The Scholarly Hothouse
Electronic STM Journals

cientific, technical, and medical (usually referred to as *STM*) information lacks the sparkle of other types of information. Within the last two years, new and useful new services have found enthusiastic customers. Among the most innovative are electronic journals, usually referred to as e-journals.

FLORA AND FAUNA OF E-JOURNALS

Electronic journals are artifacts from the earliest days of networks. Often an attempt to get around or speed up the scholarly peer viewing process, the original electronic journals flowered as a scientific communications medium. The efflorescence of peer-reviewed journals in electronic form began in the early 1990s. The plethora of tests, trials, and products included Ariadne, Ariel, BIODOC, EDDIS (Electronic Document Delivery the Integrated Solution), EDIL (Electronic Document Interchange between Libraries), JEDDS (Joint Electronic Document Delivery Software), LAMDA (London and Manchester Document Access), Mercury, NAILDD (North American Interlibrary Loan Document Delivery Project, REDD (Regional Document Delivery Project), SEREN, Surfdoc, Tilberg/TICER, and WebDoc.

The full efflorescence of peer-reviewed journals in electronic form began in the early **1990s.**

A high profile project was Elsevier Science's TULIP (The University Licensing Program) in 199 1. The program concluded in 1995, but continues with the Science Direct service (the successor to Elsevier Electronic Subscriptions) that allows Web access to many of Elsevier's 1,200 highly regarded STM publications, either in addition to or instead of paper journals. (For an assessment of the TULIP project by one of the participants, see Robert Schwarzwalder's THE TECHNOPHILE column, *DATA-BASE* June 1998).

TULIP tested systems for networked delivery of full-text journal information to the user's desktop. Scanned page images, bibliographic data, and ASCII full text created by optical character recognition of 43 Elsevier and Pergamon materials science and engineering journals were provided by Elsevier to participating universities.

TULIP explored, among other issues, user acceptance of electronic versions of scholarly journals. One outcome of the test was the speed with which other scientific publishers moved forward with their own e-journal projects. Amidst the debate on various online discussion groups and at conferences, commercial publishers examined the TULIP project and concluded that e-journals had a future. Among the STM publishers who learned from Elsevier's spade-work were Blackwell's Scientific, John Wiley & Sons, and Academic Press.

PUBLISHERS OFFER E-JOURNALS

The reasons for e-journal versions of peer-reviewed scholarly journals are many. Publishers have become more informed about Internet usage among the authors, contributors, and reviewers upon whom they depend for validation of proposed articles. Customers are requesting electronic "instances" of STM journals. Prices for many of these STM e-journals have not declined, although different pricing models have been introduced. Considerable experimentation continues in e-journals

with a mind-boggling number of options and programs available to libraries, corporations, and individuals. To sum up pricing in a nutshell you can say, "Under construction. Still expensive."

In general, subscribers can look at a table of contents, read articles, and print or copy selected articles to their hard drive. The benefits differ from publisher to publisher. In general, the e-journal services are convenient. Internet services overcome the character flaws of scholars who leave journal issues behind them on airplanes because a fresh copy is only a mouse click away.

The e-journals are not the answer to everyone's research needs. Indeed, publisher-sponsored services are aimed at readers of particular STM journals. Some researchers and many libraries want to examine many STM journals' contents and articles from one Web site. Going through journal-specific searches on publisher-sponsored sites is a time thief.

Commercial database publishers, both of the for-profit and not-for-profit variety, have traditionally served the library market. Virtually all the STM

abstracting and indexing services offer some type of table of contents and full-text services to their library customers and individual subscribers.

MUTUAL REINFORCEMENT FLOURISHES

The relationship between primary publishers like Elsevier and John Wiley & Sons and abstracting and indexing services like INSPEC and PsycInfo has, for the most part, been mutually reinforcing. A&I services provided a pathway to the literature through time and across journals from many publishers. Publishers created "new" content and distributed it in a medium that delivered a particular title to a subscriber in a "package" that provided information and (hopefully) led to a renewal of the subscription.

