused e-journals are complete replacements for print, providing an entire journal and, often, even more information than is available in any extant print alternative versions. A journal-focused e-journal generally has a recognizable journal title, an editorial process, a collection of articles on related topics, and may even have volumes and issue numbers. These complete e-journals often permit browsing through tables of contents and often feature a search engine that lets readers search for specific information. Complete electronic journals provide the same branding function that print journals provide. They are typically available directly from the primary journal publisher, usually for a subscription charge.

Article-focused e-journals are just databases of separate articles extracted from print or electronic versions of the complete journal. Commercial databases of separate articles may be available either from the primary publisher or from an aggregator service such as ProQuest, InfoTrac, or EbscoHost. Article-focused e-journals typically emphasize searching over browsing and mix articles from many different jour-

nals. In these databases it is selected articles, rather than complete journal titles, that are made available.

Even within a journal-focused e-journals, there are many variations. The scholars Rob Kling and Ewa Callahan describe four kinds of electronic journals: pure e-journals distributed only in digital form; e-p-journals, which are primarily distributed electronically, but are also distributed in paper form in a limited way; p-e-journals, which are primarily distributed in paper form, but are also distributed electronically; and p- + e-journals, which have parallel paper and electronic editions.

Electronic journals may be mere replicas of a print version, with papers presented in PDF format for handy printing, or they may provide a new e-design with added functionality, color graphics, video clips, and links to data sets. Both browsing and searching may be possible, or only one or the other. The availability of back issues also varies considerably. The American Astronomical Society has an advanced electronic-journals system, with added functions, links to other articles and to data sets, and extensive back files of old issues.

Aggregators of electronic-journal articles are companies that act as third parties to provide access to journal articles from a variety of publishers. The advantage of an aggregator or a publisher that offers many titles is, of course, the availability of many articles from many journals in just one system. The system may offer articles from a wide variety of publishers and the originals may be print, electronic, or both.

## Publishers of Scholarly Journals

From their early days, scholarly journals were published by scholarly societies, commercial publishers, university presses, and government agencies. These main categories of publishers continue today with both print and electronic-journal publishing. The number of journals published by each is not equally distributed, however.

Societies may be the most visible to scholars, yet only approximately 23 percent of scholarly journals are published by societies. They have a core constituency to serve, and publishing activities are almost always seen as a money-making venture to pay for member services. Members may receive a subscription to a print or electronic journal with their society membership or, increasingly, pay extra for it. Society publishers' main revenue source is from subscriptions paid for by libraries.

Some say that for-profit companies (commercial publishers) should not publish scholarly publications because research and scholarship should be freely available to all. A for-profit company owes its primary allegiance to its shareholders and the "bottom line" rather than only to the propagation of knowledge. Subscription fees create a barrier that means only those who can pay or who belong to an institution that can pay, have access to important research information. Still, in scholarly journal publishing, commercial publishers such as Elsevier Science, Wiley, and Springer publish the largest percentage of the scholarly journals, and that percentage is growing. For-profit publishers range from those giants to relatively tiny publishers, and together they publish approximately 40 percent of all scholarly journals. Libraries are the main subscribers to both print and electronic journals and provide access to library constituents either by password or Internet protocol address (the address, given in numbers, that corresponds to an Internet location).

University presses mostly publish monographs, but universities and other educational institutions also account for about 16 percent of scholarly journals. Other publishers, mostly government agencies, contribute 21 percent of the titles published.

Many scientists and social scientists prefer electronic journals for the convenience of desktop access and additional functions, such as the ability to e-mail an article to a colleague. E-journals also allow scholars to save time locating and retrieving articles. Since almost all electronic journals have a subscription charge, libraries are the main customers, providing seamless access for faculty, students, staff, or researchers.

## Article-Focused Alternatives to E-journals

Article-focused e-journals, being collections of articles organized in subject-related databases,

are particularly good for in-depth reading over time or for access to articles that come from unfamiliar sources. They extend, rather than replace, a library's journal collection and, like journals, are provided to library constituents on a secure basis through passwords or other authentication. Article databases are changing the nature of scholarship: In the late 1970s, scientists and social scientists read articles from an average of thirteen journal titles each year; with electronic-journal databases they now read from an average of twenty-three journal titles.

