Electronic journals, scholarly communication and libraries

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Abstract

The recent surge in scientific electronic journals began when libraries began having access to the WWW in the mid-1990s. The shift from paper to digital has affected the traditional alignment and role of the primary "stakeholders" — mainly authors, publishers, universities and libraries. The author offers a brief review of the history of the scholarly journal followed by the evolution of e-journals in during the past two decades. The article then focuses on the implications that these have had on traditional library processes and services such as selection, acquisitions, cataloguing, storage, preservation and user services. In the conclusion the author speculates on the long term effect of Web-based publishing on the format of the traditional scholarly journal as it has existed for over 300 years.

1 Introduction

It has now been ten years since libraries have had access to Internet, and some five years since the World Wide Web became generally accessible to them and, by extension, to their users. These two anniversaries offer a suitable moment to reflect on the impact of the combined computing and telecommunications technologies on scientific communication as it is manifested in the scholarly journal. This article attempts to provide a brief history of the e-journal itself, a discussion of its implications on the major parties involved —authors, publishers, libraries and their readers (many of whom may be authors as well)— and projections as to the future of the scholarly journal in the digital environment.

First, though, we must begin with a brief review of the scholarly journal itself —a medium that has proved to be extraordinarily robust over the past 350 years. A journal is a collection of articles normally bundled with additional material, in a unified presentation and adhering to a publishing schedule that ensures the production and timely distribution of the information.

Journals share with other serial publications the defining attributes of:

- issued successively in separate parts
- generally identified by chronological or numerical designations
- with no predetermined termination date.

2 Scholarly journals

The term "scholarly" applies to both the nature of the content and the type of authors. Scholarly journals contain a high proportion of articles based on original scholarship or research, whose contents are submitted by the authors, rather than being predetermined by the editor. Scholarly authors differ from their journalist counterparts in that they do not seek economic remuneration for their work, but rather recognition in their field. Indeed, they generally receive no payment for their work and, in some cases, must pay a fee for having it published. In contrast to these, professional journalists work for a salary or fee and, in many cases, receive instructions as to what topics to write about and what focus to provide.

Since their first appearance in the middle of the 17th century,[1] journals served as the principal medium for one-to-many communication among scientists and scholars.

Journals were originally published by learned societies. In fact, the tightly knit collaboration among scientists and learned societies was given the name "Circle of Gifts", whereby authors contributed their works for publication in order to disseminate their ideas, and the scholarly societies compiled journals for distribution to scholars who then responded with contributions of their own.

Commercial publishers are now responsible for a large number of scholarly journals, having gained prominence especially since the middle of the 20th century. The years following the second World War —with the post/war industrial boom in Europe and Japan together with Cold War-driven scientific developments in the US and the USSR— saw a growing demand for research in a number of fields and loosened up government purse strings. New disciplines were carved out of the existing knowledge schema and technological advances permitted scientists to branch into new fields. At the same time, pressure exerted on the scholars by their own institutions forced them to produce more published works under the well known mantra of "Publish or Perish", resulting in ever more articles seeking publishers. For instance, the American Institute of Physics has recorded a 100% increase in the number of articles submitted to it in the past 20 years (Langer 2000). The existing publishing entities in the post war period —mainly societies and universities— were unable to pick up the overflow caused by both user-based and author-based demand for new titles, and so commercial publishers stepped in to fill the void.

3 Evolution of e-journals

Although e-journals have only been available commercially on a large scale since the mid-1990s, the possibility of publishing journals electronically had been discussed in the literature for several decades. However, the lack of standards and of cost-effective delivery and storage mechanisms initially kept them in the realm of a futuristic "wish list". Adonis, one of the first e-journal experiences, appeared in pilot form at the end of the 1980s and was

finally launched as a commercial product in 1991
<http://www.adonis.nl/index.htm>. This service provided page images of
journals from major scientific publishers which were distributed to
subscribers on CD-ROM. With the extension of Internet —originally among
the US scientific community and then beginning in the early 1990s to
cultural and educational institutions— the possibility of both timely mass
distribution and direct feedback between authors and their reader
communities opened the door to numerous Ascii-based e-journals. The
number of new titles increased modestly during the early 1990s, with most
journals being the result of voluntary efforts and made available free-of-
charge.