With the advent of the World Wide Web as a distribution channel, work-flow environment, and electronic commerce engine, a new cluster of competitors began to exert increasing pressure on these mutually reinforcing relationships. Prices for many journals have risen as steeply as point-to-point airfares in the United States. Scientists in certain disciplines have chafed at the amount of time required for a peer-reviewed article to make it through a peer-reviewing process substantially unchanged since the late 19th century. Physics
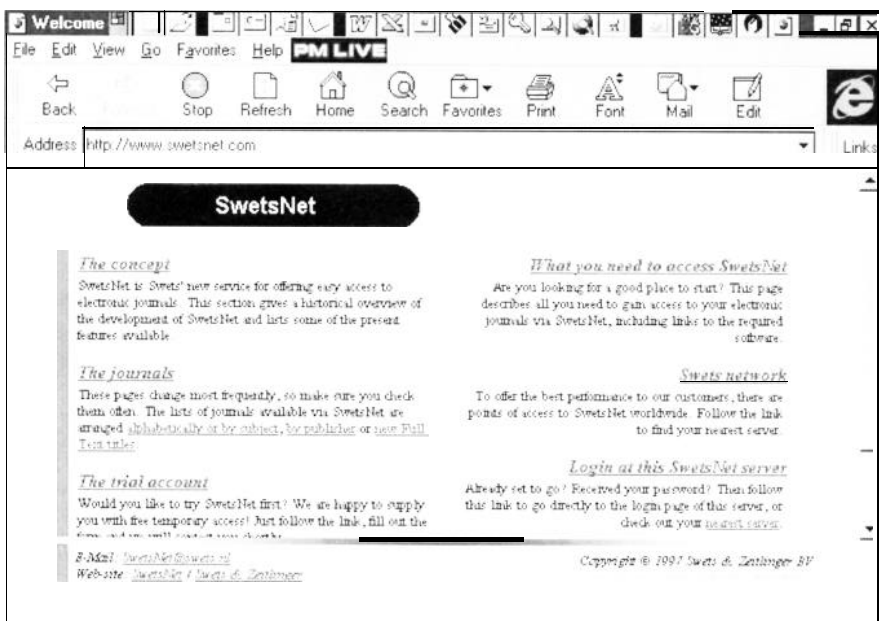
SwetsNet offers a single interface for searching and browsing across a range of full-text STM titles.

and mathematics are two disciplines where velocity has become more important from the specialists' point of view.

SUBSCRIPTION AGENCIES HOTHOUSE BLOOMS

A new type of online service has evolved from the tropical jungle of Internet innovation. Subscription services/agencies have forced their roots between the STM publishers and the abstracting and indexing services.

Subscription agents are adding e-journal features to their traditional back office activities. Although many subscription services offer electronic subscriptions to journals as well as to paper instances of journals, space considerations require a few examples, illustrate what is emerging as a major trend among these organizations. RoweCom, EBSCO Subscription Services, Blackwell's, and Dawson (Faxon and Information Quest), among others provide similar services.

the publication. Libraries pay a premium for an electronic subscription.

With offices in key worldwide locations, Swets is using its existing network of leased lines to provide speedy access to the titles in the service. More than 20 libraries in Europe and North America have acted as beta test sites for SwetsNet. The commercial service began in late 1997.

Recently launched is the facility to link from a customer's local online public access catalogue and reference databases to SwetsNet data, using structured URLs. Swets sets up its system so that customers need one password to access all applicable services and products. SwetsNet will support 239.50 in the near future.

Additional features include regular reports on title usage, access to earlier years' back issues, information and advice on electronic serials, and the choice of searching a library's own subscriptions or the full SwetsNet database including regular reports on title usage.

universities and not-for-profit foundations are making as providers of e-journals. Services are not restricted to students and faculty: for a fee, those outside academia can also gain access. Examples of new aggregators include High Wire Press (a functional unit of Stanford University's Green Library) and JSTOR (an online service that began at the University of Michigan, funded in part by a foundation).

