

E-Serials Cataloging: Access to Continuing and Integrating Resources via the Catalog and the Web

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The published literature specific to electronic serials cataloging over the decade of the 1990s and the work of CONSER, MARBI, the ALCTS Committee to Study Serials Cataloging, and others were reviewed to identify issues and developments. The proliferation and the changing nature of e-serials were challenges to catalogers throughout the period examined. Policies and procedures were offered by CONSER and its members. Multiple versions, revising AACR2, metadata, and aggregator databases were among the issues actively discussed at the close of the decade.

KEYWORDS. Electronic serials, serials cataloging

STANDARDS

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field in a consortium setting is discussed. Future growth of e-serials at Kansas City Public Library is also mentioned.

KEYWORDS. Electronic serials, continuing resources, 856 field, Web-based access, subject Web links, consortium, Kansas City Public Library

BOOKS, SERIALS, AND THE FUTURE

- E-Books: Should We Be Afraid? 281
Susan Cleyle

The e-book revolution is finally here. E-books are the last area of a library to leave the paper frontier and venture into the virtual world. Libraries are staring down a future filled with non-paper resources and the role of safe-keeping the archival paper resources of the past. Is this something that should be feared by libraries or embraced like the world embraced the horseless carriage a century ago? This paper will review the current e-book players and the state of the technology with a look at how libraries can be involved in this revolution and in so doing ensure their place in the e-book future.

KEYWORDS. E-books, electronic access, Gemstar, NetLibrary, library future

- E Is for Everything: The Extra-Ordinary, Evolutionary [E-]Journal 293
Gerry McKiernan

An ever-increasing number of e-journals are transcending the limitations of the paper medium by incorporating and integrating a wide variety of innovative electronic features and content. In this article, we examine the current evolution of the scholarly journal and review the emergence of functionalities that expand and extend the conventional electronic journal. We further explore additional e-journal enhancements and consider new forms and formats of scholarly communication likely to arise in the not-so-distant future.

KEYWORDS. Electronic journal, innovation, customization, multimedia, object-oriented

E Is for Everything: The Extra-Ordinary, Evolutionary [E-]Journal

Gerry McKiernan

SUMMARY. An ever-increasing number of e-journals are transcending the limitations of the paper medium by incorporating and integrating a wide variety of innovative electronic features and content. In this article, we examine the current evolution of the scholarly journal and review the emergence of functionalities that expand and extend the conventional electronic journal. We further explore additional e-journal enhancements and consider new forms and formats of scholarly communication likely to arise in the not-so-distant future. [*Article copies available for a fee from The Haworth Document Delivery Service: 1-800-HAWORTH. E-mail address: <getinfo@haworthpressinc.com> Website: <http://www.HaworthPress.com>* © 2002 by The Haworth Press, Inc. All rights reserved.]

KEYWORDS. Electronic journal, innovation, customization, multimedia, object-oriented

While e-journals are still primarily text, in a digital environment, text can be connected with other text, media, services, and systems, from other text, media, services and systems, with other . . .

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EDITION

Electronic Manuscript Submission, Refereeing, and Review

The conventional means by which a manuscript is submitted for consideration and review is for an author to provide a journal editor with the requisite number of copies of the manuscript in paper. Authors are also usually required to submit an electronic copy of the manuscript prepared using standard word-processing software (e.g., Microsoft Word). Typically, these are sent to a journal's editorial office using the national and international postal system or a commercial package delivery service (e.g., FedEx). Upon receipt, the journal editor will read a paper copy of the manuscript, assess its relevance to the journal's scope and its overall quality, and if deemed appropriate for further consideration, distribute copies to members of the journal's editorial board or external reviewers to evaluate the manuscript and its suitability for potential publication. As with the original submission, a copy of the manuscript would be sent by the same method used by the manuscript's author: by post or by a commercial delivery service. Following a review period—typically lasting several weeks—reviewers will return the manuscript with their evaluations and recommendations for publication.¹ After all the reviews are returned and a final assessment has been made by the journal's editor, the author will be notified—often by post—of the manuscript's acceptance or rejection.

If accepted, the author may be required to edit the manuscript to satisfy reviewer and editor recommendations. The author will then resubmit the manuscript with the appropriate changes to the journal's editorial office, once again using conventional distribution services. After final review, the edited manuscript will be scheduled for publication, and in time, published in a journal issue. Overall, such processes will require several months to more than a year before the manuscript is eventually published as an article in the respected journal. Such publication delay can be attributed to several factors, including the inherent limitations of conventional delivery systems (e.g., postal services), the duration of the review period, and the page limits of conventional paper journals.

Recognizing the need to expedite the publication of candidate manuscripts, journal publishers are utilizing the inherent potential of the Internet and the World Wide Web to facilitate the submission, review, and publication of relevant manuscripts. The American Chemical Society (ACS) is among an increasing number of scientific publishers expediting manuscript submission. For example, authors who wish to contribute to *Biochemistry* (pubs.acs.org/journals/bichaw/), the ACS journal devoted to the understanding of biological phenomena in terms of molecular structure and function, are

provided with various Web-based options that permit them to submit select types of manuscripts electronically.² Some ACS journals not only offer electronic submission, but provide Web-based manuscript review as well.³ Some journals provide a Web-based report form for reviewer ratings and comments (e.g., *British Journal of Surgery*).⁴

BioMed Central (www.biomedcentral.com/), a collection of peer-reviewed biomedical e-journals, offers authors a variety of formats for submitting manuscripts (e.g., Microsoft Word, PDF, RTF), figures (e.g., EPS, PNG, JPEG) and additional materials (e.g., XLS).⁵ For the electronic-only e-journal *Conservation Ecology*, authors are required to submit manuscripts by electronic mail.⁶ To expedite the review process, the Institute of Physics (IoP) offers a Web-based service that enables potential manuscript reviewers to register with its journal referee services so that candidate reviewers can be easily identified.⁷

In recognition of the need to provide “comprehensive workflow management solutions,” ScholarOneSM offers Web-based applications that enable scientific, technical, and medical publishers to expedite manuscript submission, peer review, production, and publication. Tools offered by ScholarOneSM have been used to create more than 120 journals, including those published by Blackwell Science, the IEEE (the Institute of Electrical and Electronics Engineers), the Institute of Food Technologists (IFT), the Society for Neuroscience, and the American Physiological Society.

