The SPARC initiative: a catalyst for change.

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Abstract
SPARC was started in 1997 by a number of large research libraries in the US. Its main goal was restore a competitive balance of the STM journals publishing market. A number of programmatic areas were initiated in order to realize this goal: SPARC Alternatives, SPARC Leading Edge, SPARC Scientific Communities, and SPARC Communication and Advocacy. Since two years SPARC puts a special emphasis on Open Access, including institutional repositories.
The paper gives an overview of the activities of SPARC and its partners in these areas. The results are evaluated and compared with the measures defined in 1997.
Finally, the paper describes the possibilities for libraries to contribute to the realization of SPARC's goals.

1. Introduction

'Publish or perish' is an adage that we are all familiar with. It is mirrored by the growth in the number of scientific papers. As a consequence of this growth, the existing publishing system is troubled by considerable problems.
One of the main problems is that the system is sluggish: it takes several months, sometimes up to a year and a half, before a submitted paper actually appears in print. Because of this delay, the role of the present traditional scientific journal in scientific communication is seriously diminished. Very often scientists use other means to communicate about their results, for instance by sending each other pre prints of their articles. The main added value of the journal is in the quality assessment: it has become a distinct factor in evaluating academic research programs and sometimes even are the base for the funding of research groups (Guédon, 2001). This contrasts with the reasons to start the first scientific journals in the 17th century: scientists needed to record research results, making known that it was *their* result and to communicate with their peers about these results.

Another important aspect of the traditional system of scientific publishing is that it is becoming unaffordable because of vast price increases, which are often higher than the general price index. These rises lead to the canceling of subscriptions, which in turn cause new increases.

The conclusion is that the system is in urgent need of innovation and, in principle, that innovation is easy with the help of modern information technology. In practice, however, innovation seems difficult to achieve. The traditional commercial publisher is not anxious to stimulate innovations that could seriously change the established process of scientific communication. His main reason for being in the publishing business is making a profit. Innovations are uncertain and thus pose a threat to the stability of his business and profit.

Also many scientists are cautious when it comes to publishing their results. They are not eager to publish in media other than established journals with high reputation. This is partly understandable because of the crucial role traditional journals play in quality assessment procedures. To a large extent, scientists derive their reputation from the journal's reputation. Furthermore, they are often unaware of the financial problems caused to libraries by the pricing policies of publishers.

While traditional publishers are reluctant to change the system of academic publishing, the promise of the internet to expand information usage and the promise of technology to reduce costs has not been sufficiently realized. As a consequence, the academic community itself is undertaking projects that may lead to innovation. It can afford to do so, because with the help of information technology, the distribution of its members' publications is a less hazardous activity than it was in the world of print publications (Savenije, 2003a).

In the US, the Association of Research Libraries (ARL) proposed several projects intended to address the crisis in scholarly publishing, but reaching consensus among the membership on a way forward was difficult. In May of 1997, at an ARL membership meeting, Ken Frazier, Director of Libraries at the University of Wisconsin, Madison, proposed that "If 100 institutions would put up $10,000 each to fund 10 start-up electronic journals that would compete head to head with the most expensive scientific and technical journals to which we subscribe, we would have $1 million annually" (Case, 2001b).

Within six months, Frazier's proposal had a name: SPARC, the Scholarly Publishing and Academic Resources Coalition. A business plan was in development, and potential partnerships were under discussion. In June 1998, a SPARC Enterprise Director was hired (Richard Johnson) and the first partnership (with the American Chemical Society) was announced.
Since 2001 there is also SPARC Europe, operating under the umbrella of LIBER, the association of European research libraries.

This paper describes the objectives and actions of SPARC and evaluates its results. But first the background, the reason for its existence will be examined: the problems in the journals market place.

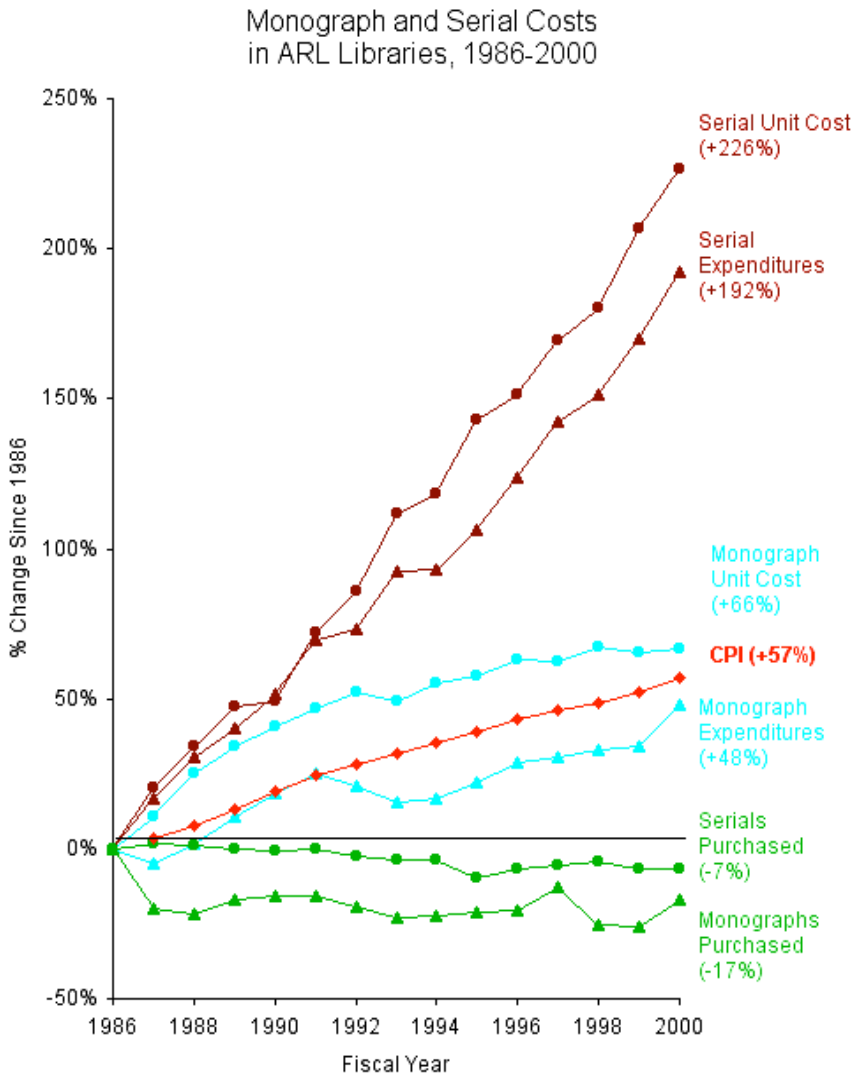
2. Problems in the journals market place

