

Seizing the Moment: Scientists' Authorship Rights in the Digital Age
Executive Summary
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Historically, publishing systems have operated in a legal and commercial framework that enables the various stakeholders involved in the creation, collection, storage, dissemination and use of information to play their roles with a reasonable degree of certainty. All that is changing, however. The historical balance is threatened because technology is modifying, sometimes dramatically, the process by which each of these activities is conducted and the roles of the stakeholders who carry them out.* These changes challenge our existing legal frameworks to deal with different business models and operating realities that accompany the digital creation, recording and transmission of information.

In science, publication is the chief currency. It is the primary measure of a scientist's productivity, and affects one's reputation, promotion, intellectual property claims, and future access to both intellectual and financial rewards. Equally important for the public is that open publication is the primary means for disseminating "certified" knowledge to a larger audience, so that it can be considered in personal decision making and public policy deliberations. It is not a trivial matter, therefore, when the traditions of scientific publishing are challenged by a revolution in publishing technology, as is happening with the evolution of the Internet.

The American Association for the Advancement of Science (AAAS), with support from the National Science Foundation, conducted a study focused on intellectual property and electronic journal publishing in science. The legal regime established to protect intellectual property rights, while also fostering dissemination of scientific information, will continue to play a major role in defining the parameters of information creation, dissemination, and sharing. Indeed, the full promise of new information technologies may never be realized without a clear and stable legal framework. This study sought to identify those aspects of the intellectual property regime that would likely facilitate or constrain scientific publishing in the electronic era. It concentrated on U.S. law and policy, while recognizing that any effort to establish a legal framework to nurture scientific publishing and maximize the dissemination of scientific information must also be undertaken internationally.

Electronic publishing presents a new and exciting prospect for science and its patrons. The electronic medium creates value for research, education and publication in a number of ways. It allows for virtually instantaneous feedback and commentary. The timeframe for moving from manuscript submission to peer review to press can be greatly accelerated in the electronic environment, and the size of the audience it can reach efficiently expanded well beyond the readership of paper-based journals. Electronic publishing also offers more powerful and creative ways for exhibiting and illustrating research findings than is possible in print publications. These advantages have led to an increase in the percentage of major scientific journals creating electronic versions of their

* The major stakeholders include the "creators" of published materials (traditionally referred to as "authors"); "publishers" (e.g., editors, referees), who render material produced by creators in a format capable of being disseminated to users; "users," who consist primarily of scientists, but also include many others with a need for or interest in science and its applications; and "conservators," those responsible for the long-term preservation of scientific information.

publications as well as a boost in the number of journals published only online in science, engineering and medicine.

Paralleling the emergence of these transformative technologies is a social movement among scientists to retain some or all rights to the products of their labor. This movement has its origins in concerns by many scientists that access to information is too concentrated in the hands of a few major publishers, and that some scientific journals are not making their contents as widely available and in as timely a manner as they should. As a consequence, there are calls for boycotts of some journals, and efforts to establish other mechanisms for disseminating scientific information.

Intellectual Property Protection

The primary purpose of intellectual property law in the United States is to “promote the Progress of Science and useful Arts,” by encouraging inventors and authors through the granting of limited monopolies in inventions and original works of authorship, with the resulting possibility of commercial reward. The United States Congress and the courts seek to craft a just balance between the interests of owners and users—between monopoly ownership and control and the interests of the public in unimpeded access and use—and the long-term public interest, with benefits to society the ultimate aim. Whether one believes that in practice such a balance is actually achieved is the subject of considerable debate.

Copyright law is by far the most significant intellectual property regime relevant to publishing generally, and electronic publishing specifically. Copyright law grants certain exclusive rights to the author or other copyright owner of an original work, including the right to reproduce the work, to create derivative works, and to distribute and display the work publicly.

