

Cyberscience and the knowledge-based economy. open access and trade publishing: from contradiction to compatibility with nonexclusive copyright licensing

Chris Armbruster
Research Associate, Max Planck Digital Library,
Max Planck Society
Invalidenstrasse 35, D 10115 Berlin
www.mpd.l.mpg.de

Executive Director, Research Network 1989
www.cee-socialscience.net/1989

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Abstract

Open source, open content and open access are set to fundamentally alter the conditions of knowledge production and distribution. Open source, open content and open access are also the most tangible result of the shift towards e-Science and digital networking. Yet, widespread misperceptions exist about the impact of this shift on knowledge distribution and scientific publishing. It is argued, on the one hand, that for the academy there principally is no digital dilemma surrounding copyright and there is no contradiction between open science and the knowledge-based economy if profits are made from nonexclusive rights. On the other hand, pressure for the 'digital doubling' of research articles in Open Access repositories (the 'green road') is misguided and the current model of Open Access publishing (the 'gold road') has not much future outside biomedicine. Commercial publishers must understand that business models based on the transfer of copyright have not much future either.

Digital technology and its economics favour the severance of distribution from certification. What is required of universities and governments, scholars and publishers, is to clear the way for digital innovations in knowledge distribution and scholarly publishing by enabling the emergence of a competitive market that is based on nonexclusive rights. This requires no change in the law but merely an end to the praxis of copyright transfer and exclusive licensing. The best way forward for research organisations, universities and scientists is the adoption of standard copyright licenses that reserve some rights, namely Attribution and No Derivative Works, but otherwise will allow for the unlimited reproduction, dissemination and re-use of the research article, commercial uses included.

Keywords

Cyberscience, cyberinfrastructure, open source, scientific publishing, guild publishing, trade publishing, peer review, open access, copyright, knowledge-based economy, Creative Commons, Science Commons

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Introduction: The emergence and future of cyberscience as sedimented human praxis

There is salience in the observation that as the new cybertechnologies emerged, they initially impacted science, even if much of the information and communication technologies associated with the Internet were developed in public research organisations.¹ As new technologies are taken up, they are tinkered with, adapted and exploited and in this sense the agency of the early movers matters. As the technologies spread, the institutional setting begins to matter more (cf. Nentwich 2003 and 2006). Yet, the notion that revolutionary change gives way to evolutionary adaptation is a discursive trope. A temporal and ideological dimension coincide in the sense that, typically, the rise of a new technology is accompanied by the pre-eminence of a technologically determinist viewpoint, while during the maturation and diffusion of the technology a viewpoint emphasising the efficacy of human agency, tradition and institutions is more prominent.

Let us recall the trouble the Soviet empire had with such a basic and offline information and communication technology as the photocopier. There was no way of 'shaping' the photocopier so as to be compatible with Soviet praxis. The only feasible course of action was to ban photocopiers for general use and to have those that were deemed useful to the regime under the strict supervision of the security services. In 1989, it was not by chance that among the first things shipped from West to East were photocopiers, for they offered a means of cheaply distributing news and information by those that did not (yet) have access to media channels.

The example of the 'Soviet photocopier' illustrates how technologies typically are a form of sedimented praxis that is rather difficult to disassemble and reassemble at will. Of course, the photocopier of the early 21st century will digitalise the photocopy and email it, as well as doubling up as a printer and fax machine. Yet, it is rather difficult to envision how the photocopier might ever be compatible with a totalitarian regime other than by restricting its use sharply.

Consequently, this article views cybertechnologies as a form of sedimented human praxis that conditions (later) human agency. More specifically, it is assumed that the cybertechnologies developed in Western public research organisations over the past decades decisively favour digital networked peer production in academia and elsewhere. To be sure, there are many ways in which the digitalised networks may be adapted and developed by scientists and scholars, but these ways are still identifiable as emanating from the same information and communication 'superhighway' that we have been travelling on since the 1960s.

Scholarly communication and knowledge distribution: the digital elaboration of networked peer production and guild publishing

My focus is on scholarly communication and knowledge distribution. It has become possible to anticipate in which way the rise of cybertechnologies and their development, diffusion and adaptation is beginning to condition scholarly agency. Cyberscience is leading to crecive change. It is a directional, cumulative and principally observable process that is increasingly likely to become irreversible with the adoption and spread of digital networked peer production. Profound results may be anticipated for scholarly communication and knowledge distribution as existing models of scholarly publishing break down.

Peer production, says Yochai Benkler (2006: 59-63), is a commons-based production practice that is decentralized and self-selected. In an open commons the inputs and outputs of the production process are shared. The sharing might be regulated to various degrees. Modern science has always been understood to be an open commons, albeit one which its peers strongly structure to distribute rights to access, use and control of resources. In the early 21st century, the knowledge-based economy, says Benkler (2006:60), "makes possible a new modality of organizing production: radically decentralized, collaborative, and non-proprietary; based on sharing resources and outputs among a widely distributed, loosely connected individuals who cooperate with each other without relying on either market signals or managerial commands." Benkler envisions that this new modality will spread across domains (e.g. science, publishing, media) and across industries (e.g. operating software, desktop software, internet software, games software). Networked peer production has been the hallmark of modern science. But what are the consequences of the digitisation of networked peer production? Which new opportunities, choices and constraints emerge with cyberscience?

