Copyright, Public Policy, and Information Technology

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One of the least recognized yet most important public debates of this century has been going on for more than 15 years. It concerns the roles of new information technologies in the American polity and public policy for those roles. The outcome of the debate will determine future patterns of information usage, origination, and dissemination, as well as new communications policies, and will affect in a substantial way the American "knowledge industry," which comprises the largest single segment of our economy (*1*). Any public policy for information technology will influence profoundly the future expression of intelligence in the American population.

Discussion about the roles information technology should play in the American polity has been occurring chiefly within the more general debates on U.S. copyright law revision. The technologies causing greatest concern have been cable television, photocopying, and computer-based information storage and retrieval systems. Related technologies such as microwave communications, new recording devices, facsimile transmission, pay television, and microreproduction have not made their political debuts, but they nonetheless have unquestioned potential for adding fuel to the already scorching policy fires.

It is my purpose to single out two major information technologies that have already fostered considerable controversies—computer-based information storage and retrieval systems and photocopying technologies—and analyze the costs and benefits they have produced in various knowledge-sensitive circles of American society. I also suggest some immediate policy steps that might be taken concerning computers, photocopiers, and other information technologies.

Computers and photocopiers are unique information technologies for a variety of reasons. One is that they have been in operation long enough to find out how they function in our technological society and what popular practices concerning them are; these "histories" give us some background on which to make projections for public policies. Another reason is that, more than any other new technology, they are involved in the origination and dissemination of scientific, technical, and social information. It is on these kinds of information that social "progress" is based. This is true no matter how progress is defined—whether as industrial growth, environmental preservation, or spiritual fulfillment. Finally, computing and photocopying technologies are becoming "homogenized" and therefore must be analyzed as components of the same concept. Increasingly, machines combine facets of both technologies, becoming at once devices for physical and bibliographic information access and for communications and "neopublishing" instruments.

Copyright as an Information Policy

Neopublishing provides an apt description of how the new information technologies function in light of traditional public policies for the origination and dissemination of information. Computers, and especially photocopiers, republish data that have been copyrighted as someone's "intellectual property." In terms of the usual concept of copyright, to republish copyrighted works without the permission of the proprietor is illegal. In the words of the Copyright Act of 1909, which remains the operative law of the land, copyright means "the exclusive right" of the copyright owner "to print, reprint, publish, copy, and vend the copyrighted work." Does this mean, for example, that when a library patron photocopies copyrighted publications without the permission of the copyright owner he becomes a lawbreaker?

At this juncture, no one really seems to know. While the definition of copyright found in the 1909 act provides no relief for our patron, the judicial doctrine of fair use and the not-for-profit limitation of the Copyright Act may save him from infringement suits.

The fair use doctrine, to explain it very briefly, is a safety valve evolved by the courts to assure that information may be disseminated without unreasonable demands being made by copyright owners for royalty payments when a portion of their intellectual property is used. To determine whether use of a copyrighted work constitutes infringement of fair use, the courts generally have relied on four criteria: the purpose of the use, the nature of the copyrighted work, how much of the work was used, and the economic effects of the use on the copyright owner. Normally, the last criterion has been the most decisive. These judicial criteria and the fair use doctrine itself have been included, for the first time, as part of the proposed Copyright Law Revision Bill. Thus, should the bill be enacted, a judicial doctrine will become statutory law.

The second exception to copyright's applicability is the not-for-profit principle contained in the 1909 act, which authorizes nonprofit, public performances of nondramatic literary and musical materials without the permission of the copyright owner. Educators have long assumed that the not-for-profit limitation protects them from infringement suits, although the judicial grounds for their assumption are at least questionable. In any event, the not-for-profit principle, like the fair use doctrine, provides a potential escape hatch for the public's use of private intellectual property (*2*).

The courts have only begun to recognize the implications of new information technologies for the traditional copyright concept. In a recent ruling, Commissioner James F. Davis of the U.S. Court of Claims held that Williams & Wilkins Company, a publisher in the biomedical field, had had its copyrighted works infringed by the National Institutes of Health and the National Library of Medicine. The cause of the

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infringement was MEDLARS, the library's medical information system, which had been photocopying copyrighted publications of Williams & Wilkins and distributing the copies on user demand, without paying royalties.