In addition to taking advantage of aggregators' article databases, readers can also choose to get individual articles from special electronic services, such as the Los Alamos/Cornell arXiv.org service or those linked to by the Department of Energy, Office of Scientific and Technical Information PrePrint Network (http://www.osti.gov/preprints/). These services provide access to articles that may be preprints of articles that will be submitted to peer-reviewed journals by the author, postprints (copies of articles that are also published in journals), or papers that will never be submitted to traditional journals.

Individual electronic articles may also be accessed at an author's website or at institutional repositories. The Open Archives Initiative has led the way in alternatives to traditional journal publishing and has inspired related initiatives that move the responsibility for distributing scholarship from publishers to the scholars themselves or to the scholars' institutions. Institutional repositories are now at the early planning and development stage, but ideally will include the entire intellectual capital of a university faculty, including papers, data, graphics, and other materials. The Open Archives Initiative promotes software standards for establishing institutional or individual e-print services (access to digital "preprints" or "postprints") so many institutions are establishing OAI-compliant sites. E-print services are well established in some academic disciplines, in particular high-energy physics and astrophysics. They are not as common in disciplines such as medicine and chemistry, which rely heavily on peer review.

## The Impact of E-publishing Alternatives

The fact that authors are now using a variety of publishing venues leads to worries about duplicate versions, as it is hard to tell which is the definitive or archival version of a paper when multiple versions of the same paper are posted over time. Also, it may be difficult to distinguish low-quality papers from high-quality papers when it is so easy for all papers to be posted. The positive impact of speedy access to research literature overshadows these fears in many scholars' minds, however, and so far some scholars and students report being able to assess the definitiveness and quality of articles without too much difficulty.

All of the new electronic models, formats, and choices show us clearly that scholarly publishing is at a crossroads. To understand what impact these new options for reading and publishing scholarly materials may have, it is useful first to consider what the traditional structure and fundamental purposes of scholarly publishing have been.

Traditionally, many people have been involved in the business of moving scholarly ideas from the hands of the author to the hands of the reader. If the people and stages involved are seen as links in a chain, the first link is the author and the last link is the reader, but there are many intervening links—peer review, editing, distribution, indexing, subscription, and so forth. Each link adds value, but it also adds costs and time delays.

Some of the links are by-products of a print distribution system and reflect the limitations of print access. Electronic distribution may be one way to cut out the intervening links, so an article moves directly from the author to the reader. But it is important to remember the functions of those links and the value they add. Peer review, for example, adds authority; editing adds quality; distribution adds accessibility; and archiving adds longevity. Online alternatives that protect these functions to some degree will be the most successful in the long run, although the relative value versus cost of these functions is hotly debated.

## The Future

Online journals today range from simplistic (and quite old-fashioned-looking) ASCII texts (texts that rely on the American Standard Code for Information Interchange, or ASCII, for data transmission) of individual articles available from aggregator services such as Lexis-Nexis to complex multimedia and interactive electronic journals available on the publisher's website. Fully electronic journals without print equivalents are still rare, but they are expected to become more common in many disciplines. Fully electronic journals can be highly interactive and can include multimedia, links to data sets, and links to other articles; they can also encourage a sense of community among their readers. Therefore their impact on scholarship in the future is likely to continue to grow.

*Carol Tenopir*

*See also* Digital Libraries

### FURTHER READING


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# ELECTRONIC PAPER TECHNOLOGY

For nearly two thousand years, ink on paper has been the near-universal way to display text and images on a flexible, portable, and inexpensive medium. Paper does not require any external power supply, and images and text can be preserved for hundreds of years. However, paper is not without limitations. Paper cannot be readily updated with new images or text sequences, nor does it remain lightweight when dealing with large quantities of information (for example, books). Nevertheless, although laptop computers have enabled people to carry around literally thousands of documents and images in a portable way, they still have not replaced ink on paper.

Imagine a thin film that possesses the look and feel of paper, but whose text and images could be readily changed with the press of a button. Imagine downloading an entire book or newspaper from the web onto this thin medium, rolling it up, and taking it to work with you. The technology to make this and similar concepts possible is currently being developed. There are several different approaches to creating what has become known as electronic ink or electronic paper.