Guild publishing, say Rob Kling, Lisa Spector and Geoff Mc Kim (2002), is a model based on "the relatively well-understood concept of the research manuscript series sponsored by ... academic departments and research institutes." Guild publishing implies formal association based on the shared interest of rapid access to research manuscripts. The likeness of the guild members facilitates quality control. If membership is selective this is a quality indicator. Guild publishing is widespread among institutes for advanced studies, research institutes and research consultancy providers as well as in a wide variety of disciplines such as computer science, economics, law, management, mathematics and physics. Guild publishing has typically been local and free for authors and readers. With the rise of the WWW Galaxy, however, guild publishing has gone global in services such as arXiv (physics, mathematics, computer science), Research Papers in Economics (RePEc) and the Social Science Research Network (SSRN). Which new opportunities, choices and constraints exist in digital guild publishing?

In this article, we investigate how the rise of cyberscience has begun to enable and constrain scholarly agency in particular ways. This enables the sociologist to anticipate the enacted change that will follow. We expect to see the adaptation and spread of digital guild publishing in epistemic networks of global scope (like arXiv, RePEc and SSRN), the enactment of non-exclusive copyright licensing (on which these publishing services are already based) and the emergence of a whole new knowledge industry based on overlay services that will include trade publishing of research articles but will also be based on new knowledge certification and evaluation services that we can yet only partly envision.

The structure of the argument: three takes

This article seeks to clarify the profound shift that is occurring as scholarly communication and knowledge distribution goes digital. In doing so, I take the multitude of studies on authors' rights and expectations for granted as well as studies that show that open access increases circulation and impact. The relevant literature is tracked in the Scholarly Electronic Publishing Bibliography (Bailey 2006) and the Open Access Bibliography (Bailey 2005).

Firstly, it is argued that the WWW Galaxy heavily favours the severance of the certification of knowledge claims from the dissemination of research papers. Underlying this shift is the emergence of an academic cyberinfrastructure based on open transmission protocols and open-source software that, in turn, favours open content and open access. 'Openness' is fundamentally compatible with the knowledge-based economy if market profits are made from nonexclusive rights. The present conflict between scholars and commercial publishers around 'open access' is based on a misunderstanding, for business models in scientific publishing that are based on the pursuit and enforcement of exclusive intellectual property rights will not persist because technological and economic conditions disfavour them strongly.

Secondly, the compatibility of open science and the knowledge-based economy may be enhanced if the dissemination of research articles is severed from their certification. As the marginal cost of digital dissemination plummets, there is a case for the public funding of the electronic dissemination of research articles. Public funding could ensure effectively that dissemination is free to authors and readers while reaping savings of several orders of magnitude as first copy costs in the online world fall to 1/10th or less of the cost in the Gutenberg Galaxy. This is, however, not true for the certification of knowledge, especially by peer review, which is likely to become more costly if it is to be of any service to readers and authors.

On the assumption that the decoupling of certification and dissemination is desirable and likely, it is argued, thirdly, that research articles should be disseminated with a nonexclusive copyright license. This does not require any changes in law, but merely a different contractual arrangement whereby certifiers (e.g. publishers, learned societies, institutional repositories and

whatever new organisations might emerge) will not be able to claim an exclusive copyright. Presently publishers collect monopoly rents because authors transfer the copyright of their papers to the publisher. If copyright for the article is no longer transferred exclusively, but licensed nonexclusively, then a competitive and efficient market for knowledge services will emerge.

Economic modelling of the potential impact of the open access dissemination of research results is under way. In a first estimate it is valued at roughly \$2bn for the UK, \$3bn for Germany, \$6bn for Japan and \$16bn for the USA – assuming a social return to R&D at 50% and a 5% increase in access and efficiency (Houghton and Sheehan 2006). This lends salience to the anticipation of the emergence and growth of a new knowledge industry around the certification of knowledge and the provision of services to readers and authors. This new industry will sit atop the open access dissemination of research articles and further contribute to growth and innovation. Reed Elsevier, the largest scientific publisher at the beginning of the 21st century, has been a big winner of the knowledge-based economy and the *bête noire* of the open access movement. My anticipation is that Reed Elsevier and other scientific publishers will survive and prosper if they adapt their business model to the emerging reality of digital networked peer production. But this emerging reality also means that new players like SSRN, RePEc and arXiv or, as yet, unfounded new ventures may capture the value that lies in the new knowledge certification services.