The implications of the Williams & Wilkins decision will not be fully understood for some time. The court may reverse Davis' recommendation, although informed observers consider this possibility extremely remote; or the ruling may be appealed at a higher level and overruled; or it may be appealed and supported; or it may stand, unappealed and unaltered; or Congress may revise the copyright law in such a way as to render the decision moot. In any event, the Williams & Wilkins case brings us back to the problem of public policy for new information technologies, but at a fundamental level—rather than addressing ourselves to the individual information user, we are now addressing systems of information use, origination, and dissemination. At root, the problem is one of new systems of information use and dissemination conflicting with old systems of information origination. The new technologies of knowledge comprise the emerging new system, and the old economics of copyright comprise the threatened old system.

Computers and Copyright

Unlike the printing press, computer-based information storage and retrieval systems not only print data, but give the copyright user what he wants in the form he wants it and even get what he wants for him. As a result of this qualitative leap in informational capacities, a variety of information systems have evolved that are using, republishing, and disseminating copyrighted data without obtaining the permission of (indeed, often without informing) the copyright owner, much less paying royalties to him. Such a development, of course, may endanger the economic incentive to create new knowledge. Other than copyright, there is no widespread method of author compensation in existence, and disregarding it means simply that the author (and publisher) will not be paid for the use of his works.

The computer facilitates the disregarding of copyright in the dissemination of knowledge. The more it is used, the more the originators of knowledge, who are more or less locked in to the copyright system, may suffer financially.

It appears inevitable that computer-based information storage and retrieval systems will grow enormously, both in data-handling capacities and popularity. The Ad Hoc Task Group on Legal Aspects Involved in National Information Systems, under the Committee on Scientific and Technical Information of the Federal Council for Science and Technology, reported that there were 1303 research and development projects on information science and technology underway in 1967, and the National Science Foundation tallied 102 projects in information coding and indexing, 126 in information retrieving systems, and 56 in the analysis and evaluation of information. Most of these projects related directly to the use of computers, and many were experimenting with machines that stored not only abstracts of articles, but whole texts. Even as these projects were being conducted, the National Science Foundation reported that at least 118 computerized information storage and retrieval systems were in operation in 1967; the Department of Defense alone had 33 of them. Similarly, computer-communications systems had grown from a paltry 31 in 1960 to more than 2300 on-line systems by 1966. Officials of IBM have reported that more than 50 percent of all computer installations will have a communications capability by 1978 (*3, 4*).

Furthermore, computers themselves are gaining popularity as an information tool because of language simplification, time-sharing techniques, and radically declining costs. According to the Stanford Research Institute, the cost for the same computational function has been falling at the rate of approximately 25 percent annually, a rate that likely will continue for the next 10 years. General Electric executives have stated that the average cost of 100,000 multiplications on a computer was initially $1, had reached 25 cents by 1963–64, and should be a nickel "in the near future" (*5*).

The legal complexities of copyright and computers are enormous. When the problem first was recognized, in the early to mid-1960's, the entanglements were of such a novel character that a number of participants in copyright revision echoed the frustration of one lawyer who asked, "and not facetiously—whether the performance of a copyrighted computer program in a public showroom . . . constitutes a public performance. . . . I would like to ask clarification . . . of what was intended with respect to copyrighted works in relation to their use in information storage and retrieval units" (*6*). So novel, in fact, was the role of information storage and retrieval systems that the Register of Copyrights admitted that, in the 1964 Copyright Revision Bill, "we deliberately avoided any specific references to 'computers' or 'information storage and retrieval units' . . . we think it is safe to draft general language, which can be interpreted by the courts to apply to particular usuages" (*7*).

Bella L. Linden, then counsel for the American Textbook Publishers Institute, was among the first to analyze in detail the implications of information storage and retrieval systems for the copyright concept, and she performed this analysis in what amounted to a conceptual vacuum on the topic. As the task group of the Committee on Scientific and Technical Information accurately noted, the "subject of information storage was only briefly considered by the House Committee at its Hearings" on copyright law revision in 1965, and no "testimony was offered by any government agency on the impact of the proposed copyright revision on the computer usage of copyrighted material" in the 1967 hearings (*3*, p. 6).

Linden's remarks in the 1965 congressional hearings on copyright law revision still provide a useful overview of the computer and copyright problem. She categorized computer manipulation of information into four processes: input, storage, retrieval, and output. Each one of these processes involved a potential infringement of copyright, although infringements had to be defined in a context that might have appeared bizarre to the original framers of the 1909 act (*8*).