In select cases, electronic submission and review of manuscripts has led to the accelerated publication of manuscripts, providing access to accepted papers prior to formal incorporation or publication in an electronic or print journal. Among the major journal publishers or services offering expedited article publication are the IDEAL Online Library (*IDEAL First*),⁸ Springer-Verlag (*Online First*),⁹ and Wiley InterScience (EarlyViews®).¹⁰

Virtual E-Journals

In an effort to reduce the Information Overload that readers may experience,¹¹ some publishers have created *virtual e-journals*. An excellent example of a virtual journal is the *Virtual Journal of Nanoscale Science and Technology (VJNS&T)*, a “weekly multijournal compilation of the latest research on nanoscale systems” published by the American Institute of Physics (AIP) in cooperation with the American Physical Society (APS).¹² This virtual e-journal provides an abstract for all articles in its collection as well as the full-text for most source journals. Articles in *VJNS&T* cover various facets of nanoscale science and technology (e.g., fabrication, process, structural properties, etc.) selected from e-journals published by AIP, APS, and several cooperating professional societies (e.g., Acoustical Society of America, the Optical Society

of America, and SPIE–The International Journal of Optical Engineering).¹³ Among *VJNS&T* source journals are *Applied Physics Letters*, *Physical Review B*, and *Physical Review Letters*.

Other virtual e-journals include *CV Surgery Online* (ahavj.ahajournals.org), published for the American Heart Association by Lippincott Williams & Wilkins in cooperation with HighWire Press™; *Virtual Journal of Biological Physics Research* (www.vjbio.org/), published by AIP and APS; and the *Virtual Journal of Helsinki Medical Research* (www.terkko.helsinki.fi/vjhmr/), a “monthly multijournal compilation of the latest research at the University of Helsinki,” Finland, and the *Virtual Journal* component of *Science’s STKE: Signal Transduction Knowledge Environment* (stke.sciencemag.org/), published by the American Society for the Advancement of Science (AAAS) in cooperation with participating publishers (see Figure 1).

Synoptic E-Journals

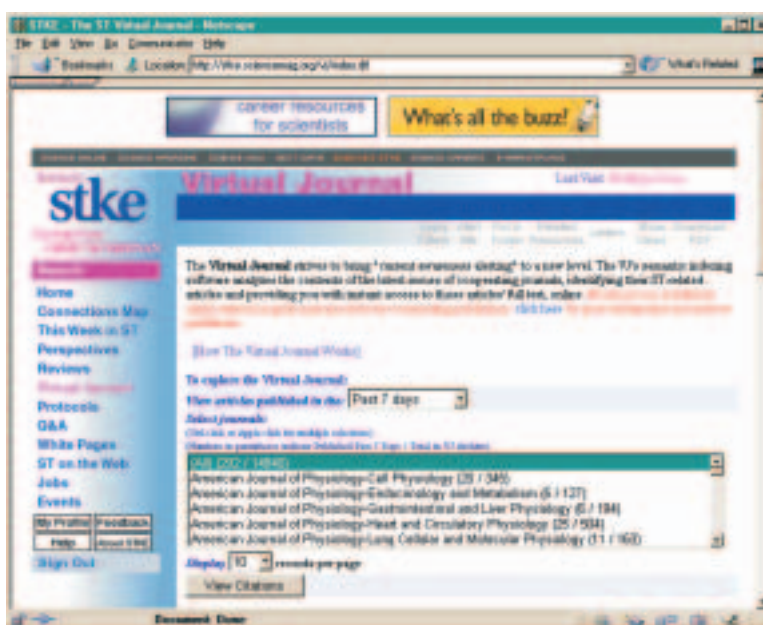
To further alleviate the burden on readers who seek to remain informed about current developments in ever-changing fields, some publishers offer electronic versions of synoptic journals. A synoptic journal may be defined as a journal that provides synopses or summaries of articles in a broad subject field (e.g., medicine) or specific disciplines within a field (e.g., cardiology). The Massachusetts Medical Society publishes several excellent examples of synoptic e-journals in the field of medicine in its *Journals Watch Online* series (www.jwatch.org/). Published with the assistance of HighWire Press™, the series provides access to synoptic journals in a variety of medical disciplines (e.g., cardiology, infectious diseases, neurology, etc.).

EGO-CENTRIC

Alerting Services

One of the most common value-added features offered by e-journals is automated notification or alerting services. Such current-awareness services typically send registered readers an e-mail message containing the table of contents of a newly published e-journal issue or the table of contents with associated abstracts, when available. With some services, a reader may have the option of receiving the full-text of articles. Such automated notification alleviates the need for a reader to continually revisit an e-journal to identify potentially relevant new content. With electronic notification, a reader can preview new content within an information system used on a routine basis for general purposes.

FIGURE 1. Home Page of Science's *STKE: Signal Transduction Knowledge Environment Virtual Journal*



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If the new content is not relevant, the reader need not revisit the journal Website, thereby reducing the time required to maintain awareness of new developments.

Representative of the range of e-journal alerting options are those offered by the Web version of *MCEER Information Service News* (mceer.buffalo.edu/infoService/enews/), the monthly newsletter of the Multidisciplinary Center for Earthquake Engineering Research (MCEER) that reviews current events and literature in earthquake hazards mitigation and related fields. For this e-publication, subscribers can:

- receive notification that a new issue has been published
- receive the titles only of the monthly news for all items
- receive full text for articles and items, and titles for the remainder
- receive full text for meetings and calls for papers, and titles for the remainder

- receive full text, citations and items of interest, and titles of the remainder, or
- receive full text for all published materials.

Readers may choose to receive the entire contents of the monthly newsletter or only news for selected topics (e.g., “Advanced Materials,” “Bridges,” “Buildings,” etc.). Content may be delivered in plain text or HTML format.

Personalized E-Journals

To reduce the Information Overload of readers, some e-journals enable readers to specify the journal titles to be read on a regular basis from a collection of available titles. For example, the Institute of Physics (www.iop.org/) allows readers to create a “Personal Main Menu” in which the reader can customize a main menu that includes only journal titles selected by the reader and not all titles subscribed to by his or her library. In addition, a reader can specify that only the table of contents for the current issue be linked and not those for the entire journal archive. In ScienceDirect®, the Elsevier Science collection of over 1,200 e-journals in the life, physical, technical, and social sciences, a reader can establish a “Personal Journal List” that focuses on his or her scientific specialty or field of interest. In addition, the service allows readers to include non-subscribed journal titles with institutionally subscribed titles, thereby providing a more comprehensive identification of potentially relevant literature.¹⁴

Through its *E-News* option (mceer.buffalo.edu/infoService/enews/), readers of the Web version of *MCEER Information Service News* can create a customized edition of the newsletter by selecting from among one or more broad topics from a predefined group (e.g., “Advanced Materials,” “Bridges,” “Buildings,” etc.). This personalized version will offer the reader relevant news in a variety of categories (e.g., “Articles,” “Call for Papers,” “Items of Interest,” etc.) for each of the selected topics (e.g., “Bridges,” “Codes,” “Insurance,” etc.) (see Figure 2).