Take One: Scholarly cyberpublishing outside of Oldenburg's long shadow

Sociologists have long reported how the rapid expansion of higher education, the 'scientization' of society and the rise of a knowledge-based economy makes commons-based peer production efficacious. Yet, the rise of the Internet and digitalisation qualitatively alter the conditions of scholarly peer production too. Scholarly publishing has been a case of networked peer production ever since Henry Oldenburg founded the *Philosophical Transactions of the Royal Society of London* in 1665. *Phil Trans*, as it is known, evaluated knowledge claims by peer review and then edited and published selected articles for distribution to and recognition by the scholarly community (Guedon 2001).

Yet, the rise of the Internet fundamentally alters the condition of scholarly communication and publishing. In the Gutenberg Galaxy peer review was a 'labour of love' and the printing and distribution costly. Online, distribution is cheap but certification expensive. Moreover, certification is becoming more expensive as the amount of knowledge claims that are circulated rapidly increases and there is a subsequent need to monitor and re-evaluate knowledge claims for their value and impact.

Scholars and publishers, whether they like it or not, will have to acknowledge that we are stepping out of Oldenburg's long shadow. Online scholarly communication and knowledge distribution will be structured qualitatively different. Oldenburg's model was based on the conjoining of certification and

dissemination ('the peer reviewed journal'), but the logic of the Internet, aided by the rise of digital networked peer production will see the severance of certification from dissemination. Some scholars and publishers may resist this, and may wish to resist as long as possible, but the technological and economic conditions favour a decoupling.

'Take One' is about how Yochai Benkler has developed an adequate typology of information production strategies and an understanding of the knowledge-based economy that is sophisticated enough to guide the reorganisation of scholarly communication and knowledge distribution. I contrast this with the misguided efforts of scholarly activists to establish open access by means of duplicating journal articles in open access repositories. Technological and economic conditions favour networked peer production and guild publishing as they become digital, but do not favour the 'digital doubling' of journal articles in open access repositories. Moreover, while digital guild publishing is fundamentally compatible with the knowledge-based economy, the pursuit of the so-called 'green road' (self-archiving) and 'gold road' (publishing) to open access has lead scholars, publishers and many academic institutions into an impasse. As two hostile camps square off, communication becomes increasingly shrill and both sides believe that they are part of a zero-sum game. Only, both sides are caught playing in a house of mirrors as they fail to understand that the future lies with the decoupling of dissemination from certification.

Academic cyberinfrastructure: how does it enable digital networked peer production?

Digital networked peer production is based on the availability and development of an open, non-proprietary cyberinfrastructure. Yet, even though developments have been monitored and evaluated closely, it does not seem easy even for digitally highly literate scholars to understand how cyberscience enables digital networked peer production and what the crucial elements are to preserve and enhance open science. Even among economists, who otherwise celebrate the soberness of the rational actor, fear is widespread (cf. David 2004, Nelson 2004).

To take one example, in the United States, the National Science Foundation published *Revolutionizing Science and Engineering through Cyberinfrastructure* (NSF 2003), followed by the American Council of Learned Societies' Commission on Cyberinfrastructure for Humanities and Social Sciences, which has posted its report *Our Cultural Commonwealth* (ACLS 2006). In this report, the ACLS commission, like the NSF commission earlier, distinguishes a 'technical' from an 'enabling' cyberinfrastructure. In the category of technical infrastructure the commission lumps together transport (e.g. broadband), devices (e.g. components, standardization), transmission protocols (e.g. TCP/IP) and software. Enabling infrastructure is meant to refer to standards of interoperability, intellectual property rights, privacy laws as well as institutional policies within the academy. The ACLS commission acknowledges the

disruptive nature of cyberscience ('impact') but is mainly concerned with academic institutions. On the one hand, the commission criticises the academy for lack of leadership and the slow pace of uptake. On the other hand, it firmly believes that the academic institutions must adapt and shape the cyberinfrastructure. Federal government and Congress are criticized for providing inadequate funding and passing intellectual property and privacy laws that hinder the progress of cyberscience, while being urged at the same time, for the sake of national competitiveness, to sponsor cyberscience.

Unfortunately, the ACLS commission got its categories of analysis wrong. While it may be the case that for books, film and music an intellectual property right matters, this is not so for the openness of scientific knowledge distribution. Changes in the law are not necessary, merely a different contractual praxis. Academic institutions and disciplines need to understand the emerging conditions of cyberscience, yet their policies are only important insofar as they may influence how successful they are in adapting to the new opportunities and constraints. In all cases, the commission designated as problematic for cyberscience issues that are non-essential. Moreover, it overlooked that standards of interoperability depend crucially on transmission protocols (e.g. TCP/IP and p2p networks) and software (e.g. software for databases, simulations and scholarly communication and publishing).

