equitable thing and take your efforts into consideration in assessing damages or penalties. This symposium is one way you can become more aware of the law and its ramifications. Ignorance of the law is no excuse, especially when there are opportunities such as this symposium to dispel ignorance.

One caveat—judges take a very dim view of willful disregard of the law. Knowledge of the law combined with willful transgression can be worse than ignorance. We have attempted to make you aware of what the law says about copying, but it is up to you to obey the law as you honestly see it.

Copyright: Kill the Goose or Protect the Golden Egg?†

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Copyright protects the rights of scientists and scholars as authors who wish to achieve the widest possible dissemination of their work and as researchers who require access to information. The founding fathers of the United States acknowledged the need for copyright protection. Two centuries later, Congress reiterated the concept that copyright assures wide dissemination of valuable information. Chemists and other scientists depend on the existence of publications with narrow constituencies in which specialized knowledge is distilled. The uncontrolled practice of photocopying without payment to the owner will surely spell the demise of science's most important medium for the exchange of current knowledge at the forefront of advancing research.

INTRODUCTION

The papers which follow explore the legal, moral, and practical issue relating to adherence to, and respect for, the copyright law. The points of view come from persons in different sectors, and they may appear adversarial. But they are not. Publishers and librarians, for example, have uncovered areas of disagreement stemming from different interpretations of the new law. However, we are all part of a continuing chain. At one end of this chain is the scientist/author conveying information to a colleague at the other end of the chain, a scientist/reader who returns the favor with his own subsequent contribution. We are simply the middlemen, the brokers in this chain, and we function as catalysts for stimulating development at the forefront of chemistry.

THE ISSUES

The Constitution of the United States says, in Article I, Section 8, "The Congress shall have power to promote the progress of science and useful arts, by securing for limited times to authors and inventors, the exclusive right to their respective writings and discoveries".

Most of you have contributed papers to journals. Many of you have contributed a chapter to a book. Some of you are authors of books. Many of you have worked on a development for which a patent was subsequently obtained, either by yourself or your company. Your right to protect your "respective writings and discoveries" is a basic constitutional right embedded in the original Articles. It is not a new idea. Chemists respect the patent and proprietary rights of others. Do they always respect the intellectual rights of fellow authors to their writings? I leave it to the reader to examine his conscience and to answer this question for himself.

Just as you transfer patent rights to your employer for the development and dissemination of the practical values in a discovery, you transfer your copyright to a publisher to ensure maximum dissemination of the ideas in your writings. When a fellow researcher photocopies your article or a chapter from your book without permission to do so or without compensation for the use of the information, he is stealing from you. When you make unauthorized copies of copyrighted material, or your library does it for you, you may be stealing from your colleagues. You may also be destroying the foundations of the distribution system for scientific literature.

There is no free lunch. Someone must pay for the cost of putting material into the system. Congress recognized this economic fact of life when it created the copyright law. It explained that copyright does not restrict dissemination of information; on the contrary, copyright promotes such dissemination. It does so by encouraging investment in the creation and distribution of the publication. Whether the publisher is a professional society such as the American Chemical Society (ACS), a commercial publisher such as John Wiley & Sons, or a university press such as MIT Press, the publisher weighs carefully the prospect of a return on his investment through the sale of enough copies of a book, enough subscriptions to a journal, enough reprints, enough microfiche, or enough uses in an electronic delivery system. The legislative history details in several places that copyright is meant to encourage such dissemination by protecting the investment from unlicensed use.[1]

Where does the abuse come from? What is the danger? In a word, the answer is republishing. Original publishing requires more than simply printing and binding. The process includes evaluating the quality of the ideas and the presentation, which in our field requires the peer review process. It means editing manuscripts for clarity. It means designing a format to improve legibility. In short, there is value added by the publisher initially, which he hopes to recoup through the distribution process. When the printed page is then photocopied and "republished" without compensation, the original publisher cannot recover his investment. The result is that a journal such as this one may very well be terminated, even though there is a wide (albeit illicit) audience for its papers. This is the journal you write for, the journal you read to keep abreast of developments. Its very existence is currently threatened by copying without permission and payment. Without respect for copyright, the system will offer less material of value or, worse, material of lesser value.

Why does a publisher need to administer copyright in a manuscript? Under the current law the author owns the rights

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to the manuscript at the moment it is created and exists in tangible form. When you transfer your rights to the ACS or Wiley, you enable your publisher not only to publish and distribute the work but also to license others to redistribute it, to sell reprints and photocopies of it, to share it with abstracting and indexing services, to include it in electronic data bases, and to create new forms of it such as microfilm.

Do not make the mistake of thinking your single, occasional use of the company Xerox machine is always trivial. Sometimes it is, and sometimes it comes under fair use. But if you work for a large chemical, petroleum, or pharmaceutical company, for example, your trip to the photocopy machine is being repeated elsewhere in your company by others like you, and, as Congress said,[2] these so-called trivial abuses, in the aggregate, can deal a mortal blow to an important journal serving a narrow, specialized subset of a discipline.

Of the thousands of journals being published today, many number their subscribers in the hundreds and not in the thousands. It does not require many photocopies to put such journals out of business. That ultimate result runs contrary to your best interests. Taking advantage of the publisher will reduce your opportunities for places to publish. If you or your company or school library are making photocopies of copyright material, the use should be reported conscientiously through the Copyright Clearance Center (CCC) so that payment can be made in support of the publication. The code appearing at the bottom of the first page of most articles in ACS journals announces the fee to be paid through the CCC. It is not designed to delay or restrict copying. It provides instant, on-the-spot permission to copy, provided the copying is paid for.

You are the authors. You are the readers. You are the users. These are your publications, and you have a vested interest in their health. Protect them by using your influence inside your companies. Express your views to the librarians and the management so that they understand you and your colleagues need to ensure the system. Urge your libraries or other photocopying facilities to secure licenses or permission to copy where necessary or else to register as users of the CCC. If you teach, please do not order multiple copies of book chapters or periodical articles without making sure your fellow authors and their publishers are compensated.

If you are an author, think about how you feel when cheated out of a royalty. If you publish in highly specialized, state-of-the-art, advanced journals, think about how you feel when such journals fold. Every two years an estimated 8000 journals cease to exist.[3] As science expands, the exchange of information about discoveries must keep pace. The charge of "proliferation of journals" is misleading in implying that the rate of growth is excessive. It is science which is expanding and the need for documentation and dissemination of information is accelerating to keep pace.

All who depend upon the system of exchanging information through publishing must honor that system by ensuring that photocopying in the library or academic institution is paid for by license or through the CCC. Do not stop copying. Do try to provide your share of the sustenance needed to maintain the goose that lays that golden egg. If not, all that will remain of the egg will be the odor of hydrogen sulfide.

REFERENCES AND NOTES

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Why Should Chemists Care about Copyright?†

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Chemists and chemical engineers have been largely unconcerned about copyright, as such, but as authors of papers and users of information they very much want to be able to publish in and use high-quality publications, and they also want them to be readily available in libraries and as quickly obtainable photocopies. They do not readily relate rising publication costs and rigid library budgets to their own publication requirements nor photocopying ethics to publication continuity. If chemists and chemical engineers really want quality publishing, they must assume some responsiblity for adequate funding of both quality publications and library programs that use them.

CREDITABLE PUBLISHING

As chemists or chemical engineers—as practitioners of science or engineering—we rarely feel any instinctive involvement with either copyright protection or related problems when we are involved in communicating, except, perhaps, when we are writing books and are concerned with royalties. As scientists or engineers, our chief concern in having our findings published is to add them *meaningfully* to the general store of scientific or engineering knowledge, preferably in such a way as to be known *creditably* as the source of what we report. (Hereafter, whenever I refer to "chemists" or "scientists" I shall also mean "and engineers".)

Now, what is really involved in "adding our findings *meaningfully* to the general store of scientific knowledge"? Until the advent of electronic publishing, this has usually meant having our papers published in the most reputable journals that specialize in our fields—where there is a choice, in the journals that reach the largest audiences of our peers. We know that this usually means going through the gadfly agonies of peer review, but most of us ultimately agree that this is beneficial to the overall quality of our papers—to putting our best foot forward.

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