IEEE

IEEE Strategic Issue
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A White Paper by John Vig, VP-elect, Technical Activities,
and Chair, TAB Strategic Planning and Review Committee

Open Access to IEEE Publications

by 2020?

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"You cannot fight against the future. Time is on our side. The great social forces which move onwards in their might and majesty, and which the tumult of our debates does not for a moment impede or disturb - those great social forces are against you; they are marshaled on our side; and the banner which we now carry in this fight, though perhaps at some moment it may droop over our sinking heads, yet it soon again will float in the eye of heaven, and it will be borne... perhaps not to an easy, but to a certain and to a not distant victory. "

W E Gladstone, 1866. [As quoted at an open access advocate's website.]

Executive Summary

The advent of electronic communication is changing the publishing scene. One of the major changes taking place is "open access." Open-access literature is free of charge to everyone. "Open access is a cost-effective way to disseminate and use information. It is an alternative to the traditional subscription-based publishing model made possible by new digital technologies and networked communications…" Open archives and open access journals are growing, with the help of powerful organizations such as universities, corporations, foundations, librarians' organizations, and governments. When these archives conform to standards created by the Open Archives Initiative, then search engines and other tools can treat the separate archives as one.
A directory of open access journals at Lund University claims that there already exist >1000 open access journals. An article in Nature (2001) claims that "over a million research articles are freely available on the web" and that "Articles freely available online are more highly cited." Many IEEE articles are available on authors' and university open archives. (IEEE policy permits this.) Google announced in April 2004 that it is working with MIT to develop a feature of its search tool that will allow users to search specially tagged open access academic content.

Much of the content of IEEE Xplore is the result of government funded research. A growing sentiment is expressed by the following: "we believe that resources that have been generated at taxpayer expense should be available to the public without undue copyright restrictions acting as a barrier to access." A bill introduced in the US House of Representatives by congressman Sabo would mandate open access, i.e., that "…Any Federal department or agency that enters into a [contract, grant, or cooperative agreement] with any person for the performance of scientific research substantially funded by the Federal Government shall include in the agreement a provision that states that copyright protection under this title is not available for any work produced pursuant to such research under the agreement…" If the Sabo bill were to pass in its current form, much of the future content of IEEE Xplore will be open access. Open access is an important issue outside the USA too.

The purpose of this white paper is to bring to the attention of the IEEE leadership the dangers and opportunities posed by open access, and to argue that the IEEE needs to take a position on open access. The position may, for example, be to support the Sabo bill provided that the bill is amended to require not only open access to articles resulting from government funded R&D but also the payment of appropriate article charges from the government contracts/grants.

A model is presented which illustrates one way the IEEE could transition to open access while maintaining the (inflation adjusted) profits the publications business currently produces.

Introduction

"A specter is haunting the publishing industry. It is the specter of "Encyclopaedia Britannica." My first paper on electronic publishing [Odlyzko1] cited "Encyclopaedia Britannica" as an example of a formerly flourishing business that fell into trouble in just a few years by neglecting electronic media. Since that time, "Encyclopaedia Britannica" has collapsed, and it was sold to Jacob Safra, who is investing additional funds to cover losses and revamp the business [Melcher]. The expensive sales force has been dismissed, and while print versions can still be purchased from bookstores, the focus is on electronic products. This collapse occurred even though "Encyclopaedia Britannica" had more than two centuries of tradition behind it, and was by far the most scholarly and best known of the English-language encyclopedias. In the apt words of P. B. Evans and T. S. Wurster,

> Britannica's downfall is more than a parable about the dangers of complacency. It demonstrates how quickly and drastically the new economics of information can change the rules of competition, allowing new players and substitute products to render obsolete such traditional sources of competitive advantage as a sales force, a supreme brand, and even the world's best content."

http://www.amacad.org/publications/trans13.htm

Is the IEEE in danger of becoming another Encyclopaedia Britannica? No, not yet. But, the IEEE currently has taken no position on open access. It is an observer rather than a player in this important game.

The purpose of this white paper is to bring to the attention of the IEEE leadership the dangers and opportunities posed by open access, and to recommend courses of action that can allow IEEE to plan for an orderly transition to open access - without financial ruin.

What is Open Access?

From http://www.earlham.edu/%7Epeters/writing/acrl.htm#Footnote_2:

Open-access literature is defined by two essential properties. First, it is free of charge to everyone. Second, the copyright holder has consented in advance to unrestricted reading, downloading, copying, sharing, storing, printing, searching, linking, and crawling. [Footnote: The only constraint that authors might want to enforce is that no one should distribute mangled or misattributed copies. This is a reason for authors to retain copyright. Authors who don't care to enforce these constraints, or who live in moral-rights countries where they are enforceable even without copyright, could put their works into the public domain.]

From http://www.arl.org/scomm/open_access/framing.html:

- **Open access is a cost-effective way to disseminate and use information.** It is an alternative to the traditional subscription-based publishing model made possible by new digital technologies and networked communications…. The [Budapest Open Access Initiative](), stated that open access would permit users to read, download, copy, distribute, print, search, or link to the full texts of works, crawl them for indexing, pass them as data to software, or use them for any other lawful purpose, without financial, legal, or technical barriers other than those inseparable from gaining access to the Internet itself. Open access does not apply to materials for which the authors expect to generate revenue.
- **Open access operates within the current legal framework of copyright law**. Authors own the original copyright in their works. In the process of publishing, authors can transfer to publishers the right for publishers to post the work freely on the Web, or authors can retain the right to post their own work on institutional or disciplinary servers. Authors, however, retain control over the integrity of their work and have the right to be properly acknowledged and cited.
- **Open access is intended to be free for readers, not free for producers**. The costs of producing digital open-access literature are believed much lower than the costs of producing print literature, but financial and human resources are required. Author or institutional fees for dissemination have been proposed as possible alternatives to the traditional library subscription model for funding the costs of open access…
- **Open access and peer review**. Open access does not mean that peer review is bypassed. Peer review is medium-independent, as necessary for online journals as for print journals, and no more difficult.

[PLoS endorses]() this definition of open access publication drafted by the [Bethesda Meeting]() on Open Access Publishing. However, PLoS has chosen to apply the less-restrictive [Creative Commons Attribution License]() to all works we publish.

[An Open Access Publication][1] is one that meets the following two conditions:

1. The author(s) and copyright holder(s) grant(s) to all users a free, irrevocable, worldwide, perpetual right of access to, and a license to copy, use, distribute, transmit and display the work publicly and to make and distribute derivative works, in any digital medium for any responsible purpose, subject to proper attribution of authorship,[2] as well as the right to make small numbers of printed copies for their personal use.