Yochai Benkler, by contrast, has a better understanding of the enabling condition of digital networked peer production (2006: 395). He distinguishes three layers, namely the 'physical' (transport, devices), 'logical' (transmission protocols, software), and 'content' (intellectual property rights) layer. It is the logical layer that represents the material condition of production for cyberscience. It conditions what scientists and scholars can and cannot do in creating and in distributing knowledge. More generally, peer production in the knowledge-based economy depends on open transmission protocols and open-source software. Increasingly, the digital economy is being run on open-source software. Crucial has been its adoption not only by the new giants of the digital economy, but also by corporations from the industrial economy. As Benkler relates (2006: 47-8), IBM has been the firm to obtain the most patents in the decade from 1993 to 2004, yet, by 2004, it made more than twice as much revenue (approximately \$2bn) from nonexclusive, Linux-related services than it did from services based on exclusive, proprietary rights. Open-source software is key to open content and open access. It is significant that well-informed economic actors consider open-source software to be more efficient than proprietary software and are willing to invest heavily: in only a decade over 2/3 of the software market has become based on open-source.

Digital scholarly publishing and the knowledge-based economy: contradictory or complementary?

A conflict between scientists and publishers emerged because on the Internet free sharing shifted into the public domain. In the Gutenberg Galaxy the nonexclusive and nonmarket scholarly peer production could coexist with the

exclusive, proprietary and commercial publishing industry because the free sharing was limited to a few typed (later: printed) copies shared with close colleagues and a conference audience. Online, with diminished marginal costs of dissemination and services that are free to authors and readers, scholars can share their working papers and pre-prints with the whole world. Free sharing in the public domain is incompatible with a publishing model based on exercising exclusive rights, that is, the transfer of copyright from author to publisher followed by marketing strategies that seek to maximise rent based on copyright (e.g. bundled subscription and site licenses, pay-per-view charges and digital rights management).

Yochai Benkler offers an understanding of information production strategies in a typology (2006: 43). In a first dimension he distinguishes threefold between strategies based on exclusive rights and rent seeking, nonexclusive rights and market profits and nonexclusive rights and nonmarket, i.e. social production. On a second dimension he distinguishes again threefold between the public domain, intrafirm trade and sharing or barter. The Internet enables and favours worldwide online sharing in the public domain - even if some scholars still seek to trade early access (e.g. at conferences, in workshops) for comments that help to improve the prospect for being accepted in a traditional journal with a high impact factor.

Open access advocates, however, have not necessarily understood the full implication of this contradiction between nonexclusive, digital networked peer production strategies and exclusive, rights-based business models. Some open access advocates have come up with the idea that open science may be served best by duplicating all research articles in national or institutional repositories. This so-called 'green road' to open access relies either on publishers consent or on a mandatory policy enforced by research funding agencies. Its aim is to have any published article deposited in an open access repository – be it as final manuscript or published copy. Unfortunately, any version of the green road only increases the cost to the taxpayer while missing the opportunities presented by the new cyberinfrastructure. Moreover, if publisher consent is necessary for deposition in an open access repository, then this solution forever hinges on social movement pressures on publishers not to exercise their exclusive rights. Publishers dedicated to capturing value from intellectual property rights on behalf of their shareholders must enforce their legal rights once the social movement pressures recede.

A mandatory open access policy has been enacted (e.g. Wellcome Trust, Research Councils UK), but not yet challenged in court. One would expect that commercial publishers will do so, for why should they view an open access repository any different than the commercial music industry viewed Napster? Should courts eventually uphold the right of research funding agencies to impose a prior contract on the researchers that forbids her to transfer the full copyright (covering any pre- or post-print) exclusively to any publisher, this would secure open access. But it would still do so at an increased cost while

missing the potential of the emerging cyberinfrastructure, namely to decouple dissemination from certification as their cost-ratio is inverted.

Nothing in the logic of the knowledge-based economy requires that scientific knowledge production or distribution be subjected to exclusive intellectual property rights. Open source software has shown how non-exclusive and non-market knowledge production is compatible with the market and with increasing revenues and rising profits (and, ultimately, rising tax revenue that could be spent on science). The challenge for academic institutions is how to insert digital networked peer production into the knowledge-based economy while retaining open access to scientific knowledge.

Take Two: Decoupling the dissemination of research articles from the certification of knowledge claims

The most complementary solution between open science and the knowledge-based economy would be digital guild publishing of research articles, free to authors and readers. Knowledge certification would be decoupled and regulated as trade publishing on the basis of non-exclusive copyright licenses, which would foster the emergence of a competitive market and innovative business models.

Paul Ginsparg, the founder of arXiv, has repeatedly advocated the decoupling of dissemination from peer review. He proposed a multiple-tier system that takes advantage of digital networked peer production (Ginsparg 2004), at the base of which all new research papers are made available instantly insofar as they are of 'refereeable quality', while peer review would have a longer timescale ranging from months to years. Ginsparg and arXiv show that online

- It is feasible to reduce first-copy costs for accredited dissemination to as little as 1/10th or less of the Gutenberg Galaxy with an automated, minimally labour intensive server;
- It is observable that expert readers do not value the filtering provided by the current review process above their preference of instant availability of papers of refereeable quality;
- An automated initial review of first papers is possible on the basis of usage statistics, reader ratings and the like;
- Peer review may be multi-tier from readers' reviews, through journal publishing to prizes, including re-reviews and re-nominations on a longer timescale.