Font, Format, and Display Control

Personalization and customization of e-journals are not limited to the selection of e-journal titles or topics. The *Internet Journal of Chemistry* (IJC) (www.ijc.com/), for example, offers a variety of options for reader configuration of its content structure, reference link style, journal title format, author name order, footnote display, and other components and content.¹⁵ While default options are available for a particular browser, platform, or hardware,

FIGURE 2. A Sample of *E-News*, a Customized Edition of the Web Version of *MCEER Information Service News*

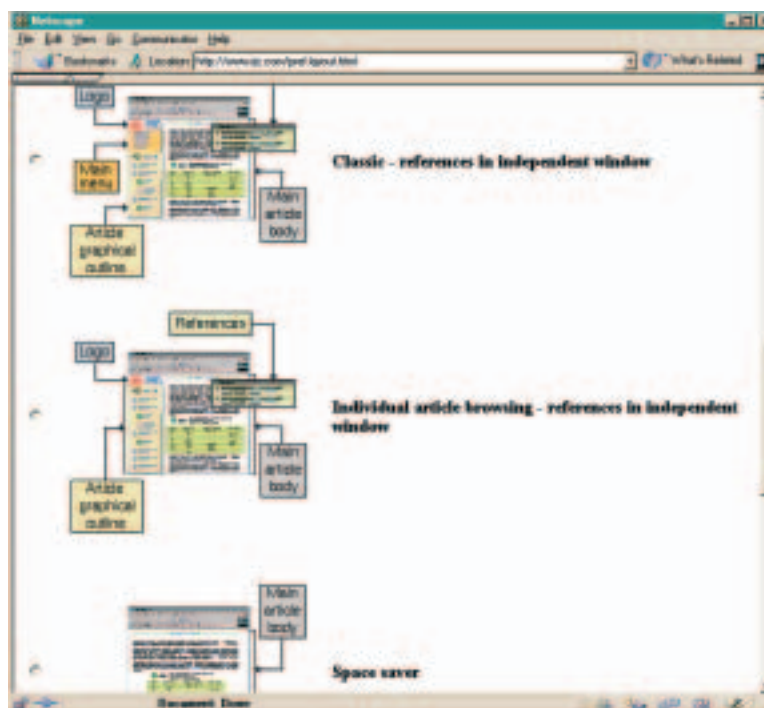


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readers can configure the journal to enable individual article browsing, display article citations in a separate window, condense an article to save space, eliminate frame presentation, or display an article as a single page, among other options (see Figure 3).

Using its customization options, readers may choose to have the standard American Chemical Society (www.acs.org) abbreviation used for a journal title (e.g., *J. Am. Chem. Soc.*) or its full title (e.g., *Journal of the American Chemical Society*) in a reference citation, and opt to display an author's name as initial(s) and surname or surname and initial(s). Readers may also select from several standard scales or base units for displaying temperature, energy amounts, or length. In addition, readers may specify the size and display style of interactive features available within the journal (e.g., ball and stick, strands,

FIGURE 3. Schematic Depicting Optional Page Layouts for the *Internet Journal of Chemistry*



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wireframe) or display the icon for available graphics (e.g., chart, figure, or equation) or linked media (e.g., interactive chemical structure, graphs, or spectral data, VRML) within an article and its associated outline.

ELECTRIC

Indexing and Searching

A select number of e-journals have embraced the potential of the digital environment, providing novel and innovative access to their content. One, *J.UCS: The Journal of Universal Computer Science* (www.jucs.org), provides access to its articles using the alphanumeric subject category codes of the *ACM Computing Classification System*.¹⁶ Articles are assigned one or more subject

codes as well as keywords, and subject codes are hotlinked within an abstract, allowing a hyperlinked search of all articles assigned the same code. *J.UCS* is a joint publication of the KNOW Center in Graz, Austria, and Springer-Verlag. It covers all aspects of computer science and was one of the first electronic journals, published without interruption since its founding in 1995.

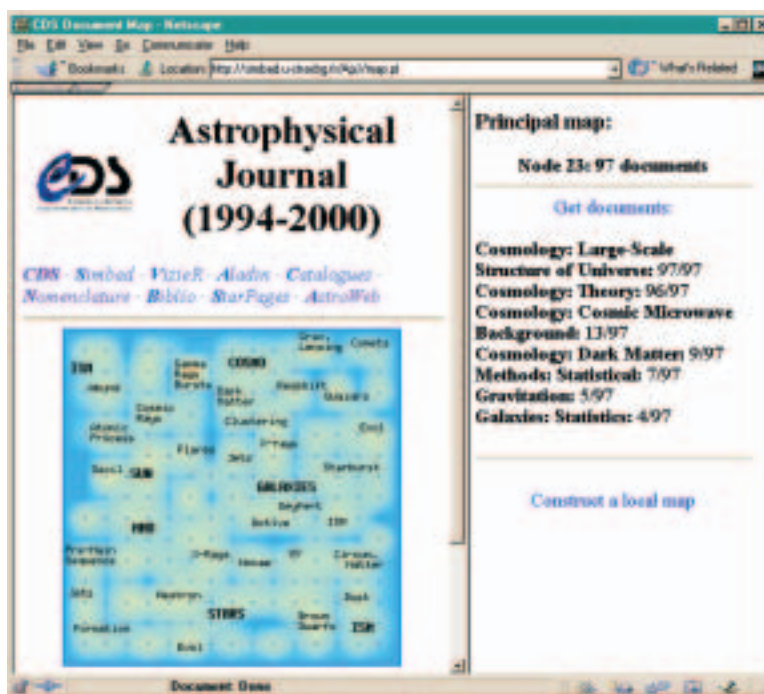
A second e-journal, the *Astrophysical Journal*, offers a “self-organized” visual index (simbad.u-strasbg.fr/ApJ/map.pl) to more than 16,000 recent articles (1994-2000) created by the application of a Kohonen Self-Organizing Map (SOM) algorithm. SOM is an artificial intelligence technology based on neural computing developed by Teuvo Kohonen of the Helsinki University of Technology. The algorithm automatically organizes indexing terms (or documents) and clusters them within a two-dimensional grid.¹⁷ The keywords and subject headings used by the *Astrophysical Journal* to index articles published in the journal serve as the source vocabulary for the application. One may browse this visual index by clicking a primary category node (e.g., “Cosmo.”) or secondary node (e.g., “Dark Matter”) from this “bibliographic map.” In a right-hand frame, the node number (e.g., “Node 23”), the total number of documents associated with the node (e.g., “97”) and all indexing terms and phrases assigned to documents categorized within the node are displayed (see Figure 4).