In this chapter, the following aspects of the journals market will be evaluated, with emphasis on STM journals (Science, Technology, and Medicine) (Savenije, 2003b):

- pricing policy,
- competition,
- mergers.

Pricing policy

The central aspect of the so-called serials crisis is the phenomenon that price increases of scholarly journals cause cancellations by libraries, which in turn are followed by new price increases. This development is illustrated by the following graph (Case, 2001a).



Graph 1. Monograph and Serial Costs in ARL libraries 1986 – 2000 (Case, 2001a)

Table 1 shows some examples of journal prices and their increase between 1995 and 2001.

Table 1. Sample of journal prices (Case, 2001a)

	1995	**2001**	**% Change**
Brain Research	$10,181	$17,444	71.3%
Biochem. Biophys. Acta	$7,555	$12,127	60.5%
Chem. Phys. Letters	$5,279	$9,637	82.6%
Tetrahedron Letters	$5,119	$9,036	76.5%
Eur. Jrnl. of Pharmacology	$4,576	$7,889	72.4%
Gene	$3,924	$7,443	89.7%
Inorganica Chem. Acta	$3,611	$6,726	86.3%
Intl. Jrnl. of Pharmaceutics	$3,006	$5,965	98.4%
Neuroscience	$3,487	$6,270	79.8%
Theoretical Computer Science	$2,774	$4,608	66.1%
Jrnl. of Exp. Marine Bio. & Eco.	$1,947	$3,501	79.8%

It is an interesting question whether these price increases differ by type of publisher, for instance: are they the same for commercial publishers and non-profit publishers? From the following overview, it can be seen that there are large differences between the different types of publishers and that commercial publishers have the largest increase.

Table 2. Average price increase by type of publisher (Tenopir & King, 2000)

	average price		**increase factor**	
	1975	1995	current $	constant $
commercial	$ 55	$ 487	8,9	3,1
society	$ 28	$ 229	8,2	2,9
educational	$ 15	$ 81	5,4	1,9
other	$ 40	$ 119	3,0	1,1
all types	$ 39	$ 284	7,3	2,6

What might be the reasons for these price increases in commercial scientific publishing? (Office of Fair Trading, 2002; McCabe, 1998).

Does the price inflation reflect increased costs? An extensive review of the relevant literature revealed that the actual cost of journal editing and printing do not seem to have suffered any unusual run-up during the past decade.

Reed Elsevier often presents the argument that there has been investment in the development of electronic methods for delivering journals by email and over the internet, and that the number of articles published in each journal has increased significantly. But

at the same time, one might have expected the increasing use of information technology to have reduced the marginal costs associated with producing and delivering journals. Furthermore, while the same developments can be observed with non-profit publishers, the average prices of commercial journals, nevertheless, appear to be substantially higher than those of non-profit journals.

Are the price increases the consequence of a simple application of supply and demand analysis? Library budgets are rather fixed so large increases in the population of available titles might induce librarians to cancel some titles as they add new ones. A decline in a title's circulation will eventually force firms to raise prices as they attempt to cover the fixed costs of publication. In other words, everything else equal, a smaller subscriber base necessitates higher prices. Demand for new titles eventually results in higher prices across the board.
However, an analysis by Roger Noll (referred to by McCabe, 1999) shows that significant price inflation has occurred independent of changes in circulation. Thus, even after accounting for the effect of circulation on prices, there remains a large unexplained increase in prices.

Do these price differences perhaps reflect differences in circulation size and discipline? Surveys covering a wide variety of academic disciplines report that the prices of many commercial journals appear much higher that non-profit alternatives even when allowing for some key sources of difference.

Another explanation might be that commercial publishers produce a high proportion of journals with small print runs. In an industry with high fixed costs and low variable costs per journal, this could result in higher average costs for commercial publishers. There is, nevertheless, no evidence for this.

If commercial publishers use their more profitable journals to support less profitable ones, this may explain the high prices for the former. However, it is far from clear why commercial publishers would want to do that. It also would not help to explain the overall observed price disparity.

An alternative hypothesis might be that the publishers offer subsidised subscriptions to individuals, and this contributes to price increases for institutions ('cross subsidisation'). However, there is no evidence that suggests this is the case.

Furthermore, there is no evidence on the failure rate of new titles, which might indicate high risk as a justification for high prices.