The cosmic shift occurred in the mid-1990s when the tremendous potential
of the WWW became apparent.[2] Up until that time, publishers were stymied
by a series of obstacles such as:

- Ascii text could not convey the visual image associated with a
  publication (logotype, design, layout, graphics, etc.)

- proprietary formats used for creating a document could not be read
  by the user without appropriate software

- authors were not interested in preparing original material for a title
  that had no following, no recognition and no known impact factor,

- advertisers —who play a very important role in financing the
  production of journals in fields such as medicine— were not prepared
  to finance a publication without knowing the impact of their publicity
  on readers.

With the Web, publishers could post their material for users to access using
standard Web browsers, rather than their having to load specialised
software. With these improvements, the main user communities -consisting
of both libraries and scholars- were willing to give Web-based e-journals a
chance: as prestigious publishers began producing electronic versions of
their traditional print journals, libraries gingerly began subscribing to them.
Thus the resistance of both authors and advertisers began to break down,
although in the latter case the motive was based on the advertisers'
realisation that as readership increased, they too had to jump on the WWW
bandwagon, even though the impact of web-based publicity still remains
largely unknown.

3.1 Conflicting interests

Although the above summary may suggest a close, collaborative
atmosphere, in fact skirmishes, threatening to escalate into larger battles,
were breaking out among the traditional partners in scholarly
communication: authors, publishers, libraries and universities.

Authors: In some fields authors realised that they could communicate just
as effectively with their community of readers and in a much more timely
fashion, and so began "publishing" their research results directly online,
completely bypassing the established publishing channels. A prime
example of this is the Los Alamos National Laboratory Preprints Archive
<http://arxiv.org>.

Begun in 1991 by Paul Ginsparg, the archive makes available the papers of

scientists in working in different specialised areas of physics. In checking under "New" postings, the user can find papers made available just hours earlier —a striking improvement on the natural time delay for papers going through the standard editorial process. The early success of the Preprints Archive sent a shudder of fear through commercial physics publishers, all the more vulnerable to attack because physics journals are the most costly in the world —on the average $1.880/year per title based on the 2000 annual survey published in Library Journal.

Undoubtedly, subscribing institutions might find it difficult to justify paying such high prices once they realised that the same papers were made available free of charge on the Web, as well as much more quickly than the print versions.

In all fairness, however, one must recognise that the Preprint Archive is not "free". Mr. Ginsparg created it while under salary from the laboratory in Los Alamos, and it has benefited from governmental grants. If production and maintenance costs had to be recovered by the host institution, users would undoubtedly be charged a fee for the works that are now freely available.

One might also add that the outsider will not find the interface particularly friendly, though this presumably matters less to the physics researcher more intent on content than on form. But it is a reminder that developing and maintaining easy-to-use, attractive and potent functionality come at a cost that someone along the publishing chain must bear.

Publishers: Although they have come under attack from different sectors, one must recognise the unquestionable contribution of publishers through functions such as filtering of authors and works, compiling and correcting texts, adding features to facilitate use, incorporating complementary materials, adhering to timetables, distributing the finished product through established channels, etc.

Libraries: In addition to the rising contention between authors and publishers, libraries have also voiced their opposition to the continuously increasing prices and the troubling trend of industry mergers, leaving ever more titles in the hands of a few publishing giants. Three notable initiatives with key participation by university libraries have attempted to support small publishing efforts that break with the giants' propensity to set prices according to what the market can bear, rather than in direct relation to costs:

- Highwire Press (Stanford University) <http://highwire.stanford.edu>
- Project Muse (Johns Hopkins University) <http://muse.jhu.edu>
- SPARC (Association of Research Libraries) <http://www.arl.org/sparc>

Universities: Universities themselves have also joined the fray, complaining that they already pay the salaries of a high proportion of published scholars whose work is then given away to commercial publishers, only to be purchased again by the universities' own libraries at exorbitant costs. They too are actively seeking ways to circumvent the publishers, as are certain author groups.

What will the playing field look like once all the dust has settled? Two things are certain: 1) authors will continue to need the means for disseminating their ideas to their colleagues and 2) there will be increasing reliance on digital means to make this possible. What is not known is which of the current players will still be present and which ones will have been carried off

the field. Also to be determined: what will be the nature and format of scholarly information interchange in the future?

For discussion of the e-journal market, see Gallart (1999-2) and Baiget (2000).