2. A complete version of the work and all supplemental materials, including a copy of the permission as stated above, in a suitable

standard electronic format is deposited immediately upon initial publication in at least one online repository that is supported by an academic institution, scholarly society, government agency, or other well-established organization that seeks to enable open access, unrestricted distribution, interoperability, and long-term archiving (for the biomedical sciences, PubMed Central is such a repository).

[1] Open access is a property of individual works, not necessarily journals or publishers.

[2] Community standards, rather than copyright law, will continue to provide the mechanism for enforcement of proper attribution and responsible use of the published work, as they do now.

A comprehensive list of open access references is maintained by Peter Suber.

The Advocates' Strategies for Open Access
From http://www.soros.org/openaccess/read.shtml

To achieve open access to scholarly journal literature, we [i.e., the Budapest Open Access Initiative] recommend two complementary strategies.

I. Self-Archiving: First, scholars need the tools and assistance to deposit their refereed journal articles in open electronic archives, a practice commonly called, self-archiving. When these archives conform to standards created by the Open Archives Initiative, then search engines and other tools can treat the separate archives as one. Users then need not know which archives exist or where they are located in order to find and make use of their contents.

II. Open-access Journals: Second, scholars need the means to launch a new generation of journals committed to open access, and to help existing journals that elect to make the transition to open access. Because journal articles should be disseminated as widely as possible, these new journals will no longer invoke copyright to restrict access to and use of the material they publish. Instead they will use copyright and other tools to ensure permanent open access to all the articles they publish. Because price is a barrier to access, these new journals will not charge subscription or access fees, and will turn to other methods for covering their expenses. There are many alternative sources of funds for this purpose, including the foundations and governments that fund research, the universities and laboratories that employ researchers, endowments set up by discipline or institution, friends of the cause of open access, profits from the sale of add-ons to the basic texts, funds freed up by the demise or cancellation of journals charging traditional subscription or access fees, or even contributions from the researchers themselves. There is no need to favor one of these solutions over the others for all disciplines or nations, and no need to stop looking for other, creative alternatives.

Additionally (http://www.arl.org/scomm/open_access/framing.html):

- **PubMed Central**. A digital archive of life sciences journal literature developed, managed, and supported by the National Center for Biotechnology Information at the U.S. National Library of Medicine. Access to PubMed Central is free and unrestricted. Participation in PubMed Central is voluntary and publishers can deposit journal articles at any time. Copyright remains with the journal or author.
- **BioMed Central (BMC)**. An independent commercial publishing house committed to providing immediate free access to peer-reviewed biomedical research. BMC publishes more than 50 online journals in biology and medicine and uses authors' fees and institutional memberships to fund its open access journals. Authors who publish in BMC journals retain copyright.
- **arXiv.org** **e-Print archive**. Started in 1991, arXiv.org is a fully automated electronic archive and distribution server for preprints in physics and related disciplines, mathematics, computer science, and cognitive science. The service, formerly hosted by Los Alamos National Laboratory, was transferred to Cornell in September 2001. It is supported by the US National Science Foundation and Department of Energy.

Why Open Access?

- Budapest Open Access Initiative: Removing access barriers to … literature will accelerate research, enrich education, share the learning of the rich with the poor and the poor with the rich, make this literature as useful as it can be, and lay the foundation for uniting humanity in a common intellectual conversation and quest for knowledge.
- Articles freely available online are more highly cited. For greater impact and faster scientific progress, authors and publishers should aim to make research easy to access.
- Washington Post article: A Fight for Free Access To Medical Research - Online Plan Challenges Publishers' Dominance - Why is it, a growing number of people are asking, that anyone can download medical nonsense from the Web for free, but citizens must pay to see the results of carefully conducted biomedical research that was financed by their taxes?
- NYTimes.com Article: Open Access to Scientific Research
- Information Today article – "Free Public Access to Science—Will It Happen?" It is wrong when a breast cancer patient cannot access federally funded research data paid for by her hard-earned taxes. It is wrong when the family whose child has a rare disease must pay again for research data their tax dollars already paid for.
- "The findings and recommendations presented here are based on the central principle that *publicly funded research data should be openly available to the maximum possible extent. . .* Publicly funded research data are a public good, produced in the public interest." ("Promoting

Access to Public research Data for Scientific, Economic, and Social Development," March 2003, Organisation for Economic Co-operation and Development, http://www.oecd.org/.) The report also pointed out that open access and sharing provides greater returns to the pubic investment in research. These returns are manifested in patents, copyrights, invention, innovation, and new products.

- **BMJ** - 2004;328:1-3 (3 January), Over recent years, journal prices have increased far faster than the underlying rate of inflation (figure). As their budgets have failed to keep up, cash strapped librarians have cut back on subscriptions. To compensate for lost profits, publishers have increased their prices even further—a death spiral that few traditional publishers seem ready to escape… "Taxpayers have already paid for this research—why should they pay for it again?" was the refrain taken up by America's newspapers last summer… Those who contribute most of the value to the process have begun to mutiny. Last October two scientists at University of California San Francisco called for a boycott…
- …libraries and individuals are dropping subscriptions, for a variety of reasons, including rising costs, limited budgets and diminishing space.
- **More evidence that OA increases citation impact** - Here's an excerpt from a November 13 posting to PAMnet by Sarah Stevens-Rayburn on a presentation at the November 3-4 meeting of the American Astronomical Society (AAS) Publications Board in Tucson: "The really fascinating conclusion he [Greg Schwartz of the AAS editorial office] has drawn, at least from my perspective, is that ApJ [Astrophysics Journal] papers that were also on astro-ph [an OA archive, a branch of arXiv] have a citation rate that is _twice_ that of papers not on the preprint server. Moreover, this higher citation rate appears to continue once the time gap disappears (that is, papers on astro-ph are viewed about nine months ahead of the journal paper, but after several years of availability, the astro-ph papers are still being cited at a significantly higher rate)."
- The November 8 issue of *The Lancet* (an Elsevier journal) contains a three-article series on open access. The three articles themselves are openly accessible.

How Widespread is Open Access?

- **The Directory of Open Access Journals**…covers free, full text, quality controlled scientific and scholarly journals... There are now 736 journals in the directory.
- **Article in Nature**: …over a million research articles are freely available on the web.
- **UNESCO's Social Science Online Periodicals** (full text) directory Free access to specialized articles from 367 periodicals in social science
- Tim Brody of Southampton University, has created a Registry for Open Access Eprint Archives . It currently lists 132 "live" Eprint Archives. He

also charts Eprint Archive growth, both in number of archives and in number of papers in the archives.