Digital technology and ever-growing connectivity and communications capabilities continue to push the legal system into new territory. Lawmakers struggle to create an environment that allows increased access to scientific information, while attempting to preserve the rights and commercial expectations of the creators and publishers of information.

Study Findings and Outcomes

In assessing the effects of new information technology and the legal regime in the United States on scientific publishing in the digital age, the AAAS project made the following observations:

- Technological changes, considered without reference to legal constraints, now make it possible to publish scientific works rapidly and inexpensively, whether to select or vast audiences. More robust communication and information exchange should lead to improved scientific research. Furthermore, the ability to speed results of better research into useful and productive applications, whether in a laboratory, hospital, a courtroom, or elsewhere, will have enormous consequences for social progress.
- Existing copyright law governing distribution of scientific research may become increasingly difficult to apply because of technological advances in methods of structuring, managing, processing, and providing access to information in various digital formats.
- A just system of laws requires that the public perceive them as fair; that sense of fairness in turn generates support for the restrictions imposed by the law. Intellectual

property laws, which grant a government-sanctioned monopoly for a period of time, require that a sense of fairness and the need to support a monopoly be both clear and compelling. Indeed, the Constitutional mandate and authority for the enactment of such laws stems from a sense of social purpose and ultimate public good. The existing copyright framework is coming under the pressure of popular and scholarly disapproval precisely because it is perceived as impairing the social utility of new technologies in a number of areas, including the area of immediate interest in this project, electronic publishing of scientific research. Recent legal disputes over the scope and duration of copyright law, and the new initiatives in scientific publishing to increase access, reflect the emergence of a political movement grounded in social, technological and economic forces that aims to alter the current balance of economic interests expressed in, and protected by, current copyright law.

- The conservation of scientific analyses and findings is vitally important, and both complex and difficult in the digital age. Whoever takes on the task of managing and migrating electronic publications, whether it be a library, an independent archive established to serve a specific discipline, or a publisher of scientific works, will need authority (not necessarily on an exclusive basis) to make technical changes, to add appropriate links, and to "republish" the works in new formats to make possible their continuing availability to the scholarly community.

- The present framework of copyright laws includes a number of international compacts. While these treaties can be changed, an international consensus is not now a political reality, and is unlikely to become one until new patterns of electronic publishing are in place.

- Significant changes in domestic copyright law usually take many years. In today's environment, changes will come slowly, as scientific publishers continue to rely on the protection of the present copyright regime to sustain their revenues or recover costs. Consequently, proposals for electronic publishing in the sciences that require changing United States copyright law are unlikely to be successful in the near term (whether or not they have a realistic potential for success eventually).

In light of these findings, we sought common ground on which all the stakeholders might be able to develop new publishing practices and a corresponding legal framework. Toward that end, the study identified the core values that should be embedded in any system of scientific publishing, whether print or electronic. The intent was to capture the values applicable to publishing in science that, if optimally realized, would maximize the quality of, access to, and use of scientific information. Those values are presented in Table 1.

Recommendation: Create New Patterns of Licensing to Expand Access to Scientific Information

To realize those core values, evolutionary changes in the patterns of current licensing practices for electronic publishing are required that encourage wider, faster, less expensive access to a broad range of scientific works. It is essential that scientists, who create and are the principal users of scientific information, increase their control over its dissemination and access. Scientists (or their employers where "work for hire" applies), as creators of a work, initially own the copyright, i.e., the "bundle" of exclusive rights, from the time an original work of authorship is created. That being said, scientists, as authors, should strive to use the leverage of their ownership of the bundle of copyright

rights, should they transfer copyright, to secure licensing terms that promote as much as possible ready access to and use of their published work. This approach is wholly consistent with existing United States and international copyright law, building on the rights accorded to scientists as authors under copyright law.