4 E-journals in the library

Libraries have now had several years to adjust to the challenges of e-journals in their collections. In this section we will review the implications of e-journals on the major areas of document handling: selection, acquisitions, cataloguing, storage, preservation, and use.

4.1 Selection

The selection of print-based material is normally done by librarians or subject specialists reviewing the literature and reference sources and is based on a series of criteria, not the least of which is professional judgement. Standard selection criteria for serials in general include:

- level of demand by users (gauged by requests for purchase, ILL or document supply)

- suitability of title to the needs of the institution (eg., research or teaching)

- impact factors based on analysis of citation indexes, etc.

- reputation of publisher
- price

Some of these factors are not so appropriate for selecting e-journals: for instance, many "born digital" e-journals —those with no established print version— are little known, not covered by standard abstracting/indexing or citation-ranking services; inter-library loan is frequently prohibited by license conditions; and pricing is seldom available in a clear-cut manner. On the other hand, new factors must now be taken into account, such as:

- format of files
- types and quality of delivery
- price (based on factors that vary from that of print: potential users, simultaneous users, bundled with other titles, etc.)

- conditions of use (contractual restrictions)

While the librarian or subject specialist may be able to make decisions regarding the appropriateness of the content of new titles, it is highly likely that other aspects —especially legal and technical— will have to be considered with the input of other specialists.

Similarly, the question of pricing becomes more complex. Whereas print journals for the most part had fixed prices —with slight variations for categories such as institutional/individual; member/non-member, etc.—, e-journal pricing is frequently based on other factors: number of simultaneous users, number of overall users, whether the print version is also subscribed

to, the number of subscriptions in print, etc. The price issue is further complicated by the fact that many publishers bundle their products, making it even more difficult to determine the price of a single title.

Libraries outside of North America also complain that existing pricing models are based on US-level usage, which is not necessarily appropriate elsewhere. A recent declaration by the Consorci de Biblioteques Universitàries de Catalunya (CBUC), entitled *Why some libraries and consortia are paying too much for e-information* <http://www.cbuc.es/5digital/55docs.htm>, summarises several common grievances such as:

- discrepancies in the calculation of the size of full time equivalent (FTE) student populations

- differences in the concept of "campus"

- differences in the method of teaching with more reliance on course notes than on external bibliography

- differences in the social role of universities in certain countries, in which high student enrolment does not necessarily reflect the level of class attendance

- different levels of use due to the overwhelming preponderance of English-language e-journals

4.2 Acquisitions

The main difference between the acquisition of printed and digital journals is that the former are purchased outright, whereas e-journals are acquired under licenses for using the material over a specified period of time and under stipulated conditions. The negotiation of the license agreement lengthens the purchase turn-around time, especially as different specialists must enter into the process (subject specialists, librarians, legal advisors, systems technicians, etc.). The trend towards consortia-based purchasing further slows down the acquisitions procedure.[3]

With print titles, once a subscription has been established, the library turns its attention to controlling the arrival of individual issues and claiming any that are late or missing. However, for electronic journals housed in the supplier's server, there is no simple way of knowing if an issue has been *released*. It should be stressed that with Web-based subscriptions nothing is *received*[4]: issues are only accessed when *retrieved* by the user. The only controls that are feasible —though not necessarily easy— are to assure that 1) the URL remains valid and active; 2) new information is being added according to the schedule announced by the publisher —e.g., new articles every month, weekly updates, etc.; and 3) the published material remains available for a sufficiently extended period. Although the result is a major reduction of previous check-in routines, these three recommended steps are complicated and there is as yet no standardised and automated way for them to be carried out.

4.3 Cataloguing

Many libraries are still pondering the appropriate way to catalogue

electronic journals. The fact that many current titles are electronic versions of print titles has made it easier to incorporate these into the library's catalogue. This is done simply by adding a note to the existing cataloguing record informing of the existence of the digital copy and, if possible, by adding the hyperlink to permit direct access to the electronic copy. Although not a purely orthodox interpretation of the rules, it is an easy way around a sticky problem, similar to the way in which analogue reproductions have frequently been noted on the cataloguing record of the original in the past. The problem, of course, is that where a facsimile on microfilm is identical in content and format to the original, the electronic version of a traditional journal is normally quite different from the original. One can assume that the differences will only increase as the digital version incorporates elements which the print medium cannot accommodate: sound, moving images, interactive functionality, etc. It will only be a matter of time before the electronic version will require its own full cataloguing record to allow for a proper description of its unique properties.[5]

While dual versions —print and electronic— are frequently described on the same cataloguing record, how are digital-only journals handled?. The cataloguing of electronic journals challenges existing rules and procedures, since many of the basic elements of print journals are frequently missing, such as title pages, a fixed format, etc. There is little uniformity in the presentation of e-journals. For instance,

- some titles offer various options for viewing and printing the same text; for example ASCII, HTML, PDF, PostScript, etc.

