

From the Era of Print to the Reality of Electronic Publishing

by Wendy Warr

In 1998, Michael Bowen summarized an ICSU Press workshop on electronic publishing [1]. It is reprinted below (in this issue of *Chemistry International*) and I have been invited to give a 2023 perspective on its conclusions.* Before I address those conclusions more specifically, it is worth mentioning some electronic publishing advances of the 1990s. Carnegie Mellon University advertised an opening for an “electronic librarian” as early as 1991. Some electronic products predate the World Wide Web (e.g., arXiv preprints which were first emailed using TeX in 1991). The Digital Object Identifier (DOI) was launched in October 1997. SpringerLink, Elsevier’s ScienceDirect, and PubMed were all available in 1998. The American Chemical Society (ACS) and Chemical Abstracts Service launched ChemPort in December 1997, in collaboration with seven other publishers. ACS had reinvented its journals for the Web with Articles as Soon as Possible (ASAP), search tools to find specific articles easily, and links to databases, and to cited articles through ChemPort. The scene was clearly set for electronic publishing, and so let’s move to the eight 1998 predictions from the ICSU Press workshop.

1. *Electronic journals will become dominant (over conventional paper publishing) in the next 5–15 years*

In 1998, a British librarian reported that his university spent just 10 % of its budget on electronic items [2]. Fourteen years later, a survey found that 76 % of scholarly readings were obtained through electronic means [3]. By 2018, it was reported that virtually all STM articles were available online [4]. A 2019 article indicates that only 8 % of researchers read print articles from a print journal [5]. The ICSU Press workshop prediction was clearly correct.

2. *Peer review and methods to “brand” electronic papers will be indispensable to successful electronic publishing*

Today in 2023, the research community continues to see peer review as fundamental to scholarly communication [4]. Open access journals as well as those behind paywalls recognize peer review as a mark of quality, but alternative approaches to the traditional

peer review process are now practiced by some publishers. Journals are still proudly branded by publishers. Major journals continue to report their Journal Impact Factors, but many alternative metrics are in use. Back in 2018, Herman Spruijt of Elsevier said that we must accept that the next generation may want the “article” rather than the journal [2], but 25 years later, both authors and publishers still accept that choice of journal is important; the article is not yet fully freed from its “container.” The ICSU Press workshop conclusion is broadly justified but some recent initiatives were perhaps not foreseen.

3. *Electronic publishing may be just as expensive as, or even more expensive than paper publishing*

I am grateful to Alexander Grossmann of HTWK Leipzig for useful discussions on this topic. He published in 2021 a very useful market analysis [6] and welcomes comments on ScienceOpen [7]. (ScienceOpen is a research, networking, and discovery platform that boasts some of the recent initiatives mentioned above.) In the era of print, publishers bore the costs of authoring, submission, initial editorial checking, managing the peer review process, and, after acceptance of an article, copyediting, typesetting, printing, and dissemination of the printed journal issues. In the digital era, there are additional costs for generation of a media-independent electronic version of the text, tagging, reference linking, DOI assignment (plus a fee for Crossref), metadata generation, etc., plus costs associated with the digital infrastructure for content management, peer review, access and rights management, article hosting and long-term archiving. In addition, there are costs associated with maintenance of the IT infrastructure. Further costs would be associated with more sophisticated enhancements such as live graphics. Costs for printing and mailing of physical issues are saved, of course, but these are estimated to be less than 5 % of total costs. It is obvious that creating a digital version must be associated with substantial extra costs.

4. *Publishers have done a poor job explaining to authors and librarians how they have added value to authors’ work*

This is a contentious issue. Alexander Grossmann has summarized some of the “nonpublication” costs borne by publishers [6], but opinions vary on how publishers’ profit margins are justified in relation to these costs.

* In 1998, Wendy Warr was chair of the IUPAC Committee on Printed and Electronic Publications (CPEP was the predecessor of the current CPCDS) and Mike Bowen was Secretary. It was an advisory function of the committee to keep-up with how the landscape of electronic publishing was evolving.

5. Gathering detailed information on the searching habits of scientists when they access electronic publications will pose ethical questions for publishers

When the Committee on Publications Ethics (COPE) was founded in 1997 it was not known that by 2023 our mobile phones would reveal our precise whereabouts and search engines would target us with advertisements based on the data about us that they collect. Artificial Intelligence (AI) is by no means new, but as used in 2023 it raises a host of new ethical issues. The 1998 workshop did not anticipate privacy regulations such as GDPR. There is also no mention of the intellectual property implications of one's search terms being recorded.