- **Timeline of the Open Access Movement**

Who Support Open Access?

Among those supporting open access are not just wild-eyed idealists but also many universities, librarians' organizations, foundations, corporations and search engines, such as Google. Those supporting open access include:

- **Association of Research Libraries** (ARL) - ARL is a not-for-profit membership organization comprising the leading research libraries in North America. **SPARC** is an international alliance of 275 academic and research libraries, including 186 libraries in the United States.
- **American Association of Law Libraries**
- **European institutions** support Open Access with the '**Berlin Declaration**' – "The Internet has fundamentally changed the practical and economic realities of distributing scientific knowledge and cultural heritage. For the first time ever, the Internet now offers the chance to constitute a global and interactive representation of human knowledge, including cultural heritage and the guarantee of worldwide access…." Signatories include: "Max Planck Society, Centre, National de la Recherche Scientifique (CNRS), Fraunhofer Society, Chinese Academy of Science,…
- **Wellcome Trust** (UK). "…as a funder of research, we are committed to ensuring that the results of the science we fund are disseminated widely and are freely available to all…
- **Australian government provides support for Open Access projects** - The Australian government has announced an AU$12 million (approximately US$8.5 million) funding initiative to support the management of university information and institutional repositories…
- **Soros Foundation**
- **The Public Library of Science** (PLoS) is a non-profit organization of scientists and physicians committed to making the world's scientific and medical literature a freely available public resource.
- In December 2002, PLoS announced that it has received a $9 million grant from the Gordon and Betty Moore Foundation to launch a nonprofit scientific publishing venture, controlled and operated by scientists for the benefit of science and the public.
- **Howard Hughes Medical Institute** - The HHMI directorate feel that Open access publication is critical to supporting the development of new data-mining methodologies and sophisticated text-searching approaches that are impossible with current publishing practices (see *Open Access Now*, September 8, 2003). The HHMI also feels that expensive subscriptions put

many journals beyond the reach of institutions and libraries in poorer countries and that this situation conflicts with the organization's strong commitment to supporting international science. The HHMI will cover each author's charges up to a maximum of US$3,000 per year.

- **Hewlett-Packard Co. and the Andrew W. Mellon Foundation** - Six major research universities announced this week that they are working with the Massachusetts Institute of Technology to fine-tune an MIT program for archiving scholarly works called DSpace, which has become wildly popular in academe in just a few months. …MIT designed DSpace with **Hewlett-Packard Laboratories** to allow professors to store reports and other research documents in a searchable digital archive. Eventually, MIT officials hope, professors will be able find scholastic research as easily as college students search for MP3's of their favorite music… MIT received a $300,000 grant from the Andrew W. Mellon Foundation to form the federation. That's in addition to a $1.8-million grant from the Hewlett-Packard Company to create the software.

- **Oxford University Press** - The persuasive nature of the Open Access model has driven several traditional publishers to explore how they might transition to Open Access. Notably UK-based publishers Oxford University Press and the Company of Biologists announced that they will be experimenting with author-pays models as an option for authors in the new year.[i.e., 2004]

- **Major Austrian science funding agency signs Berlin Declaration** - The largest science funder in Austria, the Austrian Science Fund has just signed the Berlin Declaration on Open Access to Knowledge in the Sciences and Humanities.

- **Bill & Melinda Gates Foundation** - The Bill & Melinda Gates Foundation has awarded OCLC a three-year, $9 million grant to build a web-based, public access computing portal for public libraries and other organizations that provide open access to information.

- Support for Open Archives Initiative activities has come from the Digital Library Federation, the Coalition for Networked Information, and from National Science Foundation

- **The California Digital Library**

- **Open Archive Forum** (Europe)

- **Open Archives Activities and Experiences in Europe**

- "**NIH** reaffirms its support for the concept of data sharing. We believe that data sharing is essential for expedited translation of research results into knowledge, products, and procedures to improve human health…."

- **December 12, 2003**. The UN **World Summit on the Information Society** approved a Declaration of Principles and Plan of Action that contained explicit, if brief, endorsements of open access to scientific information.

- **GOOGLE TO OFFER SEARCHES OF ACADEMIC PAPERS** "Working with the Massachusetts Institute of Technology (MIT) and 16 other universities, Google is developing a feature of its search tool that will allow users to search specially tagged academic content.

Using a tool called DSpace that MIT developed, colleges and universities can build so-called "superarchives" of scholarly work, including metadata tags that allow for online searches of that content. According to MIT's MacKenzie Smith, about 125 institutions have used DSpace, but there has not been a tool to search across all of these archives. The Google tool will use an interface created by the Online Computer Library Center and will likely be part of the search site's advanced-search page. Smith said she hopes all institutions that use DSpace will eventually be included in the search tool. She also noted that the search capability is not restricted to Google. Other search engines may create search tools specifically for the academic content, said Smith, or "[w]e may even do our own thing."
Chronicle of Higher Education, 9 April 2004"

Who Opposes Open Access?

Commercial publishers, such as Elsevier, oppose open access. At least two professional societies also oppose it:

- The American Chemical Society – see [message from the ACS President](#)
- Federation of American Societies for Experimental Biology – see FASEB [letter to Congressman Sabo](#)

Interestingly, not all commercial publishers oppose open access. At least one supports it, "[BioMed Central](#), an independent publisher of biomedical and clinical journals, produces a newsletter entitled *[Open Access Now](#),* which has been supportive of PLoS' efforts and the *Sabo Bill*."

Can An Open Access Paper Meet IEEE Quality Standards?

Yes. Especially because, often, an open access paper IS an IEEE paper! [IEEE policy](#) permits "Authors and/or their companies… to post their IEEE copyrighted material on their own servers without permission…" More and more authors are posting their papers in open archives. It is self-evident, and there are statistics to prove it, that open access papers are cited more frequently than other papers. Clearly, when an IEEE paper is posted in both IEEE Xplore and an open archive, more researchers have access to the paper; the paper is more likely to be cited.

In addition, peer review is medium independent, i.e., there is no reason for an open access journal's peer review process to be any less rigorous that an IEEE journals'.

"[Journals are not yet ready to risk making the transition to open-access publishing, but 55% of them already officially support author self-archiving](#). And

many of the rest will agree if asked, because no publisher wants to be seen as blocking the research impact of the knowledge that their authors are freely giving them and their peer-reviewers are freely reviewing for them. It is now up to research institutions and funders to extend their "Publish or Perish" policies to "Provide Open Access to Your Publications" so as to maximize the benefits of this give-away knowledge to the tax-paying society that funded it."