- some journals publish articles as they are received, with the journal "issue" being compiled subsequently.

- some publishers deposit published articles into a database, rather than maintaining them in discrete back issues.

These changes are so fundamental that the traditional definition of what is a serial is being reconsidered to distinguish between those that are issued in separate numbers (called "successively issued"), and those that are fed into a database ("integrating"). (Estivill; Gascon, 1999; Hirons, 1999)

Most libraries concur that certain journals deserve full cataloguing in order to be able to give systematic and coherent access to them, integrated into the rest of the library's collection. While libraries may differ on exactly which titles warrant cataloguing, the typical selection includes 1) those that are subscribed to; 2) those that are produced by the library or the institution it belongs to; and 3) those that the library has an obligation to make available to the public (e.g., legal deposit material).

Other options chosen by some libraries are to list e-journals on the web page or to make them accessible in a database separate from the OPAC. In their recent article on how libraries handle free web resources, Estivill and Abadal discuss the present trends (Estivill; Abadal, 2000).

Given libraries' constant complaint about the high cost of serial publications, it is quite ironic that many free titles from major reputable entities are not being catalogued. While libraries cannot catalogue all free resources on the web, there are many out there that, were they issued on paper, would in fact be catalogued. But somehow, by virtue of being electronic, they are being bypassed. (Fosmire; Young, 2000).

4.4 Storage & preservation

Storing e-journals and the related issue of long-term preservation are topics currently under intense scrutiny. While some e-journals are in fact housed in the local institution, the overwhelming majority of titles are now being accessed via remote servers.

Of course, some of the earliest experiences with e-journals used CD-ROMs for delivery, access and storage, such as *Adonis* <http://www.adonis.nl/index.htm> and *Ovid's Core Medical Collection* <http://www.ovid.com/products/journals/cbc.cfm>. Some publishers of online journals also provide CD-ROMs with the full year's contents, as a security copy. And numerous projects —such as *Elsevier's Tulip Project* (Lynch, 1995) and the EU-funded *Decomate project* <http://www.cordis.lu/libraries/en/projects/decomate.html>— have explored models for local storage and access. In fact, the Decomate system is used by the Universitat Autònoma de Barcelona for providing access to journal literature stored in local servers <http://decomate.uab.es>.

Although systems for locally-stored information give the library greater control over the information and its accessibility, it does so at a high cost to the institution in terms of development, maintenance and storage.

As Internet connections have become more powerful and dependable, the current model of remote access has come to be accepted as the standard model for distribution and access of e-journal contents. As such, the library never physically obtains the contents, which remain at the supplier's site for direct access by the user. This has profound implications for long term preservation, as well as for usage. A library's paper copy of a journal remains in its possession regardless of whether the subscription has been cancelled or if the title is no longer being published. The shift from local to supplier-based storage removes the assurance of permanent access. What will happen to the contents of the journals —licensed rather than purchased— if the library decides to cancel the subscription, if the publisher drops the title or if the publisher ceases to exist? Publishers are in no position to take on the challenge of permanent storage and so models are being sought. Yale University's library and Elsevier Science recently announced a project for developing a digital archive for the 1,100 journals published electronically by Elsevier Science <http://www.elsevier.nl/inca/esav/shownews.htt? item=WN/nt00002036&mode=basic>.

OCLC's Electronic Collections Online (ECO) service <http://www.oclc.org/oclc/eco/archive.htm> guarantees libraries permanent access to contents that had been acquired, as well as the future migration of these contents to new platforms, formats, etc. It does this by requiring that the publisher deposit the collections with OCLC and charging libraries a separate maintenance fee apart from the subscription which must be paid regardless of whether the title is still alive or being subscribed to. Of course, as a library consortium, OCLC is in a better position to commit to long-term storage since its members decide on the organisation's goals and strategy based on their own interests and needs. This is quite different from most other service providers who are market- and profit-driven.