Stanford University set up HighWire Press several years ago to foster access to high-value research. The goal of HighWire Press is to "return responsibility for scholarly publishing to those committed to the primacy of scholarly communication rather than profit taking."

A BUDDING INTERNET IMPRINT

The HighWire Press, an enterprise unit of Stanford University Libraries and Academic Information Resources,

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SWETSNET

SwetsNet (http://www.swetsnet.com) offers customers a single interface for searching and browsing across a range of full-text titles from a number of leading academic and scholarly publishers. The content offering of Swets is reasonably robust and Swets is running an aggressive rights campaign to sign up other titles.

SwetsNet's powerful search engine allows users to search text within Tables of Contents and abstracts, as well as by author, journal title, and publisher name, using Boolean operators and other retrieval tools. Authorized users can then view the full-text articles on screen, presented in Portable Document Format (PDF) with a handful of publications in Catchword's Realpage format. SwetsNet catalogue, table of contents, and abstracts are in HTML.

The journals delivered by SwetsNet replicate the appearance and pagination of the related print journals. Security of access is provided through user address checking and user passwords. Authorization to view the complete article requires a subscription to

TECHNICAL SUPPORT

Swets' design is modular. The intent is to introduce new developments and adapt to changing standards. By combining browsing and searching options, along with the ability to open complete articles in electronic full text at one location, SwetsNet is one of the more interesting electronic journal services now on the market.

The economics of the venture are relatively straightforward. Users (whether individuals or libraries) subscribe to one or more publications. The fees flow directly to Swets & Zeitlinger. If the title is one they own, they keep the money. If the title is one licensed from another publisher, Swets deducts a service charge or commission.

In the present publisher-subscription agency relationship, each company defines the limits of its services. Despite the presence of fairly advanced Internet technology, publishers and subscription agencies are in different businesses.

SURPRISING ALTERNATIVES BLOSSOM

One of the more interesting developments in STM is the strong showing

is emerging as co-publishers of low-cost, graphically rich Internet editions of University and scholarly society electronic journals. HighWire Press works with its partners to publish, distribute, and archive electronic journals. Individuals and institutions can subscribe to the publications.

HighWire is the "Internet Imprint" of Stanford University Libraries. The meat of the project is full-text and/or abstract access to over 70 STM journals through HighWire's Web site (http://highwire.stanford.edu). The titles of currently available journals appear with buttons for browsing the current issue, future content, and the archive, as well as a button for searching articles published in that journal in the last year or as far back as 1987 depending on the journal. At this point, there is no searching across multiple journals simultaneously, but a search on one journal can be carried over to another by using the "Try this search in" pull-down menu on the search results page. Each journal has a "home page" with its table of contents.

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To view the full text of an article, a user must be a subscriber to the print edition. A separate subscription to the online service is also required. Prices are comparable.

HighWire says that its "mission" of the enterprise includes:

- Foster research and instruction by providing a more direct linkage between the writers and readers of scholarly materials.
- Use innovative network tools for capture, publishing, retrieval, reading, and presentation.
- Affect the economics of provision of scholarly information to researchers-especially science, technology, and medical research information.
- Ensure that the nascent marketplace for electronic communication among scholars does not develop along the semi-monopolistic lines of current STM publishing.
- Build new technological, economic, and programmatic partnerships with others investigating related problems.

HighWire has given Stanford a high profile in the e-journal market-place. It has also provided the school and its researchers with a rich archive of electronic documents and a potentially rich revenue stream. The real motive behind these uni-versity-anchored electronic publish-ing schemes is to obtain electronic versions of documents and have "control" over the content.