'Take Two' is about how and why Paul Ginsparg has an accurate perception of the enabling and constraining conditions of the Internet and a good grasp of creative change. I elaborate on the distinction between guild and trade publishing and show why the funder- or author-pays publishing model associated with the gold road to open access is not suited to online publishing. Finally, I contrast Ginsparg's well-informed understanding of how cyberscience conditions scholarly agency with a *Study on the economic and technical*

evolution of the scientific publication markets in Europe (Dewatripont 2006) commissioned the European Commission, which failed to understand these conditions and developed misguided recommendations.

Guild publishing as accredited dissemination that is free to authors and readers

Consider arXiv, RePEc and SSRN. arXiv is largely funded by Cornell University and the National Science Foundation, supported by hardware donations and run by editorial volunteers. RePEc thrives on content and services that are provided by a multitude of institutions, including economics departments, national research institutes, international organisations and publishers. RePEc is an add-on digital library to which new content and new services may be joined by linking servers. SSRN is self-funded from philanthropic donations and self-generated revenue and relies on hundreds of volunteers for editorial services. All three are an instance of a global and distributed digital peer production in an epistemic network that facilitates open access guild publishing for worldwide community of scholars and scientists, for higher education and for readers in business, government and civil society.

All three services provide accredited classification and instant dissemination of research articles. At arXiv authors need an endorsement from an active author with a number of submissions for a first submission or for a first submission to a new field. Broad research fields in physics, mathematics and computer science are organised into subject categories that have named moderators (from academic institutions all over the world). The subject categories evolve with community interest and demand. At RePEc authors typically disseminate their research articles in series sponsored by their academic institution and quality is thus locally controlled and indicated, depending on the academic institution's prestige and review process. At SSRN any scholar may create an author's page, which registers academic affiliation, and upload research articles. SSRN provides download counters and ranks authors and papers. Uploaded papers are classified and scrutinised by the volunteer editors who provide awareness and alert services for working papers and accepted papers, i.e. accepted for publication in a journal.

For arXiv it is estimated that first copy costs lie between \$1-5 per research article, says Paul Ginsparg (2001, supplemented by personal communication 2006) "based on the direct labor costs per year involved only in processing incoming submissions and operating an e-mail "help desk". (Hardware and labor costs for maintaining the static archival database add on only a small percentage.) The estimate is given as a range because the labor per submission is a skewed distribution." For RePEc, says Thomas Krichel (personal communication, 2006), first copy costs "are zero, essentially. All you have is the network cost (depending on the amount of access to the paper and metadata) and the cost of keeping the server, i.e. electricity, wear and tear. The latter costs are common to all papers, so have to be divided by the number of papers in the archive to get the per paper amount." For SSRN, says Gregg Gordon (personal communication, 2006), open access should be free to

authors and readers and supported by value-added services. To accomplish that goal, we work very hard to keep our costs as low as possible.”²

In this context, the largest open access publisher, BioMed Central, is and will remain the exception. BioMed Central is a feasible business model because of public health and safety issues. In biomedicine one would want to ensure that only peer reviewed, double-checked and thus maximally safe research results are distributed. Even the most prestigious journals have published results that later turned out to be fraudulent (Nature, the cloning fraud) and to have sparked a public health crisis (The Lancet, the MMR vaccine). It is not, however, a reason to abandon peer review in biomedicine, only to improve it.

BioMed Central offers a platform of over 180 open access journals by charging publication fees in a range from \$515 to \$2460, which are typically covered by research funding agencies, as biomedicine is the best-funded research field. Whether open access, author-pays publishing in the long run would be cheaper than commercial STM publishing that charges readers, remains to be seen – the Public Library of Science has raised its publication charges up to \$2750 per article and Springer’s Open Choice program charges \$3000.³ BioMed Central would seem to run on a cost-based model rather than a value-based one. Yet, online there are few incentives to have multiple, competing platforms (arXiv, RePEc and SSRN are global epistemic networks) and thus it is unlikely that a market for open access, author-pays publishing will emerge. Hence, all depends on controlling costs. Social production models that are free to readers and authors are thus much more likely to minimise costs than commercial production models based on charging someone.

Trade publishing as layered certification that will and should be value-based

The internal logic of science as a social system requires not only the certification of the validity and reliability of knowledge claims by peer review, but also, over time, the ranking of knowledge claims by value. Reputation, status and prestige are peer produced in an iterative process that includes not just publication in prestigious journals, but also keynote speeches, research grants, scholarly awards and, ultimately, the Festschrift, the lifetime achievement award and the Nobel Prize (or its substitutes). Particularly in the social and cultural sciences as well as the humanities it has been a long-standing practice to continuously reprint books and articles that are highly valued by successive generations of scholars. The certification of knowledge claims is and will remain labour intensive and expensive.