Assuring that users have access to the contents is not the only issue. Of greater concern is how to guarantee the preservation and usability of the information, threatened by factors that are both inherent in the storage media, as well as external to it, such as technological advances. Generational changes leave documents created within a certain

technological environment —software, hardware, operating system-unreadable as the technology evolves. A document left behind —for instance an article prepared using the program WordStar and stored on a 5 1/2 inch diskette in 1988— is considered an "orphan" if subsequent technological changes have obliterated the components necessary for it to be read. The suggested measures for ensuring permanent access to digital content include *refreshing* data by passing it from one support to another (to avoid degeneration of the physical medium); continual *migration* of data from one platform to another in order to keep up with both technological changes and software evolution, and prevent it being "orphaned"; *emulation*, by which systems of the future will be able to interpret data created in the past, by replicating older platforms in order to preserve the "look and feel" of original documents; and *computer museums* in which entire systems will be maintained in order to read documents retained in obsolete formats. (Keefer, 1999)

Bearing in mind the speed at which systems change —calculated at 3 years for hardware and 18 months for software— it is obvious that much serious attention need be given to this problem in order to assure that today's e-journals will be readable long into the future —hopefully for as long as 350 years— in the same way that readers can still consult the earliest journals from the 17th century.

Obviously long-term storage and preservation of digital materials go beyond e-journals and affect all digitally created material. The purely technical questions are frequently surpassed in complexity by other issues, such as metadata, data integrity and authenticity, copyright, standards, etc., all of which are beyond the reach of this article. There are a number of very interesting international initiatives exploring all aspects of the issue, including the CEDARS project in the United Kingdom <http://www.leeds.ac.uk/cedars> and the EU-funded NEDLIB project <http://www.kb.nl/coop/nedlib>.

4.5 Usage

The subject of use and usability spans several issues, from the types of usage permitted by the license agreement to how libraries make e-journals available to their users and how the users react to the transition from print to Web. Although in-depth contractual issues go beyond the scope of this article, it is worthwhile here to summarise some of the terms of agreements that cover usage.[6] Most licenses will define both "user" and "use". Libraries should take great care in reviewing these terms to make sure that the license agreement does not prohibit them carrying out a basic service to their authorised users.

Users: A typical license for a university library may limit access, so as to include only current students and full time faculty and staff. Where would this leave other user groups that the library may have a formal —even legal— obligation to serve, such as part time professors, physicians at teaching hospitals affiliated with the university, visiting professors, or students from other local universities who have access to the library's collection through reciprocal agreements?

Use: The types of use that should be addressed are: downloading, printing, e-mail transmission, interlibrary loan, etc. While some publishers are hesitant to give too much freedom for fear of losing both control and income, libraries must protect their rights and abilities to serve their users. The complexity of contract negotiations and the fact that everyone is

treading on unfamiliar terrain are factors that have contributed to the trend toward consortia licensing: libraries are in a stronger negotiating position and publishers are comforted by the promise of an assured income.

Once libraries have subscribed to e-journals they must introduce the service to their users. A valuable resource is the American Library Association's 1997 *Guidelines for the introduction of electronic information resources to users* <http://www.ala.org/rusa/stnd_electron.html>.

Users' reactions may vary for a number of reasons: age, discipline, need for information, timeliness of information needed, etc. (Keefer, 1997; Marcos, 2000). Of course a fundamental requirement is that a proper infrastructure exists, including internet connections and the capacity of local PCs for viewing, downloading and printing. Users who frequently find themselves frustrated when trying to access and download information will not easily be persuaded to switch from a paper copy to the digital version. Although scientists have been using online information for many years, users from the humanities and social sciences may be more reticent: there may not be sufficient key journals available online in their fields to warrant changing usage habits (a threshold referred to as *critical mass*) and, in fact, their usage of journals may be less important than that of books or grey literature.

