

## Copyright protection and open access<sup>1,2</sup>

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"It is the sense of Congress that any Federal department or agency that enters into funding agreements should make every effort to develop and support mechanisms for making the published results of the research freely and easily available to the scientific community, the private sector, physicians, and the public" (1).

So reads HR 2613, Public Access to Science, a bill before the US House of Representatives that is sponsored by Representative Martin Sabo of Minnesota and that, if enacted, would place all published work that is "substantially funded" by agencies of the US government "beyond the reach of copyright protection so that they will be freely available for the benefit of the people of the United States" (1). This bill would run counter to Article I, Section 8, of the Constitution (2), which gives Congress the responsibility to "promote the progress of science and the useful arts, by securing for limited times to authors and inventors the exclusive right to their respective writings and discoveries." However, because scientific discoveries by US government employees are considered "works for hire" and are not protected by copyright (3), HR 2613, also known as the Sabo bill, would simply broaden the definition of "works for hire" to include any scientific discovery supported by US government funds. The elimination of copyright rights and the free availability of published works are at the core of the Public Library of Science (PLoS), which will be launching an online journal in October 2003. The purpose of the PLoS is to provide "immediate, free and unrestricted access" of all its contents to the scientific community and the public (4).

On the face of it, the interacting concepts of copyright elimination and open access might appear as a rational and solid foundation for the most timely and widest dissemination of new scientific knowledge to humanity. Yet these concepts are strongly opposed by the established scientific publishing community because they could produce the exact opposite result—distortion of scientific findings and increased public confusion. This editorial will examine each concept from the point of view of our solidly established, relatively small, financially solvent specialty journal, the *American Journal of Clinical Nutrition* (*AJCN*), which is supported by a society, the American Society for Clinical Nutrition, Inc (ASCN), which has clear goals of promoting nutrition education in medical schools and advancing scientifically proven knowledge of human and clinical nutrition. The *AJCN* is in a somewhat unique position because the scientific discoveries we publish are for the most part directly related to an area of huge public interest and commercial enterprise: the relation of diet to health and disease.

According to its website, the PLoS is supported by a \$9 million endowment, has an editorial board of established academic biological scientists, will follow standard principles of rigorous peer review, and is dedicated to rapid and free dissemination of new results to anyone who logs onto the Internet (4). This most recent PLoS venture follows a recent unsuccessful attempt by its organizers to obtain 30 000 signatures of biological scientists on a petition to boycott all scientific journals that use the conventional publication model. Several ongoing online journals now adhere to the rapid publication open access model, including those of BioMed Central and the European Molecular Biology Organization, but none of these journals has attempted to eliminate copyright. In addition to waiving copyright protection, successful PLoS authors must pay a \$1500 fee from their research budgets to defray publication costs. Assuming that the research is government-funded, the federal agency that supports the research also will ultimately pay for public dissemination of its results. The overriding principle is that as soon as an article is approved and paid for, it is immediately placed online for open access by anyone—scientist, physician, or layperson—interested in the data and the research.

In contrast to the PLoS, the *AJCN* follows a conventional model in which all submitted articles undergo rigorous peer review before acceptance, and publication follows careful technical editing for accuracy. The copyright for each published article is transferred to the ASCN, which has the legal obligation to defend all *AJCN* scientific content against potential misuse and distortion. During the first 12 mo after publication, nonsubscribers may access any article from our online journal for a nominal fee of \$8. Twelve months after the date of publication, original articles are freely available to anyone from our website. In practice, any academic scientist working in a university, foundation, or corporation with an institutional subscription has free online access to *AJCN* content through that institution's library. The *AJCN* provides immediate access to current articles to scientists in third-world countries via free institutional subscriptions through an arrangement between the publisher of our online content, HighWire Press, and the World Health Organization. The estimated *AJCN* publishing cost, derived by dividing the annual expenses of scientific editing in Davis and production management in Bethesda by the annual number of pages published, works out to \$435 per page, or

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roughly \$2500 per 5-page printed article, which is considerably more than the \$1500 charged in the PLoS model. These *AJCN* costs are borne in part by the authors, who pay just \$75 per published page for each accepted article (\$375 for a 5-page article), and mostly by individual and institutional subscriptions, which are paid to the ASCN and budgeted to the *AJCN*.

What are the downsides of the PLoS model and its supportive bill, HR 2613? Why should we maintain the more costly conventional publishing model that relies on subscriptions, transfers copyright to the society, and delays open public access to original articles by 1 y? Copyright ownership is essential to the integrity of all the scientific information we publish. Without this safeguard, any of our published material could be distorted and used for commercial purposes. Suppose, for example, that we publish a paper in which the author carefully evaluated the composition, benefits, and risks of a nutritional supplement, in accordance with our stated policies (5). Without ASCN-protected copyright, a supplement marketer could simply list the published benefits, without the formulation or risks of usage of the supplement, in its promotional advertising. Because average consumers are unlikely to seek out the original bases for advertising claims or the original publications of the research, their choices would be based on misinformation taken out of context from an unbiased, published scientific article.