In addition to this, Wyly (1998) has analysed that the overall profitability of commercial STM publishing is high, not only in comparison to non-profit journals, but also in comparison to other commercial journal publishing.

Usually competition brings forward a decrease of prices; are there any factors that might prevent competition from working in scientific publishing?

Competition

Notwithstanding their high subscription fees, the profit publishers have a large share of the market. The following table illustrates this for the STM market. It presents for the largest publishers their number of journals (in 1998) and their share (as a percentage) of the total number of STM journals. It can be seen that 15 publishers constitute 50% of the market. The eight largest publishers are commercial.

Table 3. Publishers of ISI-rated STM journals (OFT, 2002)

		1998 number	share %
1 Elsevier Science	commercial	1347	18
2 Wolters Kluwer	commercial	552	7
3 Blackwell	commercial	341	4
4 Bertelsmann	commercial	326	4
5 Wiley	commercial	279	4
6 Taylor & Francis	commercial	191	2
7 Sage	commercial	123	2
8 Karger	commercial	101	1
9 Inst. E&E Engineers	society	93	1
10 Cambridge Un. Press	univ. press	84	1
11 Gordon & Breach	commercial	84	1
12 Oxford Un. Press	univ. press	83	1
13 Marcel Dekker	commercial	76	1
14 Holzbrinck	commercial	67	1
15 Am. Inst. Of Physics	society	41	1
Others (2034 publishers)		3922	50

This certainly raises some questions about the characteristics of the market of scholarly journals. There are a number of aspects that are typical for this market, especially in the STM sector.

First, there is inelastic demand: price competition is not a dominant feature of the market. Many journals have a particular reputation and there is often unwillingness of researchers and institutions to substitute a cheaper journal for an expensive one. The price sensitivity of demand for many journals is thus very low and journals are generally perceived as competing on quality rather than price. Certain journals can even be regarded as markets in their own right.
Secondly, there are certainly barriers to entry ('positional advantage'): it appears to be very difficult for a new journal to become established and secure a strong reputation. Also, on the demand side, the limited budget of libraries is an immediate barrier to establishing a new journal successfully. On the supply side, the overall position of the leading journals remains very strong in almost all fields of STM research.

Is there any reason to expect that competition might work better from now on?

Price increases of, for instance, Elsevier Science, used to be more than 10% per year but are recently not as large as they used to be:
2000 7,5 %
2001 6,7%
2002 6,5%

But we have to keep in mind that the US Consumer Price Index in these 3 years together was only 8%.

There also is not much influence to be expected from 'buyer power': historically buyer power does not appear to have constrained price increases by commercial scientific journal publishers.

Considerations as described above have led the Office of Fair Trading to the following conclusion: "We believe that there is evidence that the market for STM journals may not be working well." (Office of Fair Trading, 2002)

Mergers and acquisitions

In this context, a striking phenomenon in the commercial scientific publishing market is the number of mergers and acquisitions. Mergers and acquisitions result, of course, in a small number of rather large market players.

Robinson (2003) gives an overview of mergers and acquisitions in the period 1990-2000:
- Bertelsmann buys Random House for $ 1.5 billion;
- Bertelsmannn buys 80% of Springer Verlag for $ 600 million;
- Elsevier buys Compendex;
- Wolters Kluwer buys Plenum;
- Pearson buys Simon & Schuster for $ 4.6 billion;
- AOL buys Time Warner for $ 165 billion;
- CSA buys R.R. Bowker;
- Taylor & Francis buys Gordon & Breach for $ 31.5 million;
- Vivendi buys Houghton Mifflin for $ 2.2 billion;
- Reed Elsevier buys Harcourt General for $ 5.7 billion;
- Wolters Kluwer buys Ovid Technologies for $ 200 million;
- Wolters Kluwer buys Silverplatter;
- Swets and Blackwell merged in 2000 and acquired Martinus Nijhoff;
- Elsevier buys Endeavour.

And recently Cinven & Candover purchased Bertellsmann Springer (with Kluwer Academic), resulting in the second largest publisher in the world.

From the library world there is often a lot of opposition towards mergers and acquisitions. They turn, for instance, to the Office of Fare Trading in the UK and to the regulatory authority in the US, the Federal Trade Commission and Department of Justice.

In the US, the antitrust rule of thumb is that a merger or purchase must give one firm control of at least 35 % of the marker to trigger an intervention.
Only a few mergers have been abandoned after confronting antitrust scrutiny, including the proposed merger of Reed Elsevier and Wolters Kluwer.

But competition among STM journals does not function in the same manner as it does among trade magazines, because each journal is a unique entity with a reputation and position in the scientific world and some core titles are indispensable to coverage of a field. Libraries attempt to provide access to as many titles as possible. In this type of market, each seller holds a higher degree of power over the market than in an industry where buyers only purchase one product. When reviewing proposed mergers, antitrust authorities should consider the decision-making process used by libraries, the primary customers of academic publishers (Susman et al., 2003).