Next-generation digital rendering, indexing, linking, querying, accessing, mining and transmitting of information (Ginsparg 2004) will require investment. Investment costs are likely to be high while the returns are uncertain. Insofar as there are joint standards, interoperability is assured and software is open-source, it will not be a winner-takes-all game as in commercial fights to set the standard (e.g. video), but entrepreneurial investors will still need to be able capture value to be persuaded to invest in the first place. Yochai Benkler’s

typology and the recent history of IBM suggest that a profitable market based on nonexclusive licensing may emerge.

Paul Ginsparg's multi-tier model of publishing opens up the realm of trade publishing for innovation and investment. Science and the knowledge-based economy may develop a complementary relationship, whereby intellectual property regimes need not threaten open science, if the base is the open dissemination of research papers. Trade publishing, for varying audiences, may then sit atop this base. In the social and cultural sciences as well as the humanities, to continue with this example, the repeated printing of books and articles in new series, edited volumes and different languages has typically served to reach varying audiences, sometimes including non-academic audiences in business, government and civil society.

The limited uses of the funder- or author-pays publishing model

Objections to the author-pays model frequently centre on the possible bias of editors towards accepting articles to 'make money' as well as the potential exclusion of poorer countries, disciplines and scholars. Yet, these objections could be met for online publishing by adapting the author-pays model on a sufficiently large scale so that rejection rates and poorer authors do not undermine the business model. BioMed Central, for example, would seem largely immune due to its size and the possibility of offering national deals to cover publication charges.

The attraction of open access author-pays publishing is the systematic observation that the ratio of conventional journals subscription prices of for-profit publishers versus not-for-profit publishers is three to one. Since open access author-pays publishing would be cost-based and might be largely not-for-profit, it would seem to promise very large overall savings. Part of the attraction is the dream of de-commoditizing scholarly publishing and returning it into the hands of learned societies. Yet, this intent to perpetuate Oldenburg's Phil Trans model would come very expensive. It is not only that the corporate publishers enabled and drove the growth of journal publishing while the learned societies largely could not or would not, but also, principally, that publishing is a dynamic market. It will continue to grow as higher education continues to expand rapidly worldwide, as digitisation takes hold and as research results increasingly form the basis for advancement in the knowledge-based economy. The author-pays model will not deliver the massive investments in trade publishing that are necessary.

Copyright contracts matter: what the *Study on the economic and technical evolution of scientific publication markets in Europe* got wrong

The *Study on the economic and technical evolution of the scientific publication markets in Europe* (Dewatripont 2006) recommends that European authorities push for digitisation, encourage interoperability and support long-term

preservation. These recommendations are correct and obvious. Furthermore, the study recommends that European authorities:

- Take measures to guarantee public access to published research results, but this would only increase the cost of government by a yet unknown ratio (and absolutely a large sum) instead of utilising the internet to slash the tax funded cost of dissemination by a factor of at least 10;
- Create a level playing field between reader-pay and author-pay models by directly subsidising the author, but this is likely to lead to price hikes on part of all publishers, for-profit or not, which will only further increase the cost to the taxpayer;
- Support the extended quality ranking of traditional journals, but this would only serve to increase the lifetime of a business model that is suited neither to digital networked peer production nor the knowledge-based economy;
- Monitor closely any further merger in the STM publishing industry, but this is a misunderstanding as in a value-based industry there are good reasons for mergers, for bundling strategies and for buyer consortia if the seller has the exclusive rights and will exercise these;
- Advocate 'usage' or 'cost' as basis of journal pricing, but this would stifle the growth and expansion of trade publishing as well as innovation in services.

The public policy recommended is likely to cost the taxpayer in direct subsidies to outdated publishing and access models that will stifle growth as innovation is hindered. The competition policy recommended means that Europe would be stuck with an increasingly antiquated publishing industry that has its prices regulated for the short-term benefit of library budgets. The authors do mention in conclusion that further studies should address the evolution of copyright and look at the unbundling of dissemination and certification. Yet, the authors of the study should have made this their priority, for it is the nonexclusive copyright licensing that enables the decoupling of certification from dissemination and fosters the emergence of innovative knowledge services.

Take Three: Nonexclusive copyright to facilitate the emergence of a competitive market for knowledge services

Copyright in scholarly publishing is a protracted issue. Publishers typically seek to transfer the copyright from the scholar to the publishing house. This is facilitated by the 'teacher exception', i.e. the legal and customary understanding that academics, even though employed, are the owners of their texts. University copyright policy, if existent, tends to reinforce the notion that academics 'own' their texts, thereby inadvertently enabling the transfer of copyright to the publisher (Crews and Ramos 2004). This is detrimental to academic institutions, collectively and individually, as they then must spend a considerable part of their budget to buy access and pay for copies to the very same publishers that their employees transferred the copyright to.

The solution lies not in changing the law, but in changing the terms of the publishing contract: to nonexclusive licensing. In other words, the business model for the dissemination of research article is switched from exclusive rights to nonexclusive licensing. Authors (in some cases: the academic institution) would offer a nonexclusive license to trade publishers and, by implication, to anyone else wishing to distribute, print, download and copy the article, subject to proper attribution and respect for the integrity of the text.