Input, or "feeding information into a system," required the "translation" of data into a computer language. Since translation of a work was the legal prerogative of the copyright proprietor, an infringement was evident when copyrighted data were encoded on punch cards or tapes.

Storage necessitated the transference of information from cards to magnetic tape. When a computer programmer did this, he automatically created "a new kind of anthology . . . of copyrighted works that is published in the computer system. . . ." Merely because information was assembled electron-

ically on tapes, rather than printed in conventionally bound books, did not render the information any less free from copyright restrictions. Sophistication of format was no escape from copyright.

Retrieval, or the means by which the system scanned data stored in its memory banks, also held a potential for copyright infringement. It was possible that retrieval (or, more precisely, scanning) might be the exclusive prerogative of the copyright owner of the information scanned, in that retrieving data might "be analogized to a performing right."

Finally, output paralleled storage in the sense that it republished the system's data. In the output process, however, information was not published on tapes, but on viewing screens or printouts. This aspect rendered computer-based information systems quite similar in concept to photocopying machines.

The implications of Linden's remarks were familiar to publishers. The task group has noted that, of the 25,000 book titles published in the United States every year, the 6,500 annual science and technology volumes are "probable candidates" for reissue in a new format by national information storage and retrieval systems (*3*, p. 73), and that such reissue would not necessarily provide compensation to authors and publishers under copyright arrangements.

The 1973 Copyright Revision Bill (S. 1361) affects computer-based information storage and retrieval systems in two ways: in certain instances the bill could require researchers to secure permission from copyright owners in order to use their materials in computer programs, and for the first time computer programs themselves would be protected by copyright law.

The former point is still open to legal interpretation, but, in cases where the judicial doctrine of fair use is not applicable, computer users could be subject to copyright infringement suits. Copyright owners contend that their intellectual property would escape copyright law simply by virtue of being run through a computer before distribution; requiring permissions from users at the input stage of a computer project would discourage this. Copyright control of output by computers has also been considered, but the difficulty of policing this stage of automated information dissemination presents formidable administrative problems, and control of input seems to be the current focus of argument.

The Interuniversity Communications Council, an organization of universities with interests in information technology, was the first users' group to call attention to the fact that, by requiring a copyright toll at the input stage of a computer program, certain exemptions for nonprofit institutions could be destroyed. Section 110(1) of the 1973 bill exempts from copyright infringement suits the "display of a work by instructors or pupils in the course of face-to-face teaching. . . ." To place a copyright toll at the input stage might abrogate this exemption, as the clauses may well be mutually conflicting. In addition, a permissions requirement on computer input could hamper research. Anthony G. Oettinger, director of the Harvard University Computer Center, objected in testimony that (*9*, p. 588):

> . . . I would have not only to acquire and evaluate materials, but in each instance, before experimenting with them, seek out the owner of a copyright, if any, make formal requests for permission to use the material, pay royalties . . . etc. All this before any material could actually be used and, in fact, before I could find out whether or not the material was useful! The delays, the frustrations and the chaos inherent in such a process now seem so formidable that . . . I would be tempted to return to the safer occupation of copying out manuscripts with a goose quill pen.

The second aspect of copyright extending to computer usage of information refers to the registration of computer programs in the Copyright Office. The 1973 Copyright Revision Bill and its predecessors define copyright in terms that may be broad enough to include computer programs, depending on subsequent interpretation by the courts. Section 102(a) states that copyright protection "subsists . . . in original works of authorship fixed in any tangible medium of expression, now known or later developed, from which they can be perceived, reproduced, or otherwise communicated, either directly or with aid of a machine or device."

A computer program is, basically, instructions that set a computer's "switches" in order that it can perform a particular function. There are essentially three kinds of programs: systems programs, which control the operations of the machinery itself (for example, FORTRAN); application programs, which solve particular problems (for example, the social security system in the United States); and general-purpose application programs, or utility programs, which can be used by a variety of users (for example, a debugging program, which corrects mistakes in other programs).

The legality and social utility of registering computer programs are hazy issues. The issues arose when John F. Banzhaf, III, wrote a program for law research as a graduate student in 1964 and decided to protect it. He discovered that the U.S. Patent Office had ruled that computer programs could not be patented; he therefore, after considerable effort, secured what was the first copyright for a computer program. Banzhaf argues that copyright protects the effort required to compile some kinds of programs, not the program's idea, and that copyright thus provides incentive to produce computer programs by effecting a distribution of its costs among users (*10*).