Mark McCabe (1999, 2001) has analyzed the STM market and notes that the 35% market share rule for customary market monopoly control does not apply. Because each journal has a narrowly defined focus, one title cannot be substituted for another. He proposes a portfolio model that identifies a core group of titles and traced their prices as a group, by publisher, enabling him to identify increases due to merger effects.
All else equal, publishers set prices so that higher use (or quality) journals exhibit lower cost-per-use ratios. Thus, higher use journals are purchased by most libraries.
Conversely, lower use journals are purchased by fewer, relatively high budget libraries.
Higher use imparts a cost advantage that makes it more profitable for publishers to price low and sell widely. Using this model it is possible to show, in some cases, that mergers are profitable for journal publishers. A corollary is that the merged firm's journal prices increase. The merged firm is able to internalize certain pricing externalities that the merging parties fail to consider when they act independently. Larger portfolio firms are better able to capture these benefits and therefore, all else equal, set prices at a higher level.
McCabe's conclusion is that mergers increase subscription costs. The following examples support this conclusion.
After Elsevier (190 biomedical titles) bought Pergamon (57 biomedical titles), Pergamon titles increased 27% and Elsevier prices increased 7%.
The Lippincott/Kluwer merger generated a post merger (1991-1994) price increase of 35% in former Lippincott titles.
Thus, economies of scale, if achieved, were not passed on to the subscribers.

In addition to this, societies' journals are taken over by commercial publishers:
- 10 of Elsevier's 13 new titles in 2001 were drawn from scholarly associations.
- 10 of Sage's 35 new titles in 2002 represented societies' contracts.

These imperfections of the journal market place are the background for the birth of SPARC.

3. SPARC and its activities[1]

SPARC is a membership organization whose original mission is to restore a competitive balance to the STM journals publishing market by encouraging publishing partners (for example, societies, academic institutions, small private companies) to launch new titles that directly compete with the highest-priced STM journals or that offer new models that better serve authors, users and buyers. In return, libraries agree to purchase those titles that fall within their collections parameters.

At this moment around 310 libraries and library organizations are a member of SPARC, including 100 members of SPARC Europe (in 14 different countries). Members pay a modest annual membership fee and, as far as SPARC in the US is concerned, agree to the purchase commitment.

SPARC pursues a number of strategies to be successful.
In the first years SPARC categorized its efforts into a number of programmatic areas:
- SPARC Alternatives,
- SPARC Leading Edge,
- SPARC Scientific Communities,
- SPARC Communication and Advocacy.

SPARC Alternatives

The first and most directly competitive of SPARC's programs is the SPARC Alternatives. SPARC Alternatives are titles that compete directly with high-priced STM journals. The first partnership in this category was that with the American Chemical Society (ACS) which agreed to introduce three new competitive titles over three years. *Organic Letters*, the first of these, began publication in July 1999 (http://pubs.acs.org/orglett). Organic Letters competes with *Tetrahedron Letters*, a $ 9036 title (2001 subscription price) published by Elsevier Science. ACS, one of the largest professional societies in the world and highly respected for its quality publications program, was able to attract three Nobel laureates and 21 members of the National Academy of Sciences to its new editorial board. 250 articles were posted on the Organic Letters website and more than 500 manuscripts were submitted in its first 100 days.

A 2001 subscription to Organic Letters costs $ 2,438. The effects of this new offering have already been felt. The average price increase for Tetrahedron Letters for several years had been about 15%. For 2000, just after Organic Letters was introduced, the price increase of Tetrahedron Letters was only 3%; in 2001 it was 2%.
Even if the title had increased at the more modest average rate of the Elsevier Science titles for 2000 (7.5%) and 2001 (6.5%), subscribers would be paying over $ 800 more for Tetrahedron Letters in 2001 than they were actually paying.

[1] This chapter makes extensive use of the information contained in Mary Case's publications (2001b, 2002).

Even more importantly, the introduction of Organic Letters has had a significant impact on the number of pages and articles published by Tetrahedron Letters.
During the second half of 1999, the number of articles in Tetrahedron Letters declined by 21% compared to the same period in 1998 and the number of pages declined by 12%. In the first half of 2000, the number of articles decreased 16% compared to the first half of 1999 while the number of pages actually increased 5%.
The loss in articles has been compensated for by increasing the number of pages per article, in the second half of 1999 by 11% and the first half of 2000 by 24%.
Organic Letters, in the meantime, surpassed its projected pages and articles and has clearly demonstrated that quality, low-cost alternatives can attract authors.

Another example of the SPARC Alternative program is *Evolutionary Ecology Research* (EER), a title founded by Michael Rosenzweig, a Professor of Ecology and Evolutionary Biology at the University of Arizona (www.evolutionary-ecology.com). In the mid-1980's, Rosenzweig founded and edited *Evolutionary Ecology* with Chapman & Hall. The title was subsequently bought and sold, most recently in 1998 to Wolters Kluwer. During these years, the journal's price increased by an average of 19% a year. Fed up by the price increases and the refusal of the publishers to take their concerns seriously, the entire editorial board resigned. In January 1999, they launched their own independent journal published by a new corporation created by Rosenzweig. A subscription to EER was priced at $ 305, a fraction of the cost of the original title ($ 800).

As of the end of 2000, EER had published 16 issues while the original title published only 6. Authors had no qualms submitting their papers to this new journal edited by respected scholars in the field. In fact, 90% of the authors withdrew their papers from Evolutionary Ecology when the editorial board resigned. EER was quickly picked up by the major indexes, surmounting yet another hurdle that faces new publications. And, most significantly, EER broke even in its first year.

Very recently, SPARC has started a partnership with *Labor: Studies in Working Class History in the Americas* (www.dukeupress.edu/labor). This is the first partnership in humanities. It concerns a new journal founded by the entire editorial board of *Labor History*, a commercial title owned by Taylor & Francis. The new journal was created in response to "irreconcilable differences" between the editorial board and Taylor & Francis. The new journal is available in print for $ 200, which is 20% less than the commercial title, and $ 180 for electronic subscriptions.