In "The Research-Impact Cycle," Harnad shows that the research impact of open access articles is significantly higher than those of "toll-access" articles.

What is the IEEE's Position on Open Access?

The IEEE has not taken a position on the open access issue.

Why Should the IEEE Care About Open Access?

The IEEE has a highly successful publishing operation. Open access is threatening this operation in the following ways:

- **University and self-archiving is growing.** More and more papers (including IEEE papers) are becoming available on university and authors' websites. Search engines can find these papers. The value of PDF downloads from IEEE Xplore will erode as more and more papers are available in open access archives. IEEE PSPB policy states that "Authors and/or their companies shall have the right to post their IEEE copyrighted material on their own servers without permission, provided that the server displays a prominent notice…"
- **Open Access Journals** are growing and are being supported by foundations and librarians' organizations. These journals have begun to compete with IEEE journals. For example, the open access Sensors, is competing with the IEEE Sensors Journal.
- **The Sabo bill** in the US Congress would mandate open access to publications that result from US government supported research.
- **There is evidence that articles freely available online are more highly cited**.
- **Libraries are canceling subscriptions. "**Expenditures for serials by research libraries increased 210% between 1986-2001 while the CPI increased 62%. The typical library spent 3 times as much but purchased 5% fewer titles." Sentiment for open access is rising because rapidly rising journal subscription prices have severely eroded the ability of libraries, universities, and scholars to purchase the publications necessary for research and education.

Can Open Access Be Financially Viable?

This is still an open question, although the evidence is increasingly pointing to YES being the answer - as indicated by:

- **The Nine Flavours of Open Access Scholarly Publishing** …Now what needs to be made clear is that open access, even among journals, is not following a single economic model. Many people dismiss open access out of hand as clearly having no chance of being economically viable as it has no revenue stream. They fail to appreciate that among the various approaches to open access, there is still a place for subscription and other forms of revenue. To help clarify this situation, I present what I would identify as the nine flavours of open access which have demonstrated their viability.

- **Financial analysts warn about impact of changes in the scientific publishing industry** - Two leading financial institutions, BNP Paribas and Citigroup Smith Barney, recently issued stock warnings for large commercial publishers on the basis of an assessment of the threat from Open Access competition… "The significance is that two major financial firms have looked at the business model for Open Access journals and concluded that it is viable," says Suber. "The most common objection from skeptics who acknowledge the benefits of Open Access is that the business model for Open Access journals is untested." Indeed, some critics have suggested that Open Access advocates don't understand the economics of publishing and are naive about the costs. "It's significant, then, when the Open Access advocates are joined by professional financial analysts. Paribas and Citigroup both conclude that the Open Access journal model is sustainable. Paribas concludes that it's more sustainable than the pricing model currently used by nearly all commercially published journals," notes Suber.   Jan Velterop, publisher of BioMed Central, emphasizes that these reports were never meant to demonstrate that Open Access publishing is viable economically. "They just intend to warn (potential) investors that there are forces out there that may have a strong influence on the stock performance of the traditional STM publishers. The potential of Open Access is such a force."

- **BioMed Central** has shown that open access can be a viable business model funded through article processing charges. The success of BioMed Central's institutional membership program, which has attracted more than 30 institutions since January, shows that by spreading the costs of publishing across institutions open access can be maintained. The full list of members currently includes such high profile institutions as Harvard University, the US National Institutes of Health and the World Health Organization.

Most business models rely on two sources of income: article processing charges and institutional membership fees. The IEEE could have these as well as other possible sources of revenue, as is discussed in the next section.

Open Access Business Models for IEEE

There are at least three possibilities for open access:

1) **Open Access** would make all IEEE articles openly available, as of a certain date, but without the extra features that IEEE Xplore provides, such as a powerful search engine, cross referencing, alerting service, etc. Unless others can provide these enhancements better and cheaper, IEEE will still be able to charge for IEL subscriptions. If only articles after a certain date are made openly available, IEEE can charge that much more for IEL.

2) **Partly Open Access** – this would make those articles open access for which the article charges have been paid. IEL would include a mix of open access and not open access articles.

3) **Delayed Open Access** – this would make articles open access after a certain period, e.g., one year. There could be different article charges for delayed open access and immediate open access.

The profits IEEE makes from publications support other activities. Therefore, a basic premise of the business model should be to maintain the (inflation adjusted) publication profits, indefinitely. When the World Book Encyclopedia transitioned from the book version to the electronic version, its revenues declined but its profits increased (because of the lower production and distribution costs of the e-version). Similarly, as the IEEE transitions to e-publications, its costs will decline, and its revenues may also decline, but the profits should remain.

In the business model for open access, four **sources of income** will contribute to IEEE's e-publications income: 1) article charges, 2) investment returns from an endowment, 3) investment returns from reserves, and 4) e-subscription income. Paper publications are not part of the model. They will be either phased out completely, or, if not, then it is assumed that they will be a separate, self-supporting business.

- **Article charges** – if, for example, the Sabo bill became law, and if similar laws were passed by other countries that fund R&D, and if these laws mandated not only open access but also that article charges paid from the government contract or grant, then a $2K article charge would alone cover most of the costs of IEEE e-publications. The attached model assumes that the 2K charge is adjusted each year for inflation, and that the charge is paid for 15K articles by 2021. This would generate an income of $43M

in 2021. (About 13K journal and magazine articles were published in Xplore in 2003, and many more conference proceedings articles. The model assumes linear growth from 3K in 2006 to 15K paying articles by 2021. (If gov't contracts and grants require payment of article charges for conference papers too, then the numbers of paying articles will be much higher.) The table on the next page shows the articles added to IEEE Xplore in 2003 and its potential value.

- **Advertising** - Attach an advertisement to each paper viewed, similar to Google's unobtrusive but highly profitable ads. This potential source of revenue is not included in the model presented below.

- **Institutional membership** – an institutional member's employees/faculty-students would be able to publish articles without paying per article charges. In the attached model, this income is assumed to be a subset of the article charges income.

- **Article charges for legacy content** in IEEE Xplore. Presumably, these charges would be lower than the charge for current articles. Who would be the buyers? Individuals, for example, may buy open access to their publications, or, write in their will that open access be purchased from their estate. A corporation may buy open access for articles authored by its current and past employees. A foundation or wealthy benefactor may buy open access to a package of articles, e.g., all pre-1970 articles, etc. The proceeds of these sales would be deposited into an endowment.

