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### **Spreading the word: who profits from scientific publications**

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### **Abstract**

Academic libraries should be considered research tools, co-evolving with technology. The Internet has changed the way science is communicated and hence also the role of libraries. It has made it possible for researchers to provide Open Access (OA) (i.e., toll-free, full-text, on-line access, web-wide) to their peer reviewed journal articles in two different ways: (1) by publishing in them in OA journals and (2) by publishing them in non-OA journals but also self-archiving them in their institutional OA Archives. Librarians are researchers' best allies in both of these OA provision strategies. Some of the best examples of these pioneering libraries are described in this article. From them we conclude that an official mandate for OA provision is necessary to accelerate the growth of OA – and thereby the growth of research usage and impact -- worldwide.

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Progress in research is based on a worldwide collaborative, cumulative, and self-corrective cycle of publishing, accessing, and using research findings in order to generate further findings, applications and publications. For researchers to be effective, to maximise their scientific impact, their research needs to be well informed. This is why libraries are a research tool in the same way that a pipette or a microscope is; and like laboratories, libraries must be funded. Today, however, even the richest research institution's library cannot afford all the research periodicals published annually, and hence their researchers cannot access all available and necessary research information: this means a loss in scientific productivity, progress and impact. Librarians must purchase the information required by their researchers, providing the maximum value for the funds available, as rapidly as possible. Librarians today need to be aware of technical developments resulting from the Internet era and must adopt and adapt to the new tools provided by computer science, continuing to provide storage and retrieval independently of the medium (on-paper or on-line).

### **The Internet has changed the way science is communicated.**

The development of central, discipline-specific online archives was the first sign of the potential for a new openness in scientific communication. Archives like ArXiv, Cogprints, NCSRTL, REPEC, etc., were created in the nineties. Today we would call them « Open Access » (OA) archives, because their full-text contents are accessible online, toll-free for all, worldwide. But to have access to articles scattered throughout numerous disparate archives is not efficient: too much time and effort is wasted if information has to be searched for individually, archive by archive. A significant step forward for OA was provided by Carl Lagoze and Herbert van de Sompel in 1999 in creating a new metadata-tagging

protocol to make OA archives interoperable: the Open Archive Initiative (OAI, not to be confused with OA !).

The definition given by the creators of the OAI protocol was as follows: “The Open Archives Initiative promotes and encourages the development of self-archiving solutions (...) through the development of technical mechanisms and organizational structures to support interoperability of e-prints archives” [1]. This interoperability – achieved by tagging metadata such as author, title, journal, date, etc. in a uniform, standardised way -- makes it possible to search, navigate and harvest all the distributed archives jointly, as if they were only one global virtual archive. This interoperability gave a considerable boost to the OA movement. Specific OAI tools (Open Source) have been developed, the first ones at Southampton University, such as, Eprints.org, the software for creating OAI compliant archives and Citebase for citation-linking and citation-ranking of OA articles. Soon further tools began to be developed in different universities around the world. e.g. OAIster, ARC, for search services, etc. OAI interoperability helped raise awareness of the feasibility and benefits of what was officially baptised with the name “OA” at the founding of the Budapest Open Access Initiative (BOAI) on 14 February 2002, [2] BOAI alerted all researchers worldwide to the possibility of providing OA to their journal articles by two means: BOAI-1: creating institutional OA archives and self-archiving their published journal articles in them or BOAI-2: creating/converting and publishing their in OA Journals (journals that recover their costs by charging the author-institution for publication rather than the charging user-institution subscription/licensing tolls for access).

The benefits of OA for the researcher are easy to understand. OA increases scientific impact. Scientific impact can be measured by different means: citation-counts of the journal in which the article appears, citation-counts for the article, citation counts for researcher, citation counts for the pre-print, usage measures (download counts) (which are early predictors of later citations), co-citation and co-text analysis, and ever newer and richer digital performance indicators derivable from online full-text OA content. Evidence of this OA advantage in research impact has been provided by S. Harnad, T. Brody and collaborators who found that in physics self-archived (hence OA) articles were cited 2-4 times as many citations as non-OA articles in the same journal and year [3]. Increased research impact is rewarded by researchers’ institutions and funders, hence it advances researchers’ careers and increases their grant support ; it also enhances their university’s prestige and, most important, it advances research progress. OA also provides a leveller playing field for research in developing countries.

### **Libraries taking the lead in the Open Access movement**

American library associations, such as the Association of Research Libraries (ARL) and its associated Scholarly Publishing and Resources Coalition (SPARC), were the first to try to create change and to inform scientists of new possibilities. In Europe, for example, librarians sponsored by La Ligue des Bibliothèques Européennes de Recherche (LIBER) have been organizing very high level workshops on OAI, at CERN, in Geneva, since 2001. [4].