SPARC has a number of other titles in the Alternatives program. These include:

- *Algebraic & Geometric Topology*, and also *Geometry & Topology*, two free online journals published by Geometry & Topology Publications. They are alternatives to *Topology and its Applications* and *Topology*, respectively.
- *Crystal Growth and Design*, published by the American Chemical Society. It is an alternative to *Journal of Crystal Growth*.
- The *Journal of Machine Learning Research*, a computer science publication by MIT Press, offered in a free web version. It is an alternative to *Machine Learning*.

- *Theory & Practice of Logic Programming*, the official journal of the Association for Logic Programming. It is an alternative to *Journal of Logic and Algebraic Programming*.

A complete list of SPARC partners can be found at http://www.arl.org/sparc.

SPARC Leading Edge Partnerships

The aim of the Leading Edge program is to support the development of new models in scholarly publishing. It supports efforts of discipline-based communities that use technology to obtain competitive advantage or introduce innovative business models. Here are some examples of the Leading Edge program.

The *New Journal of Physics* (www.njp.org) jointly sponsored by the Institute of Physics (U.K.) and the German Physical Society, is experimenting with making articles available for free on the web and financing production through the charging of fees to authors whose articles are accepted for publication.

The *Internet Journal of Chemistry* (www.ijc.com) is experimenting with attracting authors by providing a mechanism to develop new techniques, new resources, new databases, etc. It offers the ability to include full 3-D structures of molecules, color images, movies and animation, and large data sets. It also allows readers to manipulate spectra. This electronic only journal was created by an independent group of chemists in the U.S., the U.K., and Germany.

Documenta Mathematica (www.math.uiuc.edu/documenta) is a free web-based journal published by faculty at the University of Bielefeld in Germany since 1996. A printed volume is published at the end of each year. Authors retain copyright to articles published in the journal and institutional users are authorized to download the articles for local access and storage.

BioMed Central (www.biomedcentral.com) is committed to publishing original research articles covering topics in biology, medicine and the life sciences. They are immediately and permanently available online without charge or any other barriers to access. All articles of BioMed Central's journals (over 90) are fully and rapidly peer-reviewed. BioMd Central is a for-profit company which operates its journals via institutional membership and article processing fees. BioMed Central currently has 396 members.

Public Library of Science (PLoS) (www.plos.org) has received a grant to start and promote open access journals. The first journal, *PLoS Biology*, was started in October 2003. It employs a model in which peer-reviewed research articles are freely available to read and use through the internet. The costs of publication are recovered from publication fees by the authors. PLoS journals are also available in print, but these require subscriptions to cover printing and distribution costs.

Directory of Open Access Journals (DOAJ, www.doaj.org) aims to comprehensively list open access journals that use a control system to assure content quality. It includes

journals in scientific and scholarly subject areas and published in any languages. It is maintained by the University of Lund in Sweden.

SPARC Scientific Communities

Projects in the Scientific Communities program are intended to support broad-scale aggregations of scientific content around the needs of specific communities of interest. Through these projects, SPARC encourages collaboration among scientists, their societies, and academic institutions. The Scientific Communities program helps to build capacity within the not-for-profit sector by encouraging academic institutions to develop electronic publishing skills and infrastructure, and seeks to reduce the sale of journal titles by providing small societies and independent journals alternative academic partners for moving into the electronic environment.

One of the most ambitious projects in the Scientific Communities is BioOne (www.BioOne.org), a non-profit, web-based aggregation of peer-reviewed articles from dozens of leading journals in adjacent areas of biological, environmental, and ecological sciences. Until then, most of these journals were available only in print.
While there is a risk to societies of offering electronic versions of their titles through institutional site licenses, i.e., the loss of personal member subscriptions, there is a greater danger that scholarship not in electronic form will be overlooked and marginalized. But many of the societies do not have the resources or expertise to create web editions on their own. BioOne provides that opportunity.

BioOne is a partnership among SPARC, the American Institute of Biological Sciences, the University of Kansas, the Big 12 Plus Library Consortium, and Allen Press. SPARC and Big 12 Plus Library Consortium members have contributed significant funds to the development of BioOne. These funds will be returned over a five year period as credits against their subscriptions.
From the outset, the BioOne funding partners agreed that as much as revenues as possible should go directly to the societies that had chosen to publish through BioOne. In 2002 the average journal received just over $ 8500 in revenue, which was equivalent to 52 subscriptions of the print version of the average BioOne journal (Joseph & Alexander, 2003).

Examples of other Scientific Communities projects that have received support from SPARC, are the following.

- *eScholarship* from the California Digital Library (http://escholarship.cdlib.org). Its goal is to create an infrastructure for the management of digitally-based scholarly information. eScholarship includes archives of e-prints, tools that support submission, peer-review, discovery and access, and use of scholarship, and a commitment to preservation and archiving.
- *Columbia's Earthscape* (www.earthscape.org): a collaboration among Columbia University's press, libraries, and academic computing services. The project integrates earth sciences research, teaching, and public policy resources. The site's content includes full-text books, a quarterly online magazine (*Earth Affairs*), video clips,

current journal articles, lectures and seminars, conferences, policy papers and commentary, maps and models, searchable databases, links, and live web-casts of crucial conferences.

- *MIT CogNet* (http://cognet.mit.edu): an electronic community for researchers in cognitive and brain sciences. It brings together many of the pre-eminent resources and makes them available in one online repository. These resources include major reference works and books in searchable, full-text PDF by the MIT Press. CogNet also features full-text of seven MIT Press journals and searchable abstracts of over 30 journals from other publishers.
- *Project Euclid* (http://projecteuclid.org). Cornell University Library's project Euclid is an initiative to advance effective and affordable scholarly communication in theoretical and applied mathematics and statistics. It is designed to address the unique needs of low-cost independent and society journals. Through a collaborative partnership arrangement, these publishers join forces and participate in an online presence with full-text searching, reference linking, interoperability through the Open Archive Initiative, and long-term retention of data.