HighWire wants to partner with various organizations to create con-tent. For example, partners would be:

- Scholarly societies and university presses, presumably with a need to move content from print to electronic media or already in possession of electronic content and seeking additional distribution channels.
- Universities and publishers wanting to undertake a comprehensive conversion of existing electronic files to ones that are Web-compatible
- Companies in technology and publishing industries interested in leveraging tools and techniques.
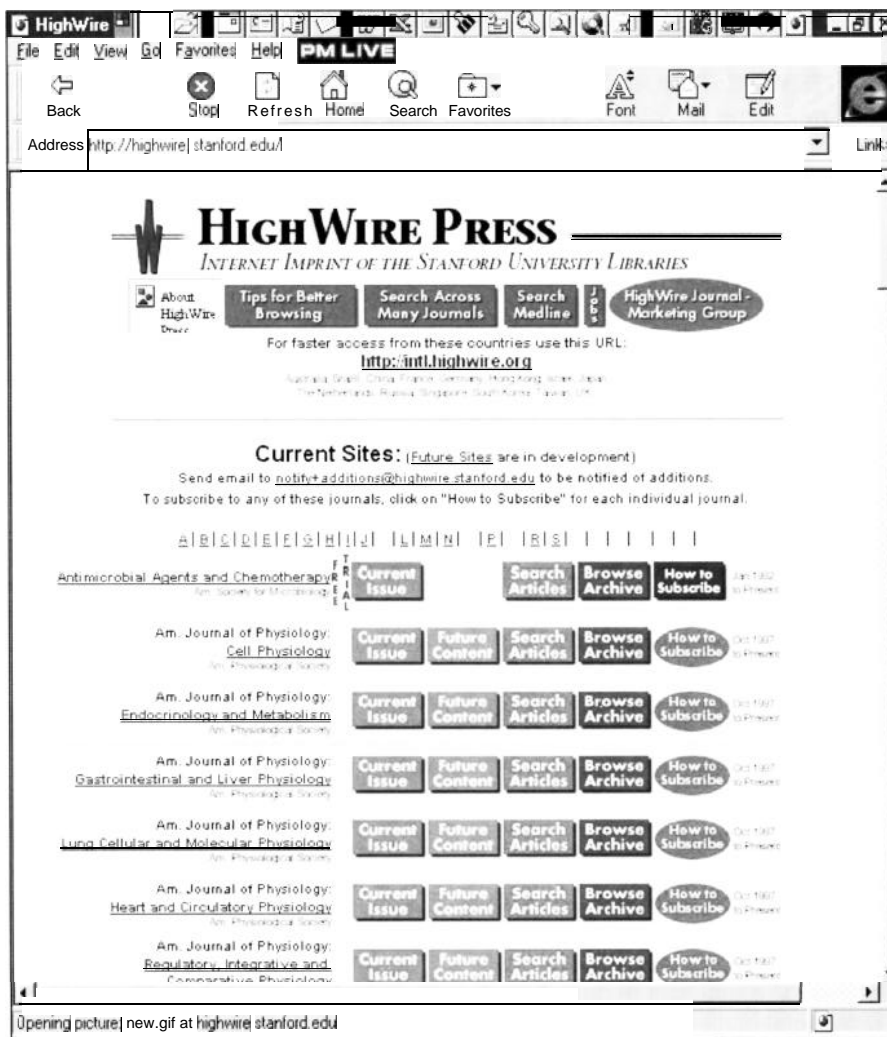
*As the **Internet Imprint for Stanford University**, HighWire presents full-text and abstract access to scientific-technical journals.*

Among HighWire's partners are such organizations as The American Academy of Pediatrics, The American Society for Biochemistry and Molecular Biology, The American Society for Cell Biology, The Histochemical Society, and The Rockefeller University Press. Representative titles available include *The EMBO Journal* (European Mole-cular Biology Organization Journal), *Gastroenterology, Genes & Develop-ment, Genetics, Genome Research, Immunity, Infection and Immunity,* and the *Journal of Applied Physiology,* among others. Johns Hopkins Uni-

versity is mounting a similar effort as a quasi-commercial enterprise known as Community of Science.

JSTOR

JSTOR is a not-for-profit organiza-tion established with the assistance of The Andrew W. Mellon Foundation. It is a "demonstration" of access to elec-tronic information. JSTOR's database of the complete backfiles of core schol-arly journals in the humanities and social sciences is nearing two million pages, and is available via site licenses at approximately 250 academic insti-

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tutions in the United States and Canada. JSTOR, unlike most commercial subscription services, is an advocate for various library concerns, particularly those relating to the high cost of some peer-reviewed journals.