- **Investment returns from the endowment** – with 1 million articles available in Xplore, the value of the legacy content is substantial. The attached model assumes that, by 2021, the endowment grows to $100M and that, therefore, it generates $7.5M per year.

- **Investment returns from reserves** – in the attached model, investment returns from IEEE reserves (currently @95M) are reinvested and allowed to grow at an assumed rate of 7.5% (which is an extrapolation of past investment trends), and then, starting in 2021, half the returns are used to fund the publishing operation and half for other purposes. In 2021, this income source would contribute $11.4M.

- **Income from e-subscriptions** – IEEE Xplore (IEL) will retain value far into the future. As long as some articles are not open access, it will have a substantial value. Even after all articles are open access (which may take a long time), as long as it provides added value (a powerful search engine, cross referencing, alerting service, etc.) it will have value that individuals and institutions will be willing to pay for, if the price is commensurate with the added value.

Articles Added to IEEE Xplore in 2003
As of 1 Feb 2004

Pub type	No. added in 2003	Portion	Total in Xplore, including legacy content	Portion
IEEE Periodical	17,225	25.6%	279,401	27.8%
IEEE Conference	47,336	70.4%	651,962	64.8%
IEEE Standard	64	0.1%	1,724	0.2%
IEE Periodical	2,608	3.9%	38,472	3.8%
IEE Conference	11	0.0%	34,116	3.4%
Total (IEEE + IEE)	**67,244**		**1,005,675**	
Total, IEEE only	*64,625*			

Potential income if all IEEE articles paid a $1500 article fee = $97M

In the "An Open Access to IEEE Publications Model" spreadsheet, the model assumes that the e-publication revenues will be $50M in 2006 and will increase with the CPI during the transition period.

The model shows one way that IEEE could transition to open access by the end of the year 2020. The model has adjustable parameters, so, anyone with better data, or a better crystal ball, may adjust the numbers and play "what if".

Why 2020? There is no particular reason except "by the end of the decade" has a nice ring to it. Some SPARC colleagues felt that open access by the end of the current decade is unrealistic; that the end of the next decade would be a more realistic goal. Sooner would be better. Market forces may give us no choice but to do it sooner.

How would the costs be affected if the IEEE started with "a clean sheet of paper" and designed a publishing system for taking the accepted papers from Manuscript Central and processed them for uploading into IEEE Xplore, without regard to the needs of the paper versions? This is a study worth doing. The financial aspects of open access are being debated. One excerpt from an on-line debate follows.

What Does Electronic Publishing Cost? …The entire superstructure is set up to hurtle headlong toward print on paper, so if you recalculate that budget and leave out the print-run and a few other things, you find you're left with 75% of the original expenses. Solution? Exorcise everything having to do with going into paper, from the bottom up. Budget an electronic-ONLY journal, and the per-page cost will come out much, much lower (if anything, my 25% is an OVER-estimate).

To put it another way: Your way of doing the figures is rather like challenging the advantages of automobiles by calculating how much they would save on horse-feed.

Recommendations

The following actions are recommended:

- That the Board of Directors adopt a statement of principle on open access based on the recommendation of a joint committee of SPC, TAB SPARC, and PSPB's SPC. The statement may be as simple as, for example, "The IEEE supports the goal of open access to IEEE publications provided that a viable business model for open access can be developed."
- That the IEEE President appoint an ad-hoc committee to develop a business model.
- That the IEEE take a position on the Sabo bill in the US Congress, and similar initiatives. The position may, for example, be to support the Sabo bill provided that the bill is amended to require not only open access to articles resulting from government funded R&D but also the payment of appropriate article charges from the government contracts/grants.
- That IEEE Xplore search not only IEEE-IEE content but also the content of open archives.
- That the IEEE's publication business be split into two parts, an e-publication business and a self-supporting paper publication business. The focus of the e-publication business should be to transfer papers from Manuscript Central into IEEE Xplore as efficiently as possible, without much regard to the needs of the paper publication business. The costs of the additional processing of paper publications should be born by the paper publication business. The paper publication business' needs should not be allowed to delay or add to the costs of e-publications.

References and Excerpts from the Open Access Literature

Framing the Issue – Open Access
http://www.arl.org/scomm/open_access/framing.html

Overview of Open Access
http://www.soros.org/openaccess/pdf/Melissa_Hagemann.pdf

The Rationale for "Full and Open Access" of Scientific Information
http://www.amacad.org/publications/trans15.htm

Directory of Open Access Journals. This service covers free, full text, quality controlled scientific and scholarly journals. We aim to cover all subjects and languages. There are now 736 journals in the directory.
http://www.doaj.org/

News About Open Access, www.earlham.edu/~peters/fos/fosblog.html and www.biomedcentral.com/openaccess\

The Public Library of Science (PLoS) is a non-profit organization of scientists and physicians committed to making the world's scientific and medical literature a freely available public resource.
http://www.publiclibraryofscience.org/

DSpace is a groundbreaking digital institutional repository that captures, stores, indexes, preserves, and redistributes the intellectual output of a university's research faculty in digital formats. Developed jointly by MIT Libraries and Hewlett-Packard (HP), DSpace is freely available to research institutions worldwide as an open source system that can be customized and extended.
http://www.dspace.org/
There are dozens if not hundreds of web sites devoted to institutional repositories and associated technologies and initiatives. This section lists projects related to DSpace, institutional repositories, related technologies, and digital preservation.
http://dspace.org/news/projects.html

EPrints.org - Self-Archiving and Open Archives - dedicated to opening access to the refereed research literature online through author/institution self-archiving.
http://www.eprints.org/

Caltech Collection of Open Digital Archives (CODA)
http://library.caltech.edu/digital/

ArXiv is an openly accessible, moderated repository for scholarly papers in specific scientific disciplines. Material submitted to arXiv is expected to be of interest, relevance, and value to those disciplines. ArXiv was developed to be, and remains, a means for specific communities of scientists to exchange information.
http://arxiv.org/

The Academic Research in the Netherlands Online (ARNO), aims to develop and implement university document servers to make available the scientific output of participating institutions.
http://www.uba.uva.nl/projecten/object.cfm?objectid=1A103F4F-A900-4FCF-9BA16965AAE3D75E

Budapest Open Access Initiative …**open access**, has so far been limited to small portions of the journal literature. But even in these limited collections, many different initiatives have shown that open access is economically feasible, that it gives readers extraordinary power to find and make use of relevant literature, and that it gives authors and their works vast and measurable new visibility, readership, and impact.