Communication and Advocacy.

From the very beginning, communication has been a critical component of the SPARC agenda.

Raising faculty awareness of the issues in scholarly publishing is a important aspect of the SPARC program. Faculty who understand the context and are reconnected with the reality of journal prices are more likely to change their submission habits if there is a reasonably priced prestigious or promisingly prestigious alternative. This educational effort is also intended to encourage editors to become more engaged in the business aspects of the titles for which they work.

SPARC's communications efforts expanded in 2000 to include the development of the advocacy campaign, Create Change. This campaign includes print and web resources designed to aid faculty and librarians in learning about and advocating changes in scholarly communication. The site also includes a database of editors of the 100 most expensive journals. Furthermore, there is a brochure available for distribution. Members are encouraged to adapt the brochure to local conditions. There are French and English versions with data relevant to the Canadian situation. There also is a UK version.

Create Change was followed by Declaring Independence, a project directed at faculty editors. Declaring Independence provides journal editors with the tools to assess whether the business practices and policies of their publishers are allowing their journals to serve best the needs of their disciplines. It is a handbook that has also been translated in several other languages.

A companion piece to Declaring Independence is a web resource titled Gaining Independence. It intends to aid institutions and small, society based publishing ventures in developing start-up business plans. It will help build competitive and viable services

more quickly by learning from experiences from others. In addition, SPARC also offers a fee-based consulting service.

4. Towards Open Access

Especially in the beginning, most of the SPARC partners, particularly the traditional publishers, have maintained the typical subscription model for their new titles. A number of titles, however, started experimenting with alternative models, directed at Open Access. Especially in the past two years SPARC has put more and more emphasis on promoting and supporting initiatives that strive towards Open Access.
Actually, this has led to the situation that the Alternatives program is no longer the central thrust of SPARC's efforts. Of course, SPARC continues to support alternatives, because of the role they play in improving accessibility and creating awareness. In order to improve access to scientific information, solutions have to be found through experimentation. Together with experiments in other areas (like licensing, for instance) the Alternatives Program has laid the groundwork for a fundamental and systematic change.

According to the Budapest Open Access Initiative, Open Access can be defined as follows: "By 'open access' to this literature, we mean its free availability on the public internet, permitting any users to read, download, copy, distribute, print, search, or link to the full texts of these articles, 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. The only constraint on reproduction and distribution, and the only role for copyright in this domain, should be to give authors control over the integrity of their work and the right to be properly acknowledged and cited." (www.soros.org/openaccess/read.shtml)

Open Access eliminates two kinds of access barriers: price barriers and permission barriers associated with restrictive use of copyright, licensing terms, or digital rights management.

Here are some examples of activities by SPARC partners towards Open Access.

Three journals hosted by university mathematics departments were taking advantage of the ease of web-based publishing to offer their products online for free. *Geometry & Topology* (www.maths.warwick.ac.uk/gt) and *Algebraic & Geometric Topology* (www.maths.warwick.ac.uk/agt) are both hosted by the University of Warwick (U.K.). *Documenta Mathematica* (www.math.uiuc.edu/documenta) is published at the University of Bielefeld in Germany. All three produce a printed volume at the end of the year which is available at a minimal cost. According to the editors of Geometry & Topology, the most time-consuming part of the publishing process is the formatting of papers. This work is being subsidized in part through the sale of the paper editions.

Another model is being explored by the *Journal of Machine Learning Research* (JMLR) (www.ai.mit.edu/projects/jmlr). JMLR is published by JMLR, Inc. in partnership with the MIT Press. Two electronic versions are offered: a free site and a paid electronic edition. The paid version provides additional features including linking to abstracting and indexing services, archiving, and mirror sites around the world. Quarterly paid print editions are also available from MIT Press.

A third model, which gradually is becoming more popular, is the charging of a fee to authors whose papers are accepted for publication.
I already mentioned the *New Journal of Physics* (NJP, www.njp.org), published by the Institute of Physics and the German Physical Society. It is an electronic only journal and available to the reader for free. A fee of $ 500 is charged to authors whose works are published.
Also BioMed Central and the Public Library of Science work with this model, combined with an institutional membership.
The author fee of BioMed Central is $ 525 and of PLoS $ 1500.

As can be seen in the Directory of Open Access Journals (mentioned above), the number of Open Access journals is growing rapidly. To support this movement SPARC carries out investigations towards business models and provides consultancy for Open Access initiatives.

Another example of SPARC's contribution to Open Access can be found in an article of David Prosser, director of SPARC Europe (Prosser, 2003). The article describes a scenario for the transition from a traditional subscription based journal to an open access journal.

Suppose there is a journal which has both a print and electronic version. It, then, presents its authors two options for a publication charge:

- The author pays the charge: the online version of his article will be available with open access.
- The author does not pay the charge: then the online version of his article will only available for subscribers.

The income from the author charges enables the publisher to decrease the subscription fee. Next, the benefits of open access for the authors are measured (more citations, e.g.) and used to recruit more authors that are willing to pay. Also pressure is to be put on funding agencies. They should include in their grant policy that grants for publication are part of the research grant. The argument for this is that a publication is the dissemination of the research's results and thus can be seen as the last stage of the research process.

This scenario is tested by a number of publishers.