6. The infrastructure that is in place in advanced countries will continue to need maintenance. In some countries large capital investments are essential if citizens are to benefit from services made available via the Internet

This is still true. Open access (OA) is also a big issue for researchers in many disadvantaged countries and institutions. The big OA movement [8-10] began after 1998. The impacts of AI, social media, mobile technologies, and blockchain on electronic publishing were unforeseen in 1998.

7. There is an urgent need to maintain archives of electronic publications, but who should be the keepers of the archives?

Fear of information loss has greatly decreased over the years, though cyberattacks are a new challenge not really considered in the 1990s. Nowadays, IT advances have addressed the issue of hardware failure, mirror sites are maintained, and journal archives are commonly preserved by Controlled LOCKSS (CLOCKSS) which employs an approach to archiving (Lots of Copies Keep Stuff Safe) that was initiated by Stanford University librarians in 1999.

8. Electronic publishing has reached an exciting stage. The next few years will bring practical knowledge about how current electronic products are used and how much people are prepared to pay

We now have the reality beyond the excitement, but it seems appropriate to reproduce Dick Kaser's comments reported in my 1998 article [2]: "Think of the potential. In e-Utopia, full text will be set loose, links and citations encouraged, browsing permitted, spontaneous

purchases supported, and reuse endorsed. The challenge is to maintain the revenue stream so that we can continue "publishing", to manage in an orderly fashion the movement from print to electronic and to expand readership of the journal." Two issues we now have to address are FAIRness [11] in publication (findability, accessibility, interoperability, and reusability) and how to distribute the costs of OA publishing among the stakeholders as "Plan S" demands widespread open access [12]. 

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Since January 1992, Wendy Warr <wendy@warr.com> from Wendy Warr & Associates has been supplying business and competitive intelligence services to a broad spectrum of clients in the United States, Europe, Australia, the Middle East, and Asia. (source <https://www.warr.com/>)

ICSU Press Workshop on Electronic Publishing in Science, Keble College, Oxford, UK, 30 March—2 April 1998—some observations

This three-day conference, officially titled 'Economics, Real Costs and Benefits of Electronic Publishing in Science—A Technical Study,' was planned to follow up on the Joint ICSU Press/UNESCO Conference on Electronic Publishing in Science that was held in Paris, France, during February 1996 (*Chemistry International* 1996, Vol. 18, pp. 165–169). The Oxford workshop attracted around 50 participants, about half of whom had been present at the Paris conference. Moreover, essentially all the organizations represented in Paris were again represented in Oxford. This useful continuity, together with the smaller size of the Oxford Workshop (50 vs. 150 in Paris) made for an unusually stimulating and interactive three days in the comfortable modern facilities at Keble College's ARCO Building.

Sir Roger Elliott (Chairman of ICSU Press and a former chief executive of Oxford University Press) set the stage for the meeting by challenging the attendees to describe an electronic publishing system for science that would have a number of desirable characteristics: (1) Gives authors' works visibility, with adequate quality control; (2) Can be accessed easily; (3) Preferably costs less than the current system; and (4) Provides adequate incentive and financial return to those (such as publishers) who 'add value.'

Fred Spilhaus, Executive Director of the American Geophysical Union, predicted that the present scientific publishing system was nonlinear, and that substantial, unpredictable changes would inevitably take place. He observed that the boundaries between 'chit-chat' and formal publication were becoming distinctly blurred in the electronic arena and that electronic enhancements will become both more complex and more costly. Anent Parekh, Professor of Physiology at Oxford University, expressed the enthusiastic view of many young academics, that electronic publishing offers users many advantages and relatively few disadvantages. Among the features Parekh found most helpful were currency, ease of access (including access from one's home computer) and the ability to look at and download additional data not usually printed in the paper journal. Donald King (King Research, Ann Arbor, Michigan), Terry Scott (until recently with the American Institute of Physics), and Owen Hanson and Robert O'Shea (Lindsay Ross International, Abingdon, UK), all pointed out that a comparison between the costs of conventional (paper) pub-