In order for many traditional journal users to feel at home in the new environment, the e-journals must replicate the "look and feel" of, and enable the type of use given to, paper copies. Think of how scholars typically approach a journal: the title and contents pages are perused. (In many cases several issues of the same title are reviewed at the same time and in the same way.) They then might go directly to an article that catches their eye, or else leaf through the issue scanning titles and summary paragraphs. Once an article of interest is located, their eyes glance over it, first reading the summary, the authors' credentials, the section headers, the bibliography, etc. If at this level of analysis the article is deemed to be of interest, the user begins to read it or perhaps photocopy it for future reading.

Publishers of e-journals have learned that they must make it easy for the users to perform this bibliographic "ritual" and so their online journals must mimic the "functionality" of paper. For instance, a common approach is for the journal's home screen to give access to the current issue, as well as to other recent issues and older volumes. Once an issue is chosen, a table of contents -perhaps with abstract- allows the user to decide whether to continue forward. Flexibility of screen movement is important, in allowing the reader to proceed to the next article, return to the table of contents, go back to the journal's home page, etc.

Both HTML and PDF —the two basic formats currently used for most commercial e-journals— have adapted to readers' needs in this respect. In an HTML file the contents can be included at the beginning of the text or in a side frame, allowing the user to link directly to specific parts of the article: introduction, conclusions, bibliography, etc. Graphic material can also be identified by scrolling down the page. With PDF, although slower to load, the format of the original print document is retained, which presumably serves to comfort both traditional-minded users and the publishers themselves, who have invested heavily in developing and maintaining their journal's image. The thumbnails visible on the left hand frame of a PDF document facilitate also allow for browsing to visually identify different sections as well as graphics, charts, images, etc. In both HTML and PDF hypertext linking within the articles -for instance, from citation to bibliography- is possible. However, external linking is only possible from

HTML files. It is for this reason that some PDF-formatted e-journals include the summary, author credentials and bibliography in a separate HTML file, to allow for hyperlinking to referenced sites.

Linking between articles: As frequently occurs with technological advances, as soon as new functionality is introduced, other challenges arise. This is precisely what has happened through the proliferation of hypertext links from within journal articles. Linking is generally enabled to other articles available electronically from the same publisher. Depending on the library's subscription arrangements, the user may be able to access the full text of the linked article, or perhaps just be able to view the abstract with an option to purchase the full document itself. Some suppliers also provide access to databases -for example., *Medline* or *Biosis*- from a link within the bibliographic citation or the full text. This type of link allows the user to read the abstract available in the indexing service. However as more linking is enabled, users push for more direct access to cited works, most of which lie beyond the current publisher's server. Although technically feasible, complications arise as to the best way to establish links between articles, especially between those of different publishers, according to pre-existing arrangements of each library.

While ease of linking is very positive, the automatic procedures still have not resolved the problem of "*appropriate copy*". Now that a single journal may be available through different publishers and aggregators, and libraries enter into license agreements both individually and via consortia, it is possible that a library may have access rights to a journal through several different avenues. However, the automatic linking mechanisms from the page of an article hosted on a publisher web site still does not have the capacity to lead the user to the most efficient and cost effective site for the user's specific institution. Obviously, it is a question of utmost importance to libraries, to ensure that their users are being directed to article copies that are available —through licenses, consortia agreements, etc.— at the lowest cost possible.

One area of use that has vexed libraries is printing. The promise of a paperless society has not yet been realised. Publishers have certainly benefited from the elimination of paper, though it must be said that most are still obliged to produce dual print-electronic editions. But paper has not been eliminated by the user. Reading articles still requires a paper copy, so the cost of paper production —whether by photocopy, fax or printer— is being pushed down the line to the library or end user. The amount of printing from within libraries has dropped off in part because libraries have begun charging for printing services and partly due to the ease of downloading and/or emailing the desired text. A recent study by the Association of Research Libraries (ARL) shows that more than 80% of their member libraries now charge for printing, or plan to do so in the near future, up from less than 10% in 1992 <http://www.arl.org/spec/254sum.html>. Whoever it is that absorbs the costs of printing at the end of the line —whether the users themselves or their departments— has had to cover the additional costs within their existing budgets, very likely at the expense of other services.