The number of documents assigned for each index term or phrase relative to the number of documents in the retrieved set is indicated (e.g., “Cosmology: Dark Matter: 9/97”). The reader may retrieve citations and abstracts for all items associated with a node (“Get Documents”) or display a detailed SOM, allowing him or her to browse the conceptual context of a term or phrase. Readers may also identify and select relevant standardized terms or phrases using a “keyword query” option. Once selected, an associated SOM is created with identical display or retrieval options as found in the main SOM. A Kohonen SOM self-organized visual index has also been created for *Astronomy and Astrophysics* and its *Supplement Series* (simbad.u-strasbg.fr/A+A/map.pl).¹⁸

The *Journal of Artificial Intelligence Research (JAIR)* (www.jair.org/) allows a reader to navigate a different kind of information map. Established in 1993, *JAIR* publishes research and survey articles and technical notes in all areas of artificial intelligence (AI). Within *JAIR*, a reader may search and browse a linear index by author or title, or manipulate and interact with a three-dimensional categorized “Information Space” created by a Java applet (see Figure 5).¹⁹

Within this Information Space, yellow squares represent articles published in the journal. “Each square is arranged equidistantly about a label describing a category to which the corresponding article has been assigned. The area of the circle around each category label is directly proportional to the number of articles assigned to that category.” Viewpoints can be manipulated using appropriate shift or control keys and the mouse pointer. A mouse rollover of a square

FIGURE 4. The Kohonen SOM (Self-Organized Map) Index for the *Astrophysical Journal* (1994-2000) (left frame); The Indexing Terms and Phases for a Particular Node of the Index with the Associated Number of Articles (right frame)

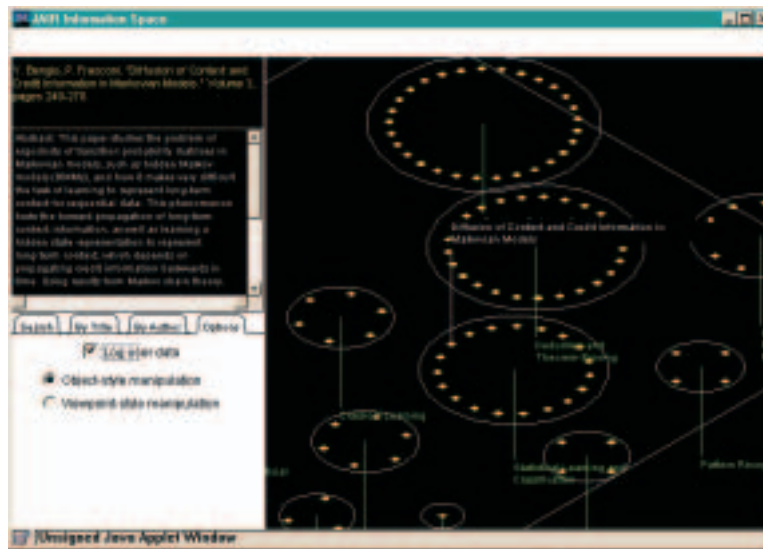


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will display the title of the associated article above the square and the full author, title, volume, and pagination of the article within a left-handed frame within the applet. The reader may retrieve the full text of the article as a full or compressed PostScript file by selecting the preferred format from an additional Java applet window.

JAIR also provides a "keyphrase" index to its content (extractor.iit.nrc.ca/jair/keyphrases/) that has been automatically generated by text summarization software (<http://extractor.iit.nrc.ca/>).

FIGURE 5. "Information Space," the Three-Dimensional Index for the *Journal of Artificial Intelligence Research (JAIR)*



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Computer Code

To complement or supplement the contents of select articles, an increasing number of e-journals encourage authors to provide supplemental data or resources. One of the more noteworthy supplemental materials found is computer code or programs. A good example is the computer software provided as an appendix to a recent article in *Conservation Ecology* (www.consecol.org). The program, *Nonpoint*, allows a reader to simulate the interaction among key stakeholders in the management of a lake vulnerable to pollution. Actors in the simulation include scientists, economists, regulations, farmers, the lake and its environment, and the reader. In addition to the program, full documentation for the use of the program is provided.²⁰

JAIR, the journal devoted to artificial intelligence research, also allows authors to include computer code with articles. For example, an article that describes a new system for induction of oblique decision trees named *OCI* includes an online appendix that is the C source code for the described system.²¹

Translation Services

Although English is the lingua franca of science and world trade and has become the de facto standard for Internet communication, it is not the only language of formal scholarly discourse or communication. Recognizing the language preferences of its readers, *Cultivate Interactive* (www.cultivate-int.org) enables readers to automatically translate an English-language article into one of several Western European languages in real time. *Cultivate Interactive* is a Web magazine funded under the Digital Heritage and Cultural Content program by the European Commission to report activities of CULTIVATE, the pan-European community of libraries, museums, archives, galleries, and non-profit organizations. For any article in the magazine, a reader may choose to have the introductory section translated into one of several Western European languages (i.e., French, German, Italian, Portuguese, or Spanish). In activating the translation from a drop-down menu at the bottom of the article, the first few paragraphs of the original English version are translated and displayed. Translations are machine-generated through WorldLingo™, a free Web-based translation service (worldlingo.com). Using the site's full service, text may be translated into another of the select Western European languages or other languages offered by the service.

Readers of the *Astrophysical Journal* can have the abstract of an article automatically translated by linking to BabelFish (babelfish.altavista.com), the translation service offered by AltaVista, through the Astronomy Abstract Service of the NASA Astrophysics Data System (ADS) (cdsads.u-strasbg.fr/).

EMPOWERING

Download Options

Before the era of e-journals, many researchers used bibliographic databases to identify publications potentially relevant to their research interests. To efficiently manage retrieved citations and abstracts they downloaded the associated records into a personal bibliographic management software package.²² Acknowledging the value of personalized bibliographic databases, a number of e-journals offer readers an opportunity to download the bibliographic records associated with e-journals into one of these packages. For example, *bmj.com* (www.bmj.com) allows readers to use EndNote® (www.endnote.com/), Reference Manager® (www.isiresearchsoft.com/rm/rminfo.asp), ProCite® (www.procite.com/), or the Medlars (Medline®) format.

Within the e-journals published by the Institute of Physics (www.iop.org), readers can save the abstract in formats used by EndNote®, Reference Manager®, ProCite®, as well as BibTex.²³ In addition, files can be saved in HTML or plain text (ASCII). Comma Separated Variable (CSV) format files within an article can be also saved, allowing the reader to collect data from any table and import it to other table-oriented applications (e.g., Microsoft Excel).

Reader Participation

Unlike the print medium, the Web permits journal publishers to *dynamically* solicit and ascertain reader opinion about a variety of professional and publication issues. Using the Web, *bmj.com* solicited reader preferences about the publication of articles in its paper journal. Specifically, it requested that readers rate the importance of “readability” versus “appraisability” of proposed shortened articles. In a second questionnaire, it solicited reader opinions about nine paper versions (www.bmj.com/cgi/content/full/319/7220/DC1/1) with links to examples of the particular versions. Among these were a “traditionally structured short version with emphasis on methods,” “journalistic style,” and “diary style.”