Open access to peer-reviewed journal literature is the goal. **Self-archiving (I.)** and a new generation of **open-access journals (II.)** are the ways to attain this goal. They are not only direct and effective means to this end, they are within the reach of scholars themselves, immediately, and need not wait on changes brought about by markets or legislation…. The Open Society Institute, the foundation network founded by philanthropist George Soros, is committed to providing initial help and funding to realize this goal.
http://www.soros.org/openaccess/read.shtml

The text of the Sabo bill, H.R.2613, the ''Public Access to Science Act,'' …''…Any Federal department or agency that enters into a [contract, grant, or cooperative agreement] with any person for the performance of scientific research substantially funded by the Federal Government shall include in the agreement a provision that states that copyright protection under this title is not available for any work produced pursuant to such research under the agreement…It is the sense of the Congress that any Federal department or agency that enters into funding agreements…should make every effort to develop and support mechanisms for making the published results of the research conducted pursuant to the agreements freely and easily available to the scientific community, the private sector, physicians, and the public.''
http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=108_cong_bills&docid=f:h2613ih.txt.pdf

For info on the status of the Sabo bill
http://thomas.loc.gov/cgi-bin/bdquery/z?d108:h.r.02613

The first scholarly article with a review of the Sabo bill, written by Samuel Trosow (80 pages). The paper considers how the balancing of interests that has historically informed copyright policy should be applied to works that have been federally supported; it reviews and assesses the initial reactions to PASA [The Public Access to Science Act, i.e., the Sabo bill] from the point of view of various stakeholders including the commercial publishers, non-commercial publishers, universities, authors and researchers, and library associations; and it considers whether the PASA's purposes might be accomplished through other mechanisms. The conclusion is reached that works resulting from extramural research that has been substantially subsidized by the Federal Government should enter the public domain in the same manner as works resulting from intramural government research undertaken by federal employees, and that PASA provides a straightforward mechanism for reaching this result...
http://publish.uwo.ca/~strosow/Sabo_Bill_Paper.pdf

The Association of Research Libraries (ARL) and SPARC (the Scholarly

Publishing and Academic Resources Coalition) support the goal of timely, sustained, and reliable open access to federally funded research and encourage broad discussion on the most effective strategies to achieve this goal….A variety of strategies have been proposed to achieve this goal, including the recent introduction of legislation by Congressman Martin Sabo (D-MN) to place articles reporting on federally funded research into the public domain (H.R. 2613, the Public Access to Science Act of 2003). ARL and SPARC welcome the platform this legislation has provided for public discussion of these important issues.
http://www.library.yale.edu/~llicense/ListArchives/0308/msg00035.html

Wellcome Trust - A position statement by the Wellcome Trust in support of open access publishing, www.wellcome.ac.uk/en/1/awtvispolpub.html

Article by the Pres., Am. Chemical Soc. opposing the Sabo bill, Jan 5, 2004.
Excerpt: "Rep. Martin O. Sabo (D-Minn.) has proposed legislation that would require free access to publication of federally supported research. This would effectively remove copyright protection for ACS and other scientific journals. It would bias the publishing system toward the open-access model and would fatally damage publications of scientific societies. ACS has taken a strong position against the Sabo bill because the legislation would destroy ACS's ability to fulfill its mission of providing high-quality chemical publications at a reasonable cost.

I think that the solution to soaring library costs does not lie with open-access publishing but rather with electronic journals from scientific societies that are made available at reasonable costs. The solution will also require scientists to exert pressure on commercial publishers. The time has come for chemists who are editors or editorial board members of commercial journals to use their considerable influence to strongly urge publishers to greatly reduce their prices. I believe it is also time for chemists to consider whether they will continue to support exorbitantly priced commercial journals by serving as editors, editorial board members, authors, and referees!"
http://pubs.acs.org/cen/coverstory/8201/8201president.html

A letter opposing the Sabo bill from the President of the Federation of American Societies for Experimental Biology
http://www.faseb.org/opa/news/docs/sabo.pdf

American Association of Law Libraries…"…we believe that resources that have been generated at taxpayer expense should be available to the public without undue copyright restrictions acting as a barrier to access."
http://www.ll.georgetown.edu/aallwash/lt081820031.html

Letter to NIH Director by library organizations in support of open access - SPARC and several major U.S. library organizations sent a letter

dated 01.06.04 to NIH Director Dr. Elias Zerhouni urging NIH to support publishing in open access journals as part of their research grants. This suggestion is included as part of a more general offer to join with the institute in a discussion about the current problems in scholarly communication.
http://www.arl.org/sparc/resources/OpenAccess-Zerhouni.pdf

NIH's Statement on Sharing Research Data - NIH reaffirms its support for the concept of data sharing. We believe that data sharing is essential for expedited translation of research results into knowledge, products, and procedures to improve human health. The NIH endorses the sharing of final research data to serve these and other important scientific goals. The NIH expects and supports the timely release and sharing of final research data from NIH-supported studies for use by other researchers. Starting with the October 1, 2003 receipt date, investigators submitting an NIH application seeking $500,000 or more in direct costs in any single year are expected to include a plan for data sharing or state why data sharing is not possible.
http://grants.nih.gov/grants/guide/notice-files/NOT-OD-03-032.html

Washington Post article on the PLoS. "Why is it, a growing number of people are asking, that anyone can download medical nonsense from the Web for free, but citizens must pay to see the results of carefully conducted biomedical research that was financed by their taxes?
The Public Library of Science aims to change that. The organization, founded by a Nobel Prize-winning biologist and two colleagues, is plotting the overthrow of the system by which scientific results are made known to the world -- a $9 billion publishing juggernaut with subscription charges that range into thousands of dollars per year. In its place the organization is constructing a system that would put scientific findings on the Web -- for free.
…Nature does not reveal financial details, but figures released by the largest publisher of scientific journals -- Amsterdam-based Elsevier -- help explain why many scientists and others are frustrated. Its 1,700 journals, which produce $1.6 billion in revenue, garner a remarkable 30 percent profit margin.
…The PLoS plan is simple in concept: Instead of having readers pay for scientific results through subscriptions or other charges, costs would be borne by the scientists who are having their work published -- or, practically speaking, by the government agencies or other groups that funded the scientists -- through upfront charges of about $1,500 an article.
http://www.washingtonpost.com/wp-dyn/articles/A19104-2003Aug4.html?referrer=emailarticle

Nature – Web Debates
One thing that is certain in these uncertain times is that there will be much experimentation. This is unavoidable, since nobody can be sure how scholarly communication will evolve. We will be working our way free of the shackles imposed by Gutenberg's print technology and exploring the novel flexibility of the electronic medium for some time to come. A prominent feature of the evolution that is unfolding is the acceleration of communication. A recent article (by A. M.