As libraries make more of their services and collections available via web, a logical consequence has been that their attendance levels have declined. Professors, researchers and students alike can access the needed information from home or office. While overall this is added convenience to users has been seen as a positive result, it has also produced the phenomenon of "the hidden user". This phenomenon is being explored in the Jubilee project currently underway in the UK <http://is.unn.ac.uk/lmri/CurrentResearch/JUBILEE/jubilee2.htm>. Libraries

have devoted a great amount of effort over the past decade to aligning their services to the users' true needs. Now that users are disappearing from the library, it becomes all the more difficult to know exactly who they are, to understand their information needs, to aid in information seeking, and to evaluate whether they are obtaining appropriate results.

5 Trends toward the future

The preceding paragraphs have reviewed the origins of electronic journals and the status of their current incorporation into library collections. But in which direction are scholarly journals, as the vehicle of scholarly communication, heading?

In the first section of this article, we discussed how longstanding relationships among researchers, universities, publishers, and libraries are now being re-evaluated and may eventually be totally realigned, though it is still too early to know for certain where we will stand in the mid- to long-term future. An interesting document —*Principles for emerging systems of scholarly publishing* <http://www.arl.org/scomm/tempe.html>— was drafted by representatives of different scholarly collectives, and may shed light on which direction they, at least, hope that scholarly publication will head.

Another question arises as well, and that is whether the very format of journals is suited to the electronic medium. When prominent publishers issue articles as soon as they pass the editing process, and only later finalise the journal issue, perhaps the concept of "issue" is no longer pertinent. After all, its original purpose was to serve as a vehicle to carry communications to many readers and, as is obvious, this is no longer necessary if articles can be conveyed to the readers through a network. One might argue that the standard journal format —volumes broken into numbers, and articles identified by pages— forms the backbone of scholarly citation. How can one make reference to another work without these defining attributes? The answer is actually quite easy: through new identification systems, such as the *document object identifier* (DOI) <http://www.doi.org>. In fact, a number of the most prestigious international publishing houses have joined together in an association -Publishers International Linking Association- to work towards a unified and standardised way of providing links among their articles through their CrossRef service <http://www.crossref.org>. In just under one year, they have created a database with over 3 million articles, each identified by a DOI.

Other studies, such as PEAK (Pricing of Electronic Access to Knowledge) <http://www.lib.umich.edu/libhome/peak/overview.html>, have shown that users, when given the choice frequently choose articles from journals not subscribed to by their libraries. If scholarly articles are easily identified, generally accessible, and available immediately after preparation, some stakeholders -both suppliers and purchasers- may question the need for journals at all. In fact, this trend began in the mid-1990s as libraries cut subscriptions, choosing to rely on Current Alerting Service/Individual Article Supply (CAS-IAS) to fill the gaps.

We have now evolved to a point at which many scholarly journals are available in electronic form on the web, greatly extending the availability of these resources over time and distance. But it remains to be seen if the success of this new delivery means will ultimately fatally undermine the status of the traditional journal format, as we have come to know it over 350 years.

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Notes

[1] The first journals are acknowledged to be the French title, Journal des Sçavants, and the English title, *Philosophical Transactions*, both published for the first time in 1665.

[2] The Association of Research Libraries' *Directory of Scholarly Electronic Journals and Academic Discussion Lists, First Edition* (2000) lists almost 4.000 peer-reviewed electronic journals, up from 1,049 in 1997. <http://dsej.arl.org>. [Available: 4-26-2001].

[3] For a discussion of issues related to the selection and purchase of electronic titles, see the International Coalition of Library Consortia's *ICOLC Statement of Current Perspective and Preferred Practices for the Selection and Purchase of Electronic Information.* <http://www.library.yale.edu/consortia/statement.html>. [Available: 4-26-2001].

[4] Some journals do send e-mail notices informing of the appearance of a journal number, sometimes with the table of contents including hypertext links to the full text. However, this practice is by no means standard.

[5] A manual for cataloguing Internet resources is available free of charge on OCLC's web: *Cataloging Internet Resources: A Manual and Practical Guide*, 2nd Ed. Nancy B. Olson, Editor <http://www.purl.org/oclc/cataloging-internet>. [Available: 4-26-2001].

[6] For a more complete coverage of licensing issues, see:

- Yale University Library's Liblicense site, <http://www.library.yale.edu/~llicense/index.shtml>. [Available: 4-26-2001].
- Licensing Electronic Resources (ARL), <http://www.arl.org/scomm/licensing>. [Available: 4-26-2001].
- European Copyright User Platform (ECUP), <http://www.eblida.org/ecup>. [Available: 4-26-2001].