As a distributed, interactive environment, the Web can empower readers to develop resource collections of significant benefit to their community. For example, readers of the *MRS Internet Journal of Nitride Semiconductor Research* (nsr.mij.mrs.org) can contribute relevant references to journal articles, books, conference papers, or unpublished work, for inclusion in its Web-accessible database (nsr.mij.mrs.org/refs/Default.html).

Virtual Filing Cabinets

Recognizing that digital environments provide opportunities to manage digital resources more effectively and efficiently than possible in paper media, some e-journal publishers enable readers to create and maintain an electronic “filing cabinet” of relevant citations with links to abstracts and article full text. For example, the Institute of Physics (IoP), through its Electronic Journals service (www.iop.org/EJ/), allows readers to “keep an online list of papers of interest” or store articles for future review or use (“Filing Cabinet”). In addition, readers can append comments or annotations (“Personal Notes”) to any article for placement in their Filing Cabinet. For the reader, these personal notes appear after the abstract on the abstract page of the article. Comments and annotations may be edited, amended, or deleted at any time.

Within the Electronic Journals service, IoP offers HyperCite™, a technology that provides a link to the abstracts of cited articles and offers access to

their full text in select journals for valid subscribers (see below). As with its published journal articles, readers can annotate and file any cited article into a Filing Cabinet. Currently, the Filing Cabinet functionality is only available in the Electronic Journals “Enhanced” and “Remote” services.

The American Institute of Physics, through its Online Journal Publishing Service (OJPS), allows all readers to create an “Article Collection” by selecting articles from a journal table of contents or article abstract page. Those with a personal or an institutional journal subscription may also create a collection from a search results page.²⁴ Each entry in the collection includes a link to its abstract. Full-text access is provided as a full or sectioned HTML file, a PDF file, and a compressed PostScript file. Non-subscribers can purchase an article on a pay-per-view basis (“Order”).

The collection is available indefinitely as long as it is accessed at least once in ninety days; a collection not accessed during this period is erased. Currently, there is no limit on the number of items that can be added to a collection. The reader may delete any or all items at any time. For future access and use, article collections must be formally named. A collection can be assigned several different names to reflect different aspects of its content. As collections are not password protected, readers are encouraged to create unique names to prevent unauthorized access.

Through its “My Folders” feature in its “My Profile” personalization function, readers of *Science’s STKE: Signal Transduction Knowledge Environment* (stke.sciencemag.org) can store information from any section of the publication in folders. As with other personal electronic filing and storage services, journal data and information are maintained on the publisher’s server and not on the user’s local workstation.

ENTWINED

Reference Linking

For scholars, the citing of relevant literature in publications is the foundation of the scholarly communication process. Through cited works, authors document and substantiate their arguments and points of view. Utilizing the inherent capabilities of the digital environment, appropriately cited references potentially can be linked to their full text, and minimally to a corresponding abstract.

Using its HyperCite® linking technology, the Institute of Physics (www.iop.org) was one of the first publishers to offer extensive access from cited references to corresponding abstracts or full-text articles. Through this technology, IoP

currently provides links to the online content of several major publishers and learned societies. Among these are the collections or services provided by the Institution of Electrical Engineers (INSPEC), Elsevier Engineering Information (Compendex®), the IDEAL Online Library, Springer-Verlag (LINK), the American Chemical Society (Chemport), the American Institute of Physics (Online Journal Publishing Service), and the CrossRef initiative, a collaborative reference-linking service managed by the Publishers International Linking Service, Inc. (PILA). CrossRef (www.crossref.org) is now the most comprehensive linking service, providing access to nearly 3 million article records for more than 3,800 journals from more than 70 publishers from its referral database.^{25,26}

One CrossRef participating publisher, Elsevier Science, through its ScienceDirect® service, provides access to the full text of more than 1,200 e-journals. Within its articles, citations may link to an abstract or to the full text of the article in HTML and/or PDF format. In addition, some cited references provide a link to a “SummaryPlus” version of the article. SummaryPlus is an abridged format of the original article that includes not only its introductory sections (i.e., author statement, title, and abstract), but a content outline, thumbnail images of all figures with their captions, and all cited references. In some cases as with the original listing of references, these secondary level references will include links to an abstract, article full text, or a SummaryPlus version of the citation.

Citation Indexing

Simply stated, “a citation index is an ordered list of cited articles, each of which is accompanied by a listing of citing articles. The citing article is identified by a source citation, the cited article by a reference citation.”²⁷ Developed a half century ago by Eugene Garfield in response to the inadequate and inappropriate subject characterization of journal articles typical of many conventional print indexes of the time, citation indexing today has become a standard technique by which conceptually related publications can be easily determined.

One of the major resources incorporated within *bmj.com* (www.bmj.com), the electronic journal of the British Medical Association, is *NetPrints*TM, (clinmed.netprints.org/), a “repository of non-peer-reviewed original research” in clinical medicine and health research sponsored by the BMJ Publishing Group in collaboration with HighWire PressTM. *NetPrints*TM offers “CiteTrack,” an e-mail alerting service that notifies a registered reader of new content that matches a keyword, subject, or author profile, or that cites a previ-

ous contribution in its collection.²⁸ Alerts include the full citation for all relevant items as well as their associated Web addresses.

Articles in the IDEAL Online Library (www.idealibrary.com) that have been cited by subsequent articles in its collection are indicated by a “Cited by” hotlink on the abstract page for the article. In linking to the associated “Cited by” page, a bibliographic list of the citing papers beneath an entry for the cited paper is displayed, as are hotlinks to the abstract, references, and the full text of the citing article. Access to the full text is provided to subscribing institutions.

Through its Electronic Journals service, the Institute of Physics (www.iop.org) offers readers an “Articles Citing this Article” page which displays a bibliographic list of articles that cite a currently viewed article in their references. Using its HyperCite® technology, links are provided from the citing references to their corresponding abstracts, if these are available in the IoP collection. If an institution subscribes to the citing journal, the citation for the citing article will include a hyperlink indicating that the full-text article is available (“IOP Article”). This hyperlink links to an abstract for the citing article from which its full text can be retrieved along with its associated citations. From this reference list, readers may further explore relevant literature by following these linked citations.

Relatedness

In addition to offering access to citing articles, the IDEAL Online Library (www.idealibrary.com) allows readers to automatically identify articles in its collection similar to the one currently under consideration (“IDEAL Related Articles”). In selecting this option, a citation list of all related articles is displayed. Each listed related article includes hotlinks to an associated abstract and to the corresponding full text. A hotlink to articles similar to each of these related articles (“More Like This”) is also provided.

Science Magazine (www.sciencemag.org), the preeminent weekly published by the American Association for the Advancement of Science (AAAS) offers an analogous feature. As with the IDEAL Online Library, readers of this e-publication can only retrieve similar articles from the local collection. The collections of other e-journal publishers or related services are not linked to either. The parameters by which articles are determined to be related or similar is not explicitly specified.