lishing and costs of electronic publishing must be conducted with great care. King stressed the need for a careful definition of terms, while the others emphasized that many costs (for example, those for peer review) do not disappear in the electronic publishing system and that there is no reason to believe, as some have suggested, that electronic publication is inherently less costly than paper publishing. Indeed, many enhancements in the electronic system—for example hot-linking and graphics display improvements—actually increase cost, they stressed. William Mischo (University of Illinois, Champaign-Urbana) described some of the technical difficulties inherent in archiving electronic journals, including the still substantial cost of archival storage, despite large decreases in storage device costs in recent years. He also raised the disturbing issue of the questionable readability in future years of outmoded storage vehicles such as 5¼-inch floppy disks and current-technology CD-ROMs. Bernard Donovan (Association of Learned and Professional Society Publishers, UK) had surveyed a number of publishers and concluded that substantial costs were incurred by scientific publishers in their conduct of peer review. He estimated such costs as typically between 100–300 GBP per accepted paper. Fytton Rowland (University of Loughborough, UK) challenged the assertion that users would find electronic publications so accessible and easy to use as to render librarians redundant. Indeed, he contended that the librarian and information intermediary functions will continue to be needed as never before, to cope with the variety and rather chaotic arrangement of materials on the Internet. Gary VandenBos and Susan Knapp (American Psychological Association) described a new all-electronic journal published by the APA; this journal has 2500 individual users, currently accessing it for no charge. However, there had been, and continued to be some resistance from potential authors and more resistance than expected from reviewers. Knapp also described an innovative pricing arrangement (still experimental) under which APA members with a print subscription to at least one APA journal could purchase in addition, at a very attractive price, access to a full-text database of all APA journals and/or to the Psychological Abstracts database. Knud Thomsen, a participant in a working group of scientists at fusion energy facilities scattered over many parts of the world, described the characteristics and problems of their system for mutual communication over the Internet. Many of these problems—for example, use of incompatible software versions and different e-mail systems—are extremely

germane to electronic publishing on 'the Net.' Abel Packer (Pan American Health Organization, Sao Paulo, Brazil) and Virginia Cano (Queen Margaret College, Edinburgh, UK) explained why scientists in developing countries are attracted to the possibilities of publishing electronically. Fundamentally, this attraction is related to the relatively low barriers inherent in operating a web site, provided that the web host possesses the ability to offer material in English, now the scientific 'lingua franca' of choice world-wide. Visibility can quickly be obtained electronically, but progress is still too often hampered in many countries by poor infrastructure (telephone system) and by a lack of computer availability or literacy. The same points were made by Attlio Bustos and Graciela Munoz (Catholic University of Valparaiso, Chile), who have developed the *Electronic Journal of Biotechnology* in Chile. Vitaly Nechitailenko (National Geophysical Committee, Russian Academy of Sciences) described some of the special problems posed by offering on-line a journal having extensive mathematics, where HTML representation is in some respects deficient.

Summarizing the status of a fast-moving and technologically sophisticated field such as electronic publishing is no mean feat, but workshop attendees attempted it with the assistance of David Pullinger of Macmillan Publishing and of the chairs of three break-out groups to which all attendees had been assigned during the last sessions of the workshop.

The following principal conclusions were among those generally agreed to by participants:

- 1 Electronic journals will become dominant (over conventional paper publishing) in the next 5–15 years.
- 2 Peer review and methods to 'brand' (indicate the quality of) electronic papers will be indispensable to successful electronic publishing.
- 3 Despite widespread expectations that electronic publishing will be less expensive than paper publishing, every evidence to date indicates that it may be just as expensive or even more expensive, de-

pending on the sophistication and cost of electronic enhancements such as live graphics and hot links.

- 4 Publishers generally have done a poor job in the past explaining to authors and librarians how they have added value to authors' work. (This explains in good part why there exists the wrong expectation described in Conclusion no. 3, above.)
- 5 The ability to gather detailed information on the searching habits of scientists when they access electronic publications will pose ethical questions for publishers. Users should be informed about any information gathering practices used by electronic publishers.
- 6 The infrastructure—telephone systems, networks, etc.—that is in place in advanced countries will continue to need maintenance; in developing countries, and even in some developed countries, large capital investments are essential if the citizens in those countries are to share in the benefits of electronic publishing and other services made available via the Internet. Inevitably, government agencies will be looked at as the source of these investments.
- 7 Everyone agreed that there is an urgent need to maintain archives of electronic publications. But who should be the keepers of the archives? Conferencees had little confidence in the willingness or ability of national governments or of commercial publishers to undertake this vital task. Not-for-profit scientific societies—presumably having an obligation to assure access to the record of their various disciplines—were seen as the most logical candidates for this Herculean task.
- 8 Electronic publishing has reached an exciting stage. There are now a sufficient number of 'products' in the marketplace that the next few years will bring a great deal of practical knowledge about how technical users react to these products, how they use them and—the \$64 000 question—how much they are prepared to pay.

Michael Bowen, 4 August 1998

About this article first printed in Chem. Int. 1998, 20(5), 140-141:

In 1998 Michael Bowen was working for the American Chemical Society and was secretary of the IUPAC committee on Printed and Electronic Publications (CPEP); In print, this report is dated 4 August 1998; it is an error and instead it should read 8 April as noted 4/8/98 in the original doc file. Considering the production workflow at

that time, it is likely that the American date format was simply not properly converted by the (English) production editor at Blackwell.

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