Begun in 1995 at the University of Michigan, JSTOR's goal is to create electronic versions of about 100 scholarly journals before the year 2000. Unlike HighWire, JSTOR is focusing on older journal literature. These materials are relatively little used in their present paper and microfilm formats, and generate little or no revenue for publishers. While it may be that, for some fields, older research is of considerably less value than more recent published articles; it is certainly not the case for all fields and disciplines. In its present format, some valuable, older research risks being lost because it is difficult to locate and inconvenient to retrieve. Rights to older information are somewhat easier to obtain than electronic rights to the most recently created content.

Representative journals in the electronic collection include such publications as *The American Economic Review, American, Historical Review, American Journal **of** International Law, American Journal Of Political Science, American Political Science Review, American Sociological Review, Annals of Mathematics,* and *Annual Review of Anthropology.*

Pricing for the JSTOR collection is based on the "size" of the library. Pricing data available in mid-1998 called for two types of payment:

- A one-time database development fee, for permanent access rights to the information in Phase I of the project.

- An annual access fee, to help cover the recurring costs of updating and maintaining the archive. Updating will include the addition of successive years of material for the

Phase I journals. Access fees will be fixed for the first three years of participation.

GERMINATION OF A JOINT INITIATIVE

In early 1998, JSTOR launched an important joint initiative between JSTOR and the Higher Education Funding Councils (HEFC) The Joint Information Systems Committee will oversee the JSTOR initiative for the HEFC. The first objective of the JISC/JSTOR collaboration was to establish a mirror site of the JSTOR database at the University of Manchester, in the U.K., which enables faster access to the collection. Both parties hope that additional scholarly publishing opportunities will emerge from this relationship. The deal theoretically gives arts and social science academics and students a new electronic resource.

JSTOR will be made available to higher education institutions in the United Kingdom for fees designed to cover the costs of building and maintaining the collection. These distribution efforts will be overseen by Manchester Information Datasets and Associated Services (MIDAS), a national research support service based at the University of Manchester, specializing in online provision of strategic research and teaching datasets, software packages, training, and large-scale computing resources for the U.K. academic community.

In order to add content, JSTOR has set up a production facility at Princeton University to convert paper journals to electronic form. This facility, which will supplement a similar operation at the University of Michigan, doubles JSTOR's capacity to gather journal runs, organize them for scanning, and load them into JSTOR's database. Through grants from JSTOR, Princeton University

currently houses a duplicate of the JSTOR database and, in conjunction with the University of Michigan, works to enhance the JSTOR system's technical capabilities. JSTOR makes use of a proprietary image format that offers smaller file sizes for page images than Adobe's Portable Document Format.

Representative customers of the JSTOR system include such institutions as Purdue University, Radford University, RAND Corporation, Reed College, Rhodes College, Rice University, Russell Sage Foundation, Rust College, Rutgers University, and Seattle University.

OBSERVATIONS

At this time, libraries and individual researchers have some interesting options from which to choose.

Individuals and institutions with sufficient resources can "subscribe" to a journal, sign up for online access to special services from publishers, commercial database publishers, subscription agencies, and online publishers like HighWire. It is a bit of extra work to investigate multiple sources for information about a specific subject in a specific discipline. Nevertheless, a researcher with money and a healthy dose of patience can cut a wide swath without having to venture much farther than the mail drop and the computer with Internet access. For those without sufficient funds, research is likely to be a bit more problematic.

For libraries strapped for funds, teaming up with other institutions and pooling money to buy access to resources that individual libraries cannot afford provides one way around the budget barriers that get higher each year. Students and faculty must use what is available to them and exercise considerable creativity when access to peer-reviewed articles are needed. Free information on the Internet is not likely to have the oomph necessary to meet the stringent demands of serious researchers.