Within PubMed Central (www.pubmedcentral.nih.gov), the NIH-sponsored repository for biological and medical research, readers are able to link to the abstract of an article in PubMed, a free version of Medline®, the premier bibliographic database covering the fields of medicine, nursing, dentistry, veterinary medicine, and related topics, produced by the U.S. National Library of Medicine and provided by the National Center for Biotechnology Information

(NCBI) (www.ncbi.nlm.nih.gov). Within PubMed, readers are able to view records similar to the one under review (“Related Articles”). A word-weighted algorithm utilizing title and abstract keywords as well as the assigned subject headings is used to determine and identify these similar articles.²⁹

One of most innovative e-journals that enable readers to identify related articles across a *variety* of electronic collections is *Perspectives in Electronic Publishing (PeP)* (aims.ecs.soton.ac.uk/pep.nsf), an experimental e-journal developed by Steven Hitchcock of the University of Southampton. In addition to its original reviews and commentary, *PeP* provides access to an indexed collection of full-text, freely available articles, papers, and other publications devoted to the various aspects of electronic networked publishing. Through an enhanced Web technology, *PeP* provides “on-the-fly” links to significant keywords, phrases, and concepts *within the text* of a selected publication, thereby allowing the user to dynamically identify other papers in its collection relevant to a specific topic (see Figure 6).

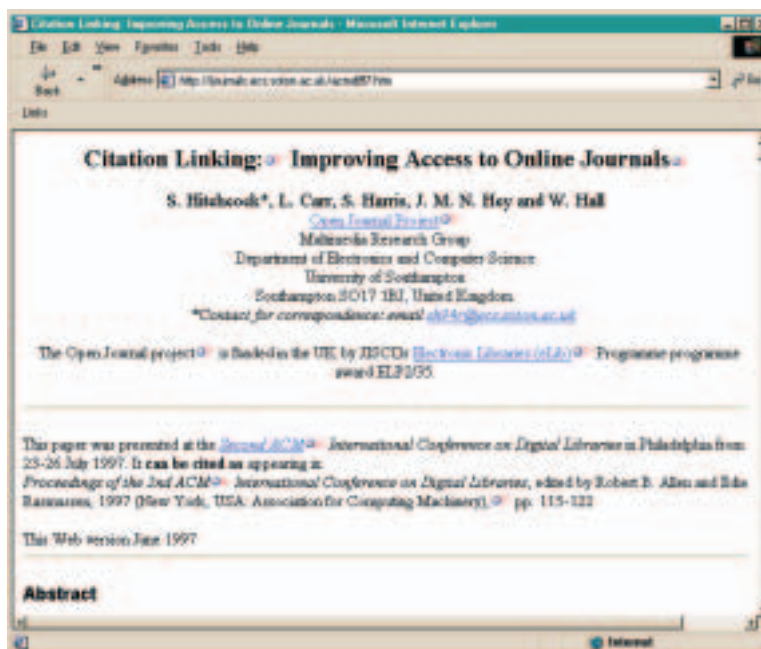
EXPLORATIVE

Database Linking

In recent years, the availability of government-supported and commercial bibliographic databases via the Web has increased significantly. Recognizing their inherent benefit, an increasing number of e-journal publishers provide direct links from articles to these resources. For example, the IDEAL Online Library (www.idealibrary.com) includes a hotlink from an article abstract page in its collection to an item record within PubMed. Within this Medline® database, readers can link to a variety of complementary sources, notably several NCBI Entrez databases (www.ncbi.nlm.nih.gov/Database/index.html) that provide data on nucleotide sequences, protein sequences, macromolecular structures, and whole genomes. In addition, readers may “LinkOut” to full-text sources for this article and as well as related articles.

Through its HyperCite® technology, the Institute of Physics (www.iop.org) has established links to several major databases, notably *INSPEC*, *Compendex®*, and *MathSciNet Reviews*. Synergy (www.blackwell-synergy.com), the online journal service from Blackwell Science and Munksgaard, provides separate hotlinks for the authors of a paper directly to the PubMed Medline® database, enabling the reader to easily identify additional papers of potential interest.

FIGURE 6. The First Page of a Sample Article from *Perspectives in Electronic Publishing (PeP)* with Embedded, “On-the-Fly,” Dynamic Links



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Demonstrations

A variety of e-journals have incorporated multimedia components to augment reader understanding of article text.³⁰ Animation, streaming and non-streaming audio and video files, and three-dimensional interactive models are major examples of common multimedia. Among the e-journals with some of the most impressive animation is *Expert Reviews in Molecular Medicine* (www-ermm.cbcu.cam.ac.uk), an e-journal published by the University of Cambridge School of Clinical Medicine devoted to understanding health and disease at the cellular and molecular level. Using Flash technology, the journal offers a variety of animations that illustrate highly complex concepts and relationships addressed in select journal articles.³¹

Visual demonstrations are not limited to animation. A select number of e-journals include non-streaming or streaming video files to complement ar-

ticle content. For example, *Development* (usa.biologists.com/Development), the research journal published by the Company of Biologists that addresses all aspects of plant and animal development, includes embedded video clips for select articles. The journal offers a separate index to facilitate access to these files (usa.biologists.com/Development/movies/index.html). One of the most innovative of all electronic journals, the *Internet Journal of Chemistry* (www.ijc.com) embeds not only QuickTime™ (www.apple.com/quicktime) and MPEG (www.mpeg.org/MPEG/index.html) movie files, but also interactive graphs and tables.

Models

Of the various media types embedded within the *Internet Journal of Chemistry*, perhaps the most impressive are interactive chemical 3-D structures created with the Virtual Reality Markup Language (VRML) and with Chime, the chemical structure plug-in provided by MDL Information Systems (www.mdli.com). With Chime models, using the mouse pointer or mouse control options, readers can rotate the molecular model; display the structure as a wire frame, sticks, ball and sticks, or space fill, or other appropriate structure; change the rendering from three-dimensional to two-dimensional; change the coloring; or cluster components, among numerous options. VRM models have similar display and manipulation options (see Figure 7).