- Oxford University Press experiments in this direction with *Nucleic Acid Research*.
- The Entomological Society of America works with this model for four journals (*Annals of the Entomological Society of America*, *Journal of Economic Entomology*, *Environmental Entomology*, *Journal of Medical Entomology*).

- The American Society of Limnology and Oceanography (*Limnology & Oceanography*).
- The American Physiological Society (*Physiological Genomics*).
- The Company of Biologists (three journals: *Development*, *Journal of Cell Science*, and *Journal of Experimental Biology*).
- Hindawi Publishing Corporation (*EURASIP Journal of Applied Signal Processing*).
- The National Academy of Sciences (*Proceedings of the National Academy of Sciences)*.

In 2003, the Information program of the Open Society Institute (OSI) and SPARC published a number of planning guides concerning Open Access (www.soros.org/openaccess/oajguides):
- Guide to business planning for launching new open access journal;
- Guide to business planning for converting a subscription-based journal to open access;
- Model business plan: A supplementary guide for open access journal developers and publishers.

Also SPARC provides consultancy for Open Access initiatives. In the first months of 2004, already 16 initiatives have made use of this service.

Repositories

Open Access journals are not the only way towards toll-free access to scientific publications. Another promising road is formed by the phenomenon of institutional repositories (Johnson, 2002).
During the past year, SPARC has been following the promise and progress of early-stage institutional repositories: digital collections capturing and preserving the intellectual output of a single or multi-university community. Institutional repositories are a practical, cost-effective, and strategic means for institutions to build partnerships with their faculty to advance scholarly communication.
Institutional repositories build on a growing grassroots faculty practice of posting research online, most often on personal web sites, but also on departmental sites or in disciplinary repositories. This demonstrates a desire for expanded exposure of, and access to, their work. In addition, digital publishing technologies, ever-expanding global networking, and enabling interoperability protocols and metadata standards are coalescing to provide practical technical solutions that can be implemented now. The convergence of these interrelated strands indicates that institutional repositories merit serious and immediate consideration from academic institutions and their constituent faculty, librarians, and administrators.

SPARC views the development of institutional and disciplinary e-archives as an important strategic direction for the future of scholarly communication. This belief is reinforced by SPARC's recent experience in bringing together stakeholders to discuss the prospects for institutional repository building. Their evident energy and activity give

cause for optimism that institutional repositories are an emerging dimension of scholarly communications.

SPARC examined the strategic roles institutional repositories serve for colleges and universities, resulting in a position paper: "The Case for Institutional Repositories: A SPARC Position Paper" (http://www.arl.org/sparc/IR/ir.html). This publication is a very useful instrument to convince scientist and administrators of the usefulness of institutional repositories. Also SPARC published a manual detailing the issues that institutions and consortia need to address in implementing an institutional repository: the "SPARC Institutional Repository Checklist & Resource Guide" (www.arl.org/sparc/IR/IR Guide.html)

The rationale for universities and colleges implementing institutional repositories rests on two interrelated propositions:

1. New Scholarly Publishing Paradigm.
   While institutional repositories centralize, preserve, and make accessible an institution's intellectual capital, at the same time they will form part of a global system of distributed, interoperable repositories that provides the foundation for a new disaggregated model of scholarly publishing. This model unbundles the principal functions of scholarly communication, thus presenting the potential to realize market efficiencies previously hidden by the vertically integrated publishing model that now characterizes academic journal publishing.
2. Institutional Visibility and Prestige.
   Institutional repositories, by capturing, preserving, and disseminating a university's collective intellectual capital, serve as meaningful indicators of an institution's academic quality.

SPARC creates awareness for institutional repositories by presentations, publications and seminars. SPARC also supports the Open Archives Initiative, an effort to develop standards to link distributed electronic archives.

5. Evaluation

When SPARC was founded, a number of measures were set out by which its success could be determined. These included:

- SPARC supported projects are financially viable and significantly less expensive.
- SPARC supported products are attracting quality authors and editors.
- New players have entered the STM marketplace.
- An environment where editorial boards have been emboldened to take action has been created.
- STM journal price increases have moderated significantly (Case, 2002).

There certainly are signs the SPARC is having the desired impact.

In the SPARC Alternative program financially viable alternatives are set up. Quality content is offered for a much lower price than the already existing alternative**.**
For instance, Crystal Growth & Design had a 49% increase in pages in 2003.
Organic Letters papers are now among the most requested from Chemical Abstracts.
Submissions in 2003 increased approximately 15% over 2002. The website averages over 200.000 hits per month.

Through the Scientific Communities program, SPARC is supporting new players in the market. Partnerships have included libraries, library consortia, and academic computing centers working with societies, university presses, independent journal boards, and individual faculty. These projects are still developing but give a clear indication of the long term possibilities for expanding not-for-profit publishing capacity.
Important new players are BioMed Central and the Public Library of Science.

SPARC has also been very successful to date in focusing attention on issues through its advocacy and public communications efforts. This in turn has created an environment where editorial boards and societies are beginning to question their publishers about pricing and other policies. This has led to a number of new titles in the SPARC Alternatives Program. But also some of these negotiations are successful, leading to the lowering of prices as happened recently in the case of American Journal of Physical Anthropology. The American Association of Physical Anthropologists was concerned over the many cancellations of its journal that had resulted from high prices. The Association and the Publications Committee informed the publisher of its title that they were considering options, including the possible launch of a competitive journal. After extensive negotiations, the publisher and the Association were able to come to terms, which resulted in a reduction in the subscription price of more than 30%.