With no printing, mailing, or distribution costs, the PLoS author fee of \$1500 per article is exorbitant, compared with the \$375 publication charge per average 5-page article in the *AJCN*. The policy is also discriminatory, because only established and well-funded authors at academic institutions could afford this fee. Less well funded scientists, such as those starting their careers, non-US scientists, or scientists employed by the US government or foundations that do not provide publication costs, would be excluded from institutional support for this exorbitant PLoS publication fee. Hence, this policy is likely to be attractive only to the well-funded scientific establishment and not to others whose science may be as good or better but who lack large-scale external funding.

The higher overall publication costs of nonprofit scientific journals such as the *AJCN* are essential to support the multiple, careful, methodical stages of scientific peer review, rigorous technical editing to ensure internal accuracy of published data, and the ultimate publication costs of both print and online versions. Furthermore, the cost to publish *AJCN* online includes free cross-referencing to other online journals published by HighWire Press, which currently has available > 600 000 online, free, full-text scientific articles and a total of >1.5 million articles from 120 different scientific journals.

Although compelling arguments can be made in favor of immediate open access to all scientific content by scientists and the public alike, several factors suggest a cautious approach. Instant access to newly published data could only further confuse a public that demands certainty, especially when health decisions must be made. Any cancer victim should be able to read any and all scientific literature about the disease and its treatment, but it is very difficult for a person untrained in scientific evaluation to discriminate good science from bad science or to distinguish an inadequately controlled drug trial from a well-controlled one. Recent surveys point to the deplorable nature of science education in the United States, where 12th graders score at the bottom of similarly schooled children


from other developed countries, and where most adults are incapable of understanding the scientific process (6, 7). In this context, it is remarkable that fully one-third of Americans consume nutritional supplements and 12% consume herbal products, although the value of most of these products is unproven by conclusive clinical trials, and none require governmental approval and regulation (8).

As scientists, we recognize that all original results must be evaluated with skepticism, and that scientific “fact,” if ever truly established, requires reproducibility and confirmation of results through independent and unbiased follow-up studies. Furthermore, the consequences of reported inaccuracy in clinical science are much greater than in basic science—eg, a 10-fold mistake in a published drug dosage can kill a patient, whereas a 10-fold error in the concentration of a biochemical reagent will only frustrate future scientists seeking to reproduce the results. Although not foolproof, vetting of each accepted paper by careful technical editing is worth the extra effort and time before publication. The current model of waiting for 6–12 mo for free availability of published studies permits an opportunity for further scientific scrutiny in the form of topical letters and editorials focused on the recently published work and enhanced validity through the reproduction of results.

In contrast with the PLoS’s imperative to rush to publish results, the slower interaction between authors and the editorial offices of conventional nonprofit scientific journals provides opportunities for greater perspectives, by placing new results in the context of established and emerging areas of scientific knowledge. For example, new *AJCN* discoveries are qualified and interpreted in context by 2 editorials and 1 review article, on average, each month, while critical letters to the editor appear regularly during the 12 mo after publication of original articles, all before their free access to the public. Although PLoS claims an intent to provide rigorous peer review of all submissions, the exorbitant author payment of \$1500 per published article suggests a potential conflict of interest for PLoS editors eager to maintain financial solvency of their online journal. Such potential conflict of interest between editors and authors cannot exist in the *AJCN* model, in which journal solvency is protected by subscriptions and membership in the parent organization, ASCN.

Last, elimination of copyright and universal implementation of open access could essentially terminate the hundreds of nonprofit scientific journals such as *AJCN* that, for the most part, are edited by dedicated, working academic scientists and the sponsoring scientific societies that depend on individual and institutional journal subscriptions for their financial solvency. In other words, both the *AJCN* and ASCN might cease to exist in this brave new world of immediate, free, and uncopyrighted access to scientific results. Sacrificing the *AJCN* for the free PLoS model would eliminate a monthly journal that continues to advance the field of clinical nutrition in medicine through publication of the highest-quality original science, reviews, and editorials. Elimination of *AJCN*-based financial support could spell the demise of the ASCN and its many activities, which include annual meetings for the exchange of new findings and ideas among clinical nutrition scientists, promotion of nutrition education in medical schools and in postgraduate training, and expert testimony to Congress on the importance of governmental support for nutrition research and on public health issues related to the American diet. Elimina-



tion of these initiatives would be an extremely high price to pay for a new, inadequately tested, and unprotected publication system that could ultimately lead to commercial misuse of experimental results and to the potential for greater public confusion through dissemination of fresh but inadequately validated scientific information. 

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