Between 1964 and late 1970, only 200 programs were registered. This low number suggests that program developers find copyright unsuited to their needs. There are several reasons for this. One is that systems programs, such as FORTRAN, are often sold by computer manufacturers as part of their sales package, and development costs are absorbed in those sales. Second, application programs, which must be written substantially in accordance with an individual user's needs, account for approximately 60 percent of all program development costs; these individually tailored programs are hardly compatible with mass-oriented copyright concepts. Finally, general-purpose application programs, which logically should derive the greatest benefit from copyright, are accompanied by expensive supporting items (for example, documentation annuals, debugging arrangements, and periodic hardware adjustments) that are tailored to the individual client. The cost of these supporting items often equals or exceeds the cost of the original program, a fact that tends to diminish the applicability of copyright to even these relatively mass-oriented programs (*11*).

In summary, while it seems possible that copyright protection might be appropriate for generally usable, off-the-shelf, low-priced programs that are sold separately from computer hardware and to widely dispersed buyers (who, theoretically, should find it impractical to agree on time-sharing arrangements), copyright does not now seem to be a

public policy that benefits the dissemination of information as it is formated in most computer programs. This conclusion may change as the market structure changes (if, indeed, it does), but recent copyright revision bills "may hinder the maximum efficient use of national information systems . . ." (*3*, p. 10). The effects of such hindrances would be to make research on information systems more difficult, perhaps render illegal abstracts of articles now used in information systems, and delay inclusion, or possibly exclude, some information from systems, even after the copyright owner is contacted.

It is not surprising that the relation of copyright law to information storage and retrieval systems has been clouded by the prospect of new computers with colossal capacities. If some progress has been made in understanding this relation (notably, the status of computer inputs in copyright law), it nevertheless stands that the rise of technology and its use in information systems has only recently indicated the potential problems involved. Only this rapid growth can account for the paucity of congressional testimony (relative to testimony on other technological issues) surrounding the place of information systems in copyright law, as the task group has noted. This lack of debate has existed despite the fact that hearings and other public meetings on copyright revision have been held for more than a decade.

Photocopying, Publishing, and Research

The extent of photocopying in the United States is awesome. In 1962, it was estimated that about 3.6 billion photocopies were made annually (*12*, p. 50). By 1969, the vice-chairman of Xerox Corporation could state: "The United States produced 27.5 billion paper copies in 1967. And this figure just covers copiers and duplicators—it doesn't take into account the miles of copying spun from computers, or microfilm copies, or spirit and stencil machines" (*13*, p. 150). The projected figures on library copying of the Committee to Investigate Copyright Problems Affecting Communication in Science and Education (CICP) indicate that roughly 60 percent of all the material copied is copyrighted (*14*).

Moreover, if per-page photocopying costs continue their downward spiral (and there is scant reason to believe otherwise), these already impressive figures should expand. No doubt there is, as economic theorists insist, a point of diminishing returns. But where that point is, and when it will be reached, is unknown. By 1965, it was possible to produce 25 or more single copies for one-half cent per page—quite a change from the quarter-a-page rate of only a few years earlier.

The most solidly founded empirical study on the relation of copying costs to the popularity of photocopying has been made by the Arthur D. Little, Inc., consulting firm. The firm concluded that photocopying technologies will improve in quality and versatility, that costs "can be expected to decline somewhat in the future," that great "continued growth must be anticipated, even if at a slightly lower rate, in both the number of machines installed and the number of copies produced," and that "there is broadening trend and incentive for the individual user to copy parts of books" (*15*, pp. 121–122).

For a decade, a number of individuals and organizations have attempted to study empirically the patterns and economic effects of photocopying. The Freehafer report of the Joint Libraries Committee on Fair Use in Photocopying, which surveyed ten libraries in 1961, was the first such attempt (*16*). In 1962, the National Science Foundation commissioned George Fry and Associates to study the problem as it pertained to scientific and technical publications (*17*). This was a relatively more thorough survey and examined the effects of photocopying on authors, publishers, users, librarians, and manufacturers of copying machinery. In 1963, Robert F. Clarke, working under a grant from the U.S. Air Force, completed a doctoral dissertation in library science on the topic; he examined copying of dissertations by University Microfilms and photocopying of articles in scientific