'Take Three' is devoted to arguing the case for nonexclusive licenses as best possible solution in the interest off all principal stakeholders: scholars, academic institutions and publishers. To date, legal advisors have recommended that scholars retain some rights as authors for the purpose of disseminating and re-using their articles, typically by suggesting new model contracts or an addendum to publishers' contracts. However, while these recommendations, for example by the Association of American Law Schools (1998), the Copyright Management Center of Indiana University and Purdue University (Crews and Wong 2004), and the Zwole Group (2004) may aid the worldwide dissemination of the article for the purpose of non-profit research and education, they do not foster the emergence of new, competitive knowledge services.

Therefore, in contradistinction to what is currently deemed 'best practice', I will review, firstly, the notion of copyright as property and show that if it is re-framed as license instead, there is no digital dilemma in scholarly publishing and no irresolvable contradiction between scholars' and publishers' interests. Secondly, it is argued that academic institutions, universities and public research organisations are the crucial players that must and will change policy and practice in the dissemination of research papers to nonexclusive licensing. Thirdly, I will investigate if academic authors could adopt a standard license, possibly based on copyright licenses developed by Creative Commons and Science Commons.

Copyright as property or license?

The ascendancy of the intellectual property regime has shifted attention away from the question of who has the right to make a copy, including fair use, to the issue of who owns a text and may enforce exclusive rights over that text, including the denial of access and the prohibition of copying. The notion of intellectual property has persuaded the principal stakeholders involved in scholarly publishing that every text must have an owner and that this owner should be entitled to exclusive rights. Unsurprisingly, the preferred solution of publishers has been to seek a transfer of ownership on the basis of rendering a service (peer review, editing, distribution) and the idea that the corporate owner will in a better position to enforce the legal and moral rights of the author. Conscientious publishers will offer their authors broad rights to re-use the text in research, teaching and publishing, the others often seek to control their newly

acquired property to the point of charging its author for the re-print of a text in a book or another journal.

On the assumption that any scholarly text is a property to which somebody holds exclusive rights, it is believed that the 'digital dilemma' equally applies to scholarly publishing. In a study entitled *The Digital Dilemma: Intellectual Property in the Information Age*, the US National Academies 'Committee on Intellectual Property Rights and the Emerging Information Infrastructure' outlined the digital dilemma succinctly (2000: 1-2): online readers may have global, simultaneous and unlimited access but, so the nightmare of the publishers, what "if the entire market can be extinguished by the sale of the first electronic copy?" The principal stakeholders in scholarly publishing are under the impression that this digital dilemma exists also for them but it does not apply. The research article is a social product that scholars give away for free. There is no intention to sell on the market. The uptake and spread of digital guild publishing demonstrates this: the first and all subsequent electronic copies are given away for free.

In the spirit of assuming a digital dilemma it is asserted that a contradiction exists between the scholarly author and the commercial publisher, in which the scholar as the original owner of the text is likely, in future, to choose open access publishing over commercial publishing. However, this is a mistaken scenario as digital guild publishing offers savings of a magnitude that Oldenburg's publishing model, even if converted to open access, would never be able to match. If guild publishing enables scholarly authors to adopt a nonexclusive license, the assumed contradiction with commercial publishing is removed as the rules of the market change: trade publishers will provide services, find buyers and make a profit on the basis of nonexclusive licenses.

For academic institutions and scholars the benefits are clear. Publishers often disagree. Yet, publishers must understand that by refusing to adopt their business model they risk, with great probability, two solutions that are detrimental to their survival:

- A) The 'green road' with a widespread adoption of Open Access archiving mandates, which will ultimately destroy the revenue base of publishers: once some academic institutions start cancelling subscriptions and site licenses because the OA archives provide a near-equivalent substitute, publishers will be forced to increase prices to maintain profits, which will lead to more cancellations and so on. Moreover, the internet will make it possible to obtain the OA copy at no extra cost and probably more efficiently, as searching for and downloading of open content is usually faster.
- B) The 'gold road' with a transition to OA publishing as research funding agencies choose to mandate open access and publishers become dependent on subsidies. This too will destroy publishers' revenue base as those paying the publication fees will collectively have the power to set fees as low as the lowest price any publishing house offers.

Bringing the university back in: the need for a policy change to nonexclusive licensing

The transfer of copyright to the publisher is not in the best interest of the academic institution because the very same institution and all other universities and public research organisations are then forced to pay a fee to access the text (subscription, site license) and, additionally, have to pay fees for every copy that is made. Moreover, the university usually subsidises the publishing process as its staff is engaged in peer reviewing and editing during work hours - though some publishers pay non-trivial compensation, possibly under a 'work for hire' clause (cf. Willinsky 2002). The university and its patrons loose in the present arrangement by unwarrantedly granting authors the right to transfer the copyright (or grant an exclusive license to the same effect).