As previously noted, some e-journals permit authors to include computer code as supplemental material. Such code may be computer software that can be used to model interactions among systems or users, such as the *Nonpoint* program provided as an appendix to an article in *Conservation Ecology* (www.consecol.org).³²

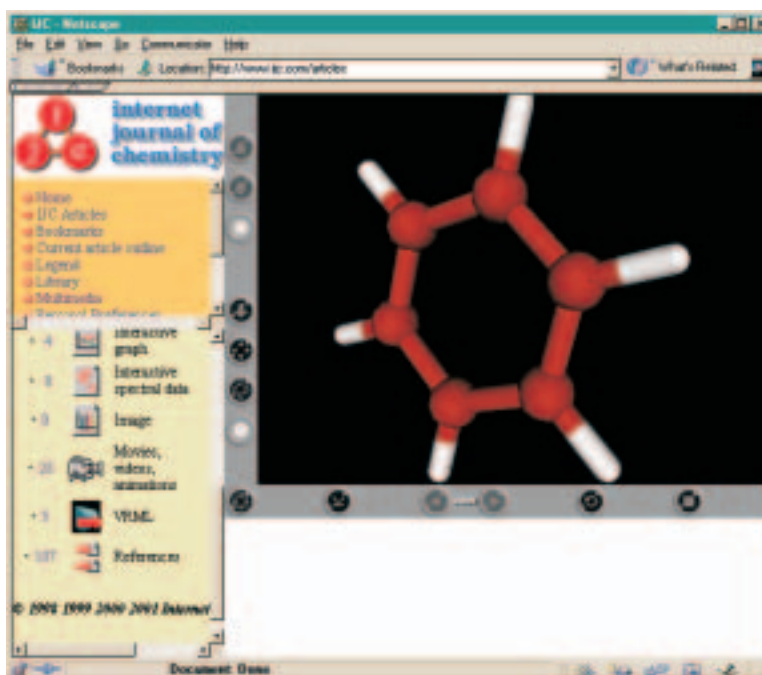
EXPRESSIVE

Discussion Forums

Electronic discussion lists were among the first scholarly uses of the Internet. Such professional forums enable individuals with similar interests to participate in a virtual discussion of relevant issues of mutual concern. Recognizing the potential value of such interactions, some e-journals have incorporated discussion forums within their journals. *Cultivate Interactive* (www.cultivate-int.org), for example, offers a discussion forum that allows individuals to discuss issues relating to the Telematics for Libraries program.

McLuhan Studies (www.chass.utoronto.ca/mcluhan-studies), the e-journal established to examine, discuss, and continue the work of Marshall

FIGURE 7. A Three-Dimensional Model of Benzene Used to Illustrate an Article in the *Internet Journal of Chemistry*. (The interactive model was created using VRML, the Virtual Reality Markup Language.)



Reprinted by permission of *Internet Journal of Chemistry*.

McLuhan—“the visionary educator of mass media”—provides a discussion forum for this purpose. The *MRS Internet Journal of Nitride Semiconductor Research* (nsr.mij.mrs.org) offers forums on several general and specific topics related to its scope. These include one devoted to properties of nitride semiconductors, one devoted to substrates, one devoted to nichia blue lasers, and one on the doping of III-V nitride semiconductors, among others.

Science's STKE: Signal Transduction Knowledge Environment Virtual Journal also offers several highly specific and general forums (stke.sciencemag.org/cgi/forum). *Sociological Research Online* (www.socresonline.org.uk) through its “Pinboard” feature (www.socresonline.org.uk/pinboard) provides a variety of methods by which readers can communicate with each other as well as with the journal editor. *Expert Reviews in Molecular Medicine*

(www-ermm.cbcu.cam.ac.uk) maintains a separate discussion group for each of its articles.³³

Dynamic Articles

Unlike the print medium, the Web offers authors an opportunity to augment a previously published work with current findings and new observations. For example, in *STKE Reviews*, a section with *Science's STKE: Signal Transduction Knowledge Environment* (stke.sciencemag.org), authors can update reviews as circumstances warrant.

Reactive E-Journals

Journals have long encouraged readers to respond to articles and other components. Such responses typically have taken the form of letters to the editor or companion articles that support or oppose published items. In the digital environment, a number of publishers are continuing this tradition by providing Web-based forms to facilitate submissions. For example, *bmj.com* (www.bmj.com), through its "Rapid Responses" feature, allows readers to comment on articles, editorials, and other content, as well as on previously published letters. Responses received for the most recent seven, fourteen, and twenty-one days are accessible. The IDEAL Online Library (www.idealibrary.com) publishes a *Forum* column that provides critiques of published papers within the scope of its individual journals (e.g., *Animal Behaviour Forum* (www.academicpress.com/anbehav/forum)). Only the electronic version of a journal contains *Forum* articles.

In the journal *Conservation Ecology* (www.consecol.org), readers may comment on an article by using Web-based response or submission forms. Readers may submit brief comments ("Response Form") (e.g., www.consecol.org/Journal/cgi-bin/response_form.html?ms=100845) or contribute extensive commentary or full articles containing charts, tables, and graphics ("Response Upload Page") (www.consecol.org/Journal/cgi-bin/long_response_form.html?ms=100845). If a response is accepted for publication, it is linked to the original article and designated as a response.

One of the most innovative e-journals incorporating a variety of novel features, functionalities, and content is the *Journal of Interactive Media in Education (JIME)* (www-jime.open.ac.uk/), a journal that seeks to "foster a multidisciplinary and intellectually rigorous debate on the theoretical and practical aspects of interactive media in education." Through its "document-centered discourse interface," *JIME* enables readers, reviewers, and authors "to progressively enrich JIME documents with . . . interactive demonstrations, video and audio clips, evaluation instruments, discussions, and pointers to related or

future work.”³⁴ Within framed windows, readers may opt to display editor, reviewer, and public comments beside an original article.

User commentary on e-articles need not be limited to public discourse. Some e-journals allow users to create personalized private or public annotations for an article or an article section. For example, *J.UCS: Journal of Universal Computer Science* (www.jucs.org/jucs) allows readers to critique articles, note relevant references, and include an active Web address for public use. The *Internet Journal of Chemistry* (www.jic.com) permits readers to add private notes to individual sections of an article in a similar manner. By using select internal and external Web addresses, readers can create a highly personalized version of an article.

EXTRA

Database Access

In addition to linking articles to select databases, some e-journals provide direct access to public or restricted bibliographic databases. For example, *bmj.com* (www.bmj.com), through its homepage, provides links to the PubMed free version of Medline® as well as to an enhanced version (Medline® Plus) for members of the British Medical Association. The *MRS Internet Journal of Nitride Semiconductors* (nsr.mij.mrs.org) offers open access to its specialized database of more than 38,000 records that can be searched by subject, author, or year. In addition, a reader can access a list of all newly added references, browse an alphabetical “directory” of journals with links to bibliographic citations to the journal, a title listing of each record organized by journal chronologically, and a first-author index.³⁵ A bibliography of records in citation format arranged alphabetically by first author is also available.

Through its ScienceDirect® service (www.sciencedirect.com), Elsevier Science offers access to some of the most significant scholarly abstract and index databases. Among these are BIOSIS Previews®, the leading life science database; EMBASE, the international biomedical and pharmacological resource; Ei Compendex®, the premier engineering database, and INSPEC®, the leading English-language bibliographic information service that provides access to the world’s scientific and technical literature in physics, electrical engineering, electronics, communications, computers and computing, and information technology. Users may search an individual database or perform searches across several databases simultaneously.³⁶ In either case, access is limited to institutional subscribers.