In some cases, the publisher would be granted copyright by the work's author and license back certain rights to the author. In other cases, the creator of the information, instead of assigning all the rights associated with copyright to a publisher, may retain most rights while granting the publisher a non-exclusive license to reproduce, distribute, and, where dissemination on the Internet is also desired, to perform and/or display the work publicly. In either case, the licenses should support the core values that we identify as central to a system of electronic publishing. This in turn will promote broad access to high quality scientific information, and help ensure future availability of the work.*

Licensing should be viewed as a means for facilitating the publication of high quality research with long-term accessibility achieved through archiving. This is not inevitable, however. Parties to licenses are not obligated to incorporate measures promoting broad public access into their agreements, and agreements that grant access to some, but constrain sharing with others, could be contrary to the goal of increasing the availability and use of information for society's ultimate benefit. For these reasons, it will be important to track the implementation of various licensing agreements over time to determine their impact on access, and to identify those that exemplify good practices in scientific publishing. We believe this endeavor will be worthwhile if it reinforces similar efforts underway, both inside and outside science, and motivates scientists to consider alternatives to the "old ways" of dealing with publishers.

To facilitate movement toward more creative and expanded use of licensing, we urge authors to consider the following guidelines:

Guidelines for Licensing Agreements Related to Electronic Journal Publishing in the Sciences

Within the rights granted under copyright law and any amending legislation:

- author-publisher license agreements should actively foster the public interest in promoting access to and broad use of scientific information. These terms should embody the core values of scientific publishing identified in the report (see Table 1).
- although it is impossible to know with certainty what added-value arrangements will be feasible and desirable in the future, authors should consider carefully the willingness and capabilities of a publisher to furnish future enhancements to their work when deciding whether to transfer all or some of their bundle of copyright rights. They should seek licenses that demonstrate a commitment to adding value and, in the process, to stimulating innovation in publishing that benefits science. All stakeholders should ultimately benefit from a consistent level of high quality information that is accessible in a reasonable, generally accepted framework of rights and obligations.
- licensing agreements should define the rights and obligations of the parties and of third-party users. Particularly important are the following provisions:
 - authors should receive proper attribution whenever their work is reproduced, redistributed, or performed or displayed publicly, in whole or in part. Absent

* Although we do not recommend a particular licensing model, Appendix C in the report includes an array of existing licenses to provide some idea of how others have approached the licensing of their work with publishers.

any pre-existing restrictions placed on the use of their work, authors should also be able to use their work without restriction and at no or nominal cost, in ways that maximize access to it by others for educational and research purposes. Authors' rights to use their own work should persist at least as long as the term of copyright, and their use should not be defined in terms of the technological capabilities at any given time.

- those with the rights to reproduce, distribute, and, where appropriate, perform and display an author's work should be able to sell the fixation of the work in a form agreeable to the author or otherwise make the work available to others, and receive a reasonable return on their investment in adding value to the original work; to have the original publication properly acknowledged by the author and other users; to keep it technologically current, if the author agrees to allow the making of derivative versions of the original work; to include the work in any future collections or databases that it produces; and to pursue on a non-exclusive basis any other uses of the work in all media, so long as the author has agreed to allow any such activities.
- users covered by a license agreement should be permitted to read, display, download and to print the materials; they should also be allowed to distribute materials to others at no charge when such distribution constitutes fair use, and otherwise at a nominal charge. Users not covered by a license agreement should have access to materials on terms compatible with copyright law, including fair use. Encryption and other similar technologies should be managed in ways that do not frustrate the access described here.
- license agreements should allow for affordable, long-term access to the work, including provisions for preservation, whether by the publisher, libraries, or some other third party. Conservators should be licensed by copyright holders to obtain and make copies of published electronic works in order to ensure their continuing availability to the research community. Conservator activities must not interfere with the ability of publishers, during a clearly defined period of time, to earn a reasonable return on their investment in adding value to the original work.

Many publishers will wish to work with authors to develop licenses consistent with these guidelines. When scientists are unable to find publishers willing or able to do so, they should consider establishing consortia, perhaps managed by distinct or interrelated intellectual communities of science, to foster publishing practices that strongly advance the public interest in science.