Campbell in Science in April 2001) about a new high temperature superconductor noted that '.every superconductivity laboratory in the world immediately began to make measurements on this new material and dash into print. Fifty e-prints had been posted on the Web by the end of February -- before the original paper was even published.' Some traditionalists bewail this hurried pace of research and publication, but that is how the world is evolving. No group that has embraced rapid electronic communication has been willing to relinquish it. The leisurely pace we have grown used to was forced on us by the print medium and was not a result of an informed choice.
http://www.nature.com/nature/debates/e-access/Articles/odlyzko.html

An Economic Analysis of Scientific Research Publishing - A report commissioned by the Wellcome Trust (UK). "…as a funder of research, we are committed to ensuring that the results of the science we fund are disseminated widely and are freely available to all… It is up to the players in the market to decide how they will use the means at their disposal. The dominance of the commercial publishers will be challenged only if other players use the opportunities available to them."
http://www.wellcome.ac.uk/en/images/SciResPublishing3_7448.pdf

Bethesda Statement on Open Access Publishing - statements of principle drafted during a one-day meeting held on April 11, 2003 at the headquarters of the Howard Hughes Medical Institute in Chevy Chase, Maryland.
http://www.earlham.edu/%7Epeters/fos/bethesda.htm

Free Public Access to Science—Will It Happen? An article by *Miriam A. Drake is professor emerita at the Georgia Institute of Technology Library, July 7, 2003.* "Sabo said: "It is wrong when a breast cancer patient cannot access federally funded research data paid for by her hard-earned taxes. It is wrong when the family whose child has a rare disease must pay again for research data their tax dollars already paid for."The legislation would preclude private publishers from claiming copyright on articles written about the results of research funded by the federal government. Scientific, technical, and medical publishers will need to find ways to finance the value-added services they provide, their distribution costs, and profits for their shareholders. The proposed legislation added that funding agencies entering into funding agreements: "should make every effort to develop and support mechanisms for making the published results of the research ... freely and easily available to the scientific community, the private sector, physicians and the public." This section implies that government agencies will need to include funding mechanisms for publication, such as page charges, in their contracts so that the goals of the legislation can be achieved.…The drive to maximize the availability of scientific research results is not confined to the U.S. It is international. The Organization of Economic Cooperation and Development (OECD) established a working group in 2001 to study issues related to access to research information. The OECD has 30 member countries in Europe, Asia, Africa, North America, and Australia. The working group's final report, issued

earlier this year, stated: "The findings and recommendations presented here are based on the central principle that ***publicly funded research data should be openly available to the maximum possible extent. . .*** Publicly funded research data are a public good, produced in the public interest." ("Promoting Access to Public research Data for Scientific, Economic, and Social Development," March 2003, http://www.oecd.org/.) The report also pointed out that open access and sharing provides greater returns to the pubic investment in research. These returns are manifested in patents, copyrights, invention, innovation, and new products.The Sabo bill by itself will not guarantee free and open access to science and medical research results. The bill may motivate and encourage new ways of communicating research results, new business models, and new ways of financing publication of research results. The bill is not likely to pass both houses of Congress. Publishers, trade associations, and others interested in preserving the current system of publication will fight the legislation with "education" campaigns and money. History reveals that easy access to information makes a difference. Open and free access to basic knowledge results in the creation of useful knowledge that contributes to international health and wealth. New models of communication will require collaboration among universities, publishers, professional societies, and government. While Congress is not likely to see the value of open access and sharing, many feel that the concept will succeed because the time is right."
http://www.infotoday.com/newsbreaks/nb030707-2.shtml

Online or Invisible? Article in Nature by Steve Lawrence; … Articles freely available online are more highly cited. For greater impact and faster scientific progress, authors and publishers should aim to make research easy to access. …Although availability varies greatly by discipline, over a million research articles are freely available on the web. Some journals and conferences provide free access online, others allow authors to post articles on the web, and others allow authors to purchase the right to post their articles on the web.
http://external.nj.nec.com/~lawrence/papers/online-nature01/

New York Times, Op-Ed "Open Access to Scientific Research" (August 7, 2003). …Articles freely available online are more highly cited. For greater impact and faster scientific progress, authors and publishers should aim to make research easy to access.
http://www.nytimes.com/2003/08/07/opinion/07THU3.html

Sabo bill sparks copyright controversy – article in *Open Access Now*
' "The bill is really fairly simple. I think that it's a fundamental principle that research that has been funded by the public sector should be generally available to the public free of charge," Sabo told Open Access Now. He feels strongly that US residents shouldn't have to pay twice - once through taxation to fund research and a second time to gain access to the results.' This article also includes the text of the Sabo bill.
http://www.biomedcentral.com/openaccess/archive/?page=features&issue=3

SPARC, the Scholarly Publishing and Academic Resources Coalition, is an alliance of universities, research libraries, and organizations built as a constructive response to market dysfunctions in the scholarly communication system.
http://www.arl.org/sparc/

CREATE CHANGE is a response to the serious crisis in scholarly communication. A number of factors, chiefly the dramatic increases in journal costs and the increasing commercialization of scholarly publishing, have decreased scholars' access to essential research resources all over the world. CREATE CHANGE seeks to address the crisis in scholarly communication by helping scholars regain control of the scholarly communication system– a system that should exist chiefly for them, their students, and their colleagues in the worldwide scholarly community, not primarily for the benefit of publishing businesses and their shareholders.
http://www.createchange.org/home.html

BMJ - For supporters of open access publishing, these are heady times. Over the past year the campaign to make the full text of original research articles freely available via the world wide web has made rapid progress (box). .. "Taxpayers have already paid for this research—why should they pay for it again?" was the refrain taken up by America's newspapers last summer.
http://bmj.bmjjournals.com/cgi/content/full/328/7430/1

George Soros Gives $3 Million to New Open Access Initiative
http://www.infotoday.com/newsbreaks/nb020218-1.htm

What Does Electronic Publishing Cost? …The entire superstructure is set up to hurtle headlong toward print on paper, so if you recalculate that budget and leave out the print-run and a few other things, you find you're left with 75% of the original expenses. Solution? Exorcise everything having to do with going into paper, from the bottom up. Budget an electronic-ONLY journal, and the per-page cost will come out much, much lower (if anything, my 25% is an OVER-estimate). To put it another way: Your way of doing the figures is rather like challenging the advantages of automobiles by calculating how much they would save on horse-feed.
http://www.arl.org/scomm/subversive/sub04.html