E-Book Access

In the past few years, an increasing number of publishers have published monographic works on the Web. Among the most notable services are the *ACM Digital Library* (www.acm.org/dl), a digital collection of the Association for Computing Machinery that provides bibliographic information, abstracts, reviews, and the full text of ACM periodicals and proceedings and the publications of its affiliated organizations, and *IEEE/IEE Electronic Library* (IEL) (ieeexplore.ieee.org), a digital library that provides the full text of journals, conference proceedings, and other serial publications of the Institute of Electrical and Electronics Engineers and the Institution of Electrical Engineers, as well as IEEE standards.

More recently, the American Society of Agricultural Engineers (ASAE), the professional and technical organization dedicated to “the advancement of engineering applicable to agricultural, food, and biological systems,” offers a *Technical Library* (asae.frymulti.com), full-text collections of select 2001 ASAE technical publications, including conference and technical proceedings, journals, monographs, and standards. The collections may be searched separately or concurrently by keyword, document number, author, title, or reference (see Figure 8).³⁷

Through its LINK service (link.springer-ny.com/home.htm), Springer-Verlag offers access to monographic works (e.g., *Handbook of Environmental Chemistry*) and several of its monographic series (e.g., *Lecture Notes in Computer Science*).³⁸ These monographic works are browsable through a table of contents and displayed as PDF files. BioMed Central (www.biomedcentral.com), the collection of peer-reviewed biomedical e-journals, offers *New Science Primers*, two-page modules with a glossary that provide a synthesized account of a “central field in modern biology.” Topics of published primers include the cell cycle, immunity, proteins, and cell signaling.³⁹

Supplemental Data

In addition to offering computer code and software programs, some e-journals allow authors to include such supplemental materials as output files from programs, data sets, as well as text appendices. Within an article in *Internet Archaeology* (intarch.ac.uk), the “first fully refereed electronic journal for archaeology,” readers may search data sets using a variety of specialized query forms.⁴⁰ Search results with relevant data are displayed in an HTML table. In some cases, links are provided from within tables to an interactive map. A reader can export data sets, including underlying geospatial data, to a local database or to a geographic information system (GIS).⁴¹

FIGURE 8. The Homepage of the *Technical Library* of the American Society for Agricultural Engineering (ASAE) with a Drop-Down Menu Listing the Available Full-Text Collections



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In some cases, supplemental material may only be available in the electronic version of a journal. A notable example is the supplemental material available in *Science* that “extends beyond the coverage of the print product to include information such as extended tables of data, explanatory figures, and details of experimental methods.”⁴²

EXPERIENCE

In one of the most insightful articles on the future of scientific journals, Bachrach reviews the potential of the e-journal in the context of scholarly activity and current technology. He perceptively notes that while “color graphics, animation, sound, and large data sets are now routine and essential

components of the scientific method and process, all of these are [typically] omitted when it comes time to distribute the knowledge.” In commenting on the inherent potential of the Internet, the Web, and associated programming languages and computer software, Bachrach notes that the “time has come for a dramatic, profound shift in how scientists should (and will) communicate in the future.”⁴³

Nearly a generation before this observation, and more recently, Lancaster outlined the inevitable replacement of print on paper by electronic publication.⁴⁴ As summarized by Shum,⁴⁵ Lancaster viewed the development of the journal as a continuum based on the utilization of computer technology:

- computers used for print production
- journal distributed in both print and electronic formats
- publication design is rooted in print, but articles are developed solely for electronic distribution
- interaction between authors and readers is possible; publications can evolve as a result of such interactions
- the inclusion of multimedia content
- both interactive participation and multimedia capabilities are supported

Not only did Lancaster concisely outline the general evolution of the electronic journal and other publications, he, and others, clearly anticipated the innovative e-journals of today. Among the novel features, functionalities, and content they identified were: accelerated publication; alerting services; user annotation and commentary; computer code and program supplements; data manipulation; electronic discussion forums; electronic manuscript submission; font, format, and display control; modeling; multimedia components; personalization; and reader participation.^{46,47,48,49} In view of the increasing availability of these and similar components in e-journals, two additional stages may be proposed for the Lancaster continuum:

- linked access to select primary and secondary information sources and resources
- “anything being connected to anything”

In describing the underlying design of the *Internet Journal of Chemistry* (www.ijc.com), Bachrach and his colleagues not only delineate its overall structure and organization, but a complete reconceptualization of the electronic journal itself as well:

In a sense, we are dramatically remaking the concept of . . . [the] scientific journal. The traditional print model has a single delivery mode of text and graphics, forever fixed upon the page, delivered in immutable form to isolated readers. In our model, the journal becomes a large inter-connected collection of objects, cross-linked and cross-referenced into a single web.⁵⁰

For Bachrach and his co-authors, the journal is one “large object” made up of article objects, individual request objects, a server object, solution objects, page objects, and reference objects, and other objects that interact with each other, the network and the hardware environment to “create the “journal” that is delivered to each reader.”⁵¹ In this model, the reader is considered an object that dynamically participates in the creation of the journal.

At a general level, one may view the emerging innovative and novel e-journals as “object-oriented” journals in which component features, functionalities, and content are interconnected and cross-referenced into an interrelated, dynamic, interactive experience. At a higher level, the transformation of the electronic journal now underway may be viewed as a realization of the perceptive vision of Tim Berners-Lee, the creator of the World Wide Web:

The vision I have . . . is about anything being connected to anything. It is a vision that provides us with new freedom, and allows us to grow faster than we ever could when we were fettered by the . . . systems into which we bound ourselves.⁵²

NOTE

The author is most grateful to the following organizations and individuals for permission to reproduce selected screen prints from their respective Web sites: Figure 1: The American Association for the Advancement of Science (AAAS); Figure 2: Multidisciplinary Center for Earthquake Engineering Research (MCEER), *MCEER Information Service News*; Figure 3: Steven M. Bachrach, Editor-in-Chief, *Internet Journal of Chemistry*; Figure 4: Soizick Lesteven, Centre de Données Astronomiques de Strasbourg (CDS); Figure 5: Martha Pollack, Executive Editor, *Journal of Artificial Intelligence Research*; Figure 6: Steve Hitchcock, University of Southampton, Intelligence, Agents, Multimedia Research Group; Figure 7: Steven M. Bachrach, Editor-in-Chief, *Internet Journal of Chemistry*; Figure 8: Donna M. Hull, Director, Publications, American Society of Agricultural Engineers.

REGISTRY

EJI(sm): *A Registry of Innovative E-Journal Features, Functionalities, and Content* (<http://www.public.iastate.edu/~CYBERSTACKS/EJI.htm>) is a categorized registry of electronic journals, journal services, or “knowledge environments” that offer or provide innovative or novel access, organization, or navigational features, functionalities, or content. E-journals that include embedded multimedia components are listed in *M-Bed(sm)*: *A Registry of Embedded Multimedia Electronic Journals* (<http://www.public.iastate.edu/~CYBERSTACKS/M-Bed.htm>).

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