Traditionally, librarians subscribe to periodicals (mostly electronic nowadays), buy books, acquire know-how and pass on the best methods for harvesting information in bibliographic databases. Keeping records was one of the original functions of libraries. Now that they are in charge of electronic periodicals, librarians try to preserve and maintain the availability of print equivalents of electronic resources. Collaboration between libraries is needed and already exists, e.g. the project Lots of Copies Keep Stuff Safe (LOCKSS ) [5]. But a question remains: who should have the responsibility for this preservation? Libraries, publishers or mandated national organisations?

Some libraries are now adding new functions. They create new OA journals, set up OA archives and self-archive journal articles by “proxy: on behalf of their researchers.

Lund University library in Sweden is one of the best examples of this new turn libraries are taking towards Open Access. Librarians created the Lund University OA Archive, LU [6] containing about 170 full-text OA articles to date; they also created a new OA Journal: *Lund Virtual Medical Journal* [7] and are maintaining the *Directory Open Access Journal* (DOAJ) [8] which lists all known OA journals (about 1200 to date) and allows many of their full-texts to be searched and harvested. Lund University Library demonstrates how OA can be adopted and used in universities, but other

universities in Europe are also leading in library-based collaborative projects, such as the Fair project in UK, [9] and the Dare Project [10] in the Netherlands.

It is also very important to note that those universities that have adopted a mandatory OA self-archiving policy are providing OA to a far larger number of articles (e.g., the Southampton University Electronics and Computer Science Department, with more than 1600 full-text OA articles in ECS Eprints archive [11]; the Australian National University, ANU Eprints [12] has also adopted an official policy and contains 2200 full-text OA articles.

The policy of providing OA to institutional research output by self-archiving it is becoming easier year by year: the number of periodicals giving the green light to author/institution self-archiving has grown from 55% in 2003 to 91% in 2004. The self-archiving policy of more than 8000 periodicals is available from the RoMeo/Eprints Directory [13] and is a real help for researchers and librarians. Libraries also need to preserve the material they have deposited in these archives (project OASIS/SHERPA in UK)[14]. Long term sustainability of archives needs to be ensured. The PADI project in Australia (Preserving Access to Digital information) [15] provides a good review of the possibilities, but these will take very long to get adopted. Today, the short-cut for preservation is to print digital texts on paper.

But far more urgent than the task of preserving the still near-empty contents of the still too-few OA archives – and recalling that these self-archived OA version are merely substitutes for the originals, which are published in conventional journals – is the task of creating and filling more of those OA Archives with the author-provided self-archived versions of their published journal articles. All libraries will no doubt create OA archives, but those that succeed in filling them fastest will be those that have an institutional OA self-archiving mandate.

### **The importance of an official university OA self-archiving mandate**

An official university self-archiving policy like that of Southampton [16] is needed to induce a rapid transition to OA. Such a policy can also be mandated by research funders as is the case with the governments of India or Australia (and recommended now by the UK and US governments). The Berlin Declaration was signed on 22 October 2003 [17] by a number of European universities.

Some governments adopted a position in favour of OA during the world summit WISI held in Geneva in December 2003 [18], but no official mandate was proposed. In September 2004, however, the US House of Representatives passed a Bill requiring that self-archiving should be mandated for all journal articles arising from NIH-funded research output (this Bill awaits passage by the US Senate). The UK House of Commons Science and Technology Committee has likewise recommended that institutional self-archiving be mandated for all UK-funded research: If this becomes UK law, the authors of all journal articles arising from UK government-funded research will be required to self-archive a digital copy of each article in their institutional OA Archives. A recent survey conducted by JISC/OSI [19] has shown that 80% of researchers will willingly self-archive if required by their funders or employers to do so. All this shows that the OA spirit has propagated quite widely in the last few years.

So now, to move ahead, institutions should adopt and implement an OA-provision policy, signing and describing it for other institutions in the Declaration of Institutional Commitment to Providing OA, thereby putting into concrete practise the many formal statements and initiatives that have declared support for the abstract principle of OA [20].

### **What can librarians do while waiting for this commitment?**

Librarians should promote OA by promoting both OA self-archiving and OA journal publishing. They should create and maintain Institutional OA Archives and help authors to self-archive. They should incorporate OA resources and OA search engines, OA Journal directories, and online scientometric performance-indicating tools in library web interfaces

When all this is done in each academic library, the new era of Open Access to scientific research will begin, and researchers and research will reap all its benefits.

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