The ultimate aim of SPARC is to make scientific research more accessible. In 2000, the overall average increase in STM journal subscriptions fell below 9% for the first time since 1993. Elsevier Science, the largest STM journals publisher in the world, announced in 1999 that it was ending the days of double-digit price increases and set increases for 2000 at 7.5% and 2001 at 6.5%. These changes are significant.
For most SPARC member libraries, the savings represented by this decline is far more than their investment in SPARC and the creation of a more competitive market environment.

The Open Access movement is gaining more and more momentum. According to the Wall Street Journal, Open Access can be considered a threat for Reed Elsevier. It also mentions Open Access as one of the Top 10 Health Stories in 2003. Science Magazine calls Open Access one of the seven breakthroughs in 2003. Scientist and Nature both mention Open Access as one of five major Science stories in 2003.

The road to Open Access through institutional repositories has received worldwide support. In several countries there are national initiatives (Australia; SHERPA in the UK, www.sherpa.ac.uk); DARE in the Netherlands, www.darenet.nl). According to the site of

the project OAIster[2] (http://oaister.umdl.umich.edu/o/oaister) there are at this moment 282 repositories with altogether more than 3 million records. There is also a growing awareness of the importance of institutional repositories with university administrators as well as funding agencies.

While SPARC may not be the only cause of these changes, it does seem clear that by raising the profile of the issues and achieving some early 'proof of concept' success, SPARC has emboldened librarians, scholars, and societies to take action. Competition can work.

6. The role of libraries

There are a number of ways in which libraries can support the goals of SPARC and make scientific research more accessible.

Libraries can subscribe to titles that have a favorable subscription price and cancel titles that are extremely expensive. Of course, the power of libraries is limited, because they have to take into account the wishes of the faculties who often pay directly for the acquisition of monographs and periodicals. But raising awareness about pricing policies may help, as recent examples in the US have shown: a number of libraries refused to sign the Elsevier Science Big Deal license with explicit faculty support.
In this context it is also important that libraries raise awareness about Open Access titles. Sometimes libraries treat these titles in a different way in their catalogue or alerting systems, because they do not haven to pay a subscription fee. This is awkward, because in this way Open Access journals would be punished for being free.

Libraries can give financial support to initiatives that lower the threshold towards scientific information, such as Open Access movements. For instance, they can become a SPARC member. Also they can pay the institutional membership fee for BioMed Central and the PLoS, thus making it more attractive for faculty to publish in their journals. They can also pay the publication fee for authors in their institution that want to publish in journals that are working with the author payment model. Of course, this financial support comes on top of traditional subscription prices, while on the longer term they are supposed to replace subscription fees. For the moment, however, these payments should be considered as long term investments, a contribution towards a change of the system.

Another way for libraries to support the accessibility of scientific information is publishing scientific journals themselves, together with faculty. Libraries can perform a number of the traditional publisher's role (organization of quality assessment by peers, distribution and creating awareness). Because they can make us of existing expertise and infrastructure, the additional costs will be affordable. Examples of libraries that do this are the libraries of the University of Arizona (Journal of Insect Science,

[2] OAIster is a project of the University of Michigan Digital Library Production Services. Its goal is to create a collection of freely available, difficult-to-access, academically oriented digital resources that are easily searchable by anyone.

www.insectscience.org) and Utrecht University in the Netherlands (among others the International Journal of Integrated Care, www.ijic.org). Useful help for these kind of activities can be found in the SPARC/OSI planning guides mentioned above.

Furthermore, libraries can set up an institutional repository for their parent institution, thus helping the researchers of their universities to archive their publications. They can make us of the white book published by SPARC.

Last, but not least, libraries can perform a crucial role in creating awareness among faculties, university administrators and funding agencies. Awareness about the situation in the scholarly publishing market and about the alternatives may change the submission behavior of scientists. It also may be a step towards the creation of new alternatives. Finally, more awareness among faculty will be useful in discussions about the library's financial problems caused by price rises and licensing policies of commercial publishers.

7. Concluding remarks

Is the state of scholarly publishing improving or getting worse? Are Open Access initiatives having any impact on scholarly publishing? It is a matter of perspective: is the glass half empty, or is it half full? (Crow, 2004)
One might say that the pace of change in scholarly publishing is agonizing slow and relatively slight. But on the other hand, the various initiatives are having a cumulative effect and are really gaining momentum.
Nevertheless, we see commercial consolidation, commercial earnings, bundling and price increases. Large STM publishers continue to merge. And at the same time library budget situation are getting worse, and higher education is in financial straits. There is reason for concern, but on the other hand: one couldn't ask for a better environment for change.

The problems in the STM journals market, as well as Open Access initiatives, are getting more and more visibility beyond the library. I already mentioned faculty reactions towards the Big Deals, the growth of the number of Open Access journals (1083 in May 2004, according the DOAJ), and the press attention.
But there is also increased governmental attention. In the UK there is the Science & Technology Committee Inquiry into Scientific Publications. The Committee is investigating pricing policies for scientific journals, focusing particularly on Big Deals as well as open access initiatives. In the US in June 2003 representative Martin Sabo introduced a bill to the Congress that would make research papers ineligible for copyright protection if written by scientists who received substantial federal financing for their work. The Sabo bill never progressed but, it sent shock waves through the scientific publishing industry (Johnson, 2004).

It is impossible to predict what the future of scientific publishing will look like. But is quite safe to predict that the present model of scientific publishing will not prevail on the longer term and that one or more new models will emerge out of the developments that are currently taking place.

SPARC's activities and results may at least be qualified as a serious contribution to this change.

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