There could be an important role for government in these matters. The principle that it is in the public interest for government to support research is well established in the United States and many other countries. Publication is integral to the research process; there can be no advances in science without publication, whatever form it might take. Hence, government, as a major supporter of basic research, should use its competitive grant system to fund experiments intended to bolster alternative models of licensing and publication. The goal is to promote wide access to and preservation of scientific information in cost-effective ways. Thus, the federal government should consider adopting guidelines for grantees that reflect the core values that we identified earlier.

Conclusion

Over the long term, there may be great benefit to society in restructuring intellectual property law so that works of authorship are more widely available. The emergence of new norms of copyright licensing in scientific publishing will gradually create a foundation for change, but this process will take time. In the interim, scientists and scientific publishers have an opportunity to take a leading role in the creative use of licensing or copyright transfer to build a new publishing system, operating within existing copyright law, that will embody the core values that should shape scientific publishing (see Table 1). The developments of licensing recommended in this report rest on a simple, yet compelling, rationale. The control of rights in scientific intellectual property should be guided by a developing consensus (not legislation or editorial coercion) toward new patterns of licensing. This shift in licensing arrangements will reinforce the goal of access that fundamentally motivates scientists, and that benefits society as a whole. Truly, this is promotion of science and useful arts in the best sense.

TABLE 1: Core Values Animating Scientific Scholarly Publishing

GROUP 1: Quality values associated with the individual published work	
1.1	Authenticity: stable, unambiguous identity of the work and its authorship, reliably reflecting authorial intentions.
1.2	Originality: freshness of insight, expansion of knowledge; differentiation from prior work.
1.3	Quality: scientific insight, authoritative understanding of subject, clarity of statement, accuracy of reporting and documentation.

GROUP 2: Quality values associated with scientific publication venues. (A venue is a site that publishes science; journals and Web sites are the most familiar venues.)	
2.1	Added scientific value: authors and users are able to add value to the publication by linking it to related items (for example, related data sets provided to enrich scientific discourse).
2.2	Editorial activities: editorial practices improve factual accuracy, clarity of language, and effective communication.
2.3	Editorial integrity: fosters free and open inquiry, follows ethical principles to manage conflicts of interest (with advertisers, publishers, etc.), and espouses the values of good science (i.e., Group 1 values).
2.4	Impact: authority and prestige are reflected in the citation frequencies of the publications in the venue.
2.5	Peer review: employs an effective and fair peer review process to ensure quality and originality of individual publications.
2.6	Research ethics: scholarly publishing venues should conform to and support the ethics of science, including research integrity and the protection of human participants in research.
2.7	Timeliness: authors have prompt publication and authoritative evidence of priority of discovery and reporting.

GROUP 3: Values associated with a system of publication	
3.1	Access: users have assured, easy, enduring access to information.
3.2	Affordability: costs do not unduly limit access to information.
3.3	Archiving: users are confident that information will remain permanently available to them, with no impairment of authenticity (that is, 1.1).
3.4	Bibliographic services: cataloging, abstracting and indexing services, and other appropriate means of intellectual access are provided to guide users to the information they need.
3.5	Entry: barriers to new publication venues should be low so long as Group 1 quality values are preserved. Similarly, quality work that challenges established thinking should find a publication venue. Sub-disciplines and specialties that meet standards of quality should find systems of publication that allow them to establish their identities.
3.6	Privacy: systems of scholarly publishing should respect the privacy of users by enabling them to determine how much information about their use of scholarly publication they want revealed.
3.7	Reuse: subject to limitations under intellectual property law, authors are able to build on, modify, and extend their own work and that of other authors at no or nominal cost. Examples of such reuse are fair use quotation, application of data to new inquiries, postings on laboratory Web sites, reserve readings and teaching materials, creating hyperlinks, etc.