University libraries have organised themselves in coalitions to oppose the steep price rises for journals (e.g. SPARC and related coalitions). Scholars, universities and public research organisations support Open Access mandates (e.g. Budapest Open Access Initiative and Berlin Declaration on Open Access). Yet, arguably the universities and public research organisations need a new copyright policy that distinguishes, firstly, the dissemination of research results in the form of articles from other kinds of publications (e.g. monographs, textbooks) and that mandates nonexclusive licensing for the digital dissemination of research articles. Academic institutions need not seek the copyright that custom and court rulings have assigned to the scientist and scholar. Yet, this is not to say that institutions could not, individually and collectively, require the open dissemination of research results.

Just like publishers have made the transfer of copyright the default, academic institutions could adopt contractual arrangements that make nonexclusive licensing the default. Universities do have copyright policies and address issues of ownership, finance and fair use – but have not yet moved towards a policy that encourages, supports or possible mandates nonexclusive licensing (cf. UC 1999, Friend 2003) Beyond the global spread of digital guild publishing, there are several precedents for such a move:

- Non-exclusive licenses for university patents, which are known to avert the anti-commons that threatens researchers with patent infringement;
- Open-source software and the copy left principle;
- Creative Commons and its attribution licenses.

Conclusion: Towards a standard Science Commons license: Attribution - No Derivative Works

Scholars are known to care most for their moral rights of authorship, e.g. accurate attribution and the punishment of plagiarisers, and the integrity of the text, e.g. its faithful and accurate reproduction and citation. These concerns may be addressed by using an existing Creative Commons license: An Attribution - No Derivative Works license. Scholars also care for the widest

possible dissemination of their work and its impact (if the above is ensured). An Attribution - No Derivative Works license would facilitate this by explicitly granting the right to copy (e.g. download, distribute, reprint, use in classroom).

Some scholars might be inclined to add a Noncommercial license – be it in the hope of making money later or out of disdain for commercial publishing. But a Noncommercial license would impede the development of knowledge services. Existing journals and their publishers should have a right to publish these articles and make a profit – for they will only make a profit if they provide a service to readers and authors. It would be of no matter whether journals charge the reader or the author, depending on who is willing to pay.

To promote guild publishing and foster new forms of trade publishing, an elaboration of the current standard Creative Commons Attribution - No Derivative Works license for the purpose of the Science Commons would be sufficient. It is, therefore, all the more unfortunate that Science Commons has begun marching in the wrong direction by offering an Open Access Addendum to authors by which they reserve the right to post the article online, i.e. self-archive digitally. Science Commons thereby falls into the trap of assuming a contradiction between commercial and open access publishing, which it seeks to remedy by supporting the green road to open access. Instead, it should support digital guild publishing by developing an Attribution - No Derivative Works license for scholarly publishing.

This proposal here bears some resemblance to the most advanced solution offered to date by Roger Clarke (2005) as 'open content license' for electronic preprints. Much of the license specification he suggests could be elaborated upon – in the context proposed here – to achieve the desired outcome. There is, however, a fundamental difference in approach. Roger Clarke assumes that scholarly publishing will remain as is, i.e. that peer review and dissemination will remain coupled. If however, as is suggested here, these two functions will be decoupled and it is the knowledge certification that will become increasingly expensive, then Clarke's additional specification that the license should be noncommercial would stifle innovation and ultimately inhibit the advancement of science. Hence, the issue is not really one of the 'openness' of preprints, but more fundamentally of the open access dissemination of the research article. Essential then is that knowledge service providers may reproduce, evaluate, link, mine and in other ways use the text without having to seek permission of the copyright holder. A nonexclusive Attribution No Derivative Works license that is attached to every electronic version made available would be the better solution.

Digital scholarly publishing websites

arXiv

<http://ArXiv.org/>

Berlin Declaration on Open Access to Knowledge in the Sciences and Humanities

<http://oa.mpg.de/openaccess-berlin/berlindeclaration.html>

BioMed Central

<http://www.biomedcentral.com/>

Budapest Open Access Initiative

<http://www.soros.org/openaccess/>

Open Archives Initiative (OAI)

<http://www.openarchives.org/>

Public Library of Science (PLoS)

<http://www.plos.org/>

Pubmed Central

<http://www.pubmedcentral.nih.gov>

Reed Elsevier

<http://www.reed-elsevier.com/>

Research Papers in Economics (RePEc)

<http://repec.org/>

Science Commons

<http://sciencecommons.org/>

Scholarly Publishing and Academic Resources Coalition (SPARC)

<http://www.arl.org/sparc/>

Social Science Research Network (SSRN)

<http://www.ssrn.com/>

Springer Open Choice

<http://www.springer.com/>

Wellcome Trust Open Access policy

<http://www.wellcome.ac.uk/>

Zwolle Group

<http://www.surf.nl/copyright/>

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² Paul Ginsparg is the founder of arXiv and continues to serve on the Advisory Board. Gregg Gordon is one of the co-founders of SSRN and currently serves as President and CEO. Thomas Krichel is the founder of RePEc and leads the RePEc team.

³ The figures given here were last checked for accuracy in October 2007.