COLLISION COURSE

Publishers, abstracting and indexing companies, subscription agencies, and the new online providers like HighWire Press seem to be on a collision course. Libraries and indi-

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vidual researchers are likely to be befuddled about where to go to find what they need in the current STM or scholarly data universe. Locating and getting precisely what one needs has become somewhat more complicated in the Internet age.

It is also not clear if the market for STM literature can sustain five or six competitors from publishing, subscription services, university and not-for-profit initiatives, commercial database organizations, and the inevitable 20-something who invents a fundamentally new way to solve an information problem.

In short, when these formerly complementary services begin to come together, some sparks will be produced. Publishers seem to have the upper hand because they create content. Unfortunately, many publishers have created an adversarial relationship among authors and reviewers.

of fighting for the rights of the libraries, services like HighWire's can morph into a powerful publishing and online delivery service. Some scholars may find the imprimatur of a new electronic, quality publishing operation magnetic enough to pull their new work from the word processor to the computers at Stanford University or their equivalent at the University of Michigan or Princeton University.

Adding volatility to the mix is the Web itself. Some scholars may band together and figure out how to provide access to new research in some electronic pre-print service and, backing it up with a grassroots peer-reviewing system. The purpose of the scholarly publishing mechanism is supported by researchers and scientists who need to get their message out with a seal of approval. Publishers have traditionally wielded the embossing tool, but in the Web-

checkbooks, the best marketers listen and respond.

Third, individual scientists and researchers are going to take more interest in new ways to publish STM information. Tools from companies as diverse as Net Perceptions (Minneapolis, Minnesota) and Xerox (Rochester, New York) stand ready to revolutionize many types of STM information exchange. Net Perceptions can monitor the exchange of researchers and automatically trigger a wide range of useful, automatic publishing functions. Xerox and IBM are introducing Internet-anchored printing engines that can output a book or collection of documents at the rate of 400 pages per minute. There is no reason why a group of experts on fractal mathematics could not create a virtual peer-reviewed journal and sell print instances of the journal worldwide.

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The tension rarely surfaces as overt statements of dissatisfaction, but publishers must tend their content producers carefully lest they jump ship or begin giving their information away on a public Web site.

DEEP TENDRILS OF SUBSCRIPTION AGENCIES

Subscription agencies have their tendrils deep into publishing houses and to the libraries the subscription agencies serve. Publishers want to keep the orders coming, but they do not want a subscription agency cutting into the potential revenue of electronic sales without appropriate compensation. Blackwells has tackled this head on by creating STM journals and an e-journal operation within its own subscription agency. Perhaps publishers should buy subscription agencies in order to gain control of this potential challenge to future revenues?

Libraries and not-for-profit online services need to move forward carefully. Armed with the positive image

centric world there may be different ways to grow an orchard of ideas and harvest the fruit of peers' endorsements.

LOOKING TO THE FUTURE

What is ahead? Three developments seem likely to unfold in the months ahead.

First, some of the e-journal initiatives will fail and be absorbed by the more successful services. Consolidation is, it seems, necessary. Revenues are likely to be hard to grow.

Second, customers at the institutional and individual subscriber level are going to become cantankerous. Online is supposed to make access to information easier than slogging through printed information. With the major STM publishers keeping some vital content on proprietary services, a user has to look two or more places for information. Research in STM is at this time arguably more difficult than in the less exciting pre-Web world. When customers speak with their

The peer-reviewing process proceeds on the Web but eliminates most of the friction introduced by traditional publishers, abstracting and indexing companies, online services, and subscription agencies.

Journal publishing is undergoing a not-so-subtle reinvention. It is too early to know how STM will be transformed in the fusion process now beginning.

*President **of** Arnold Information Technology (AIT), **Stephen E. Arnold** is the winner **of** the 1998* Gale *Group Writing Award **for** his previous article in* DATABASE *on push technology. This article is based on a chapter in* Knowledge Value Publishing, *a monograph to be published by Znfonortics Ltd, Tetbury, U.K.*

Communications to the author should be addressed to Stephen E. Arnold, AIT, P.O. Box 320, Harrod's Creek, KY 40027; 502/228-1966; ait@arnoldit.com.