J. Willinsky has written extensively on the rationale and costs of open access. His publications are available (open access) at
http://pkp.ubc.ca/publications/index.html

Open Archives and Intellectual Property: Incompatible World Views? - A presentation to **The Second Open Archives Forum Workshop,** *Open Access to Hidden Resources*, Lisbon, 6 December 2002

http://www.oaforum.org/documents/wspres.php

Overview of OAI Activity in Europe, Susanne Dobratz (Humboldt University)
http://www.oaforum.org/documents/wspres.php

JSTOR - The Scholarly Journal Archive…"archives more than 300 journals in various disciplines…"…"created with the assistance of The Andrew W. Mellon Foundation…"
http://www.jstor.org/

HighWire Press is a division of the Stanford University Libraries,… hosts the largest repository of free full-text life science articles in the world, with more than 600,000 free, full-text articles online.
http://highwire.stanford.edu/

The Case for Institutional Repositories, presentation by Rick Johnson, Association of Research Libraries (ARL)
http://www.arl.org/IR/case_files/frame.htm

Creating a global knowledge network, Paul Ginsparg, "If we were to start from scratch today to design a quality-controlled archive and distribution system for research findings, would it be realized as a set of "electronic clones" of print journals? Could we imagine instead some form of incipient knowledge network for our research communications infrastructure? What differences should be expected in its realization for different scientific research fields? Is there an obvious alternative to the false dichotomy of "classical peer review" vs. no quality control at all? What is the proper role of governments and their funding agencies in this enterprise, and what might be the role of suitably configured professional societies?…The essential question for "Electronic Publishing in Science" is how our scientific research communications infrastructure should be reconfigured to take maximal advantage of newly evolving electronic resources. Rather than "electronic publishing" which connotes a rather straightforward cloning of the paper methodology to the electronic network, many researchers would prefer to see the new technology lead to some form of global "knowledge network", and sooner rather than later…. The order of magnitude conclusion is that costs on the order of some irreducible **$1000** per peer-reviewed published article should be expected, using current methodology… A key point of the electronic communication medium is that the cost to archive an article and make it freely available to the entire world in perpetuity is a tiny fraction of the amount to produce the research in the first place. This is, moreover, consistent with public policy goals [3] for what is in large part publicly funded research.
http://arxiv.org/blurb/pg01unesco.html

For Whom the Gate Tolls? - How and Why to Free the Refereed Research Literature Online Through Author/Institution Self-Archiving, Now, Stevan Harnad
http://www.ecs.soton.ac.uk/~harnad/Tp/resolution.htm

Let All Knowledge Be Free That Wants to be Free, Stevan Harnad, "Journals are not yet ready to risk making the transition to open-access publishing, but 55% of them already officially support author self-archiving. And many of the rest will agree if asked, because no publisher wants to be seen as blocking the research impact of the knowledge that their authors are freely giving them and their peer-reviewers are freely reviewing for them. It is now up to research institutions and funders to extend their "Publish or Perish" policies to "Provide Open Access to Your Publications" so as to maximize the benefits of this give-away knowledge to the tax-paying society that funded it.
http://www.ecs.soton.ac.uk/~harnad/Temp/gazette.html

DECLARING INDEPENDENCE, "We scientists *can* exercise control of our journals. We can transform them from commercial commodities back to instruments of service to education and research. When we are in control, we fulfill our responsibility to ourselves, to society, to our institutions, and to our colleagues throughout the world…."
http://www.arl.org/sparc/di/toc.html

A comprehensive list of open access references is maintained by Peter Suber.

GOOGLE TO OFFER SEARCHES OF ACADEMIC PAPERS
Working with the Massachusetts Institute of Technology (MIT) and 16 other universities, Google is developing a feature of its search tool that will allow users to search specially tagged academic content. Using a tool called DSpace that MIT developed, colleges and universities can build so-called "superarchives" of scholarly work, including metadata tags that allow for online searches of that content. According to MIT's MacKenzie Smith, about 125 institutions have used DSpace, but there has not been a tool to search across all of these archives. The Google tool will use an interface created by the Online Computer Library Center and will likely be part of the search site's advanced-search page. Smith said she hopes all institutions that use DSpace will eventually be included in the search tool. She also noted that the search capability is not restricted to Google. Other search engines may create search tools specifically for the academic content, said Smith, or "[w]e may even do our own thing." Chronicle of Higher Education, 9 April 2004
http://chronicle.com/free/2004/04/2004040901n.htm

Definitions, from http://www.oaforum.org/tutorial/english/page1.htm

Open Archive Initiative (OAI)
OAI is an initiative to develop and promote interoperability standards that aim to facilitate the efficient dissemination of content.

Archive
The term "archive" in the name Open Archives Initiative reflects the origins of the OAI in the e-prints community where the term archive is generally accepted as a synonym for repository of scholarly papers. Members of the archiving profession have justifiably noted the strict definition of an "archive" within their domain; with connotations of preservation of long-term value, statutory authorization and institutional policy. The OAI uses the term "archive" in a broader sense: as a repository for stored information. Language and terms are never unambiguous and uncontroversial and the OAI respectfully requests the indulgence of the professional archiving community with this broader use of "archive".
(OAI definition quoted from FAQ on OAI Web site)

OAI Protocol for Metadata Harvesting (OAI-PMH)
OAI-PMH is a lightweight harvesting protocol for sharing metadata between services.

Protocol
A protocol is a set of rules defining communication between systems. FTP (File Transfer Protocol) and HTTP (Hypertext Transport Protocol) are examples of other protocols used for communication between systems across the Internet.

Harvesting
In the OAI context, harvesting refers specifically to the gathering together of metadata from a number of distributed repositories into a combined data store.

Data Provider
A Data Provider maintains one or more repositories (web servers) that support the OAI-PMH as a means of exposing metadata.
(OAI definition quoted from FAQ on OAI Web site)

Service Provider
A Service Provider issues OAI-PMH requests to data providers and uses the metadata as a basis for building value-added services. (OAI definition quoted from FAQ on OAI Web site) A Service Provider in this manner is "harvesting" the metadata exposed by Data Providers

Additional Definitions, from http://www.ecs.soton.ac.uk/~lac/archpol.html

An *eprint* is the digital text of a peer-reviewed research article, either before or after refereeing and publication.

A *preprint* is any version of an article before the final, refereed, revised, accepted draft.

A *postprint* is any version of an article from the refereed, accepted, final draft onwards (including post-publication corrections and revisions).

Metadata is information about an eprint, usually the name of the authors, the title, date, journal *etc.*

To *self-archive* is to deposit a digital document you have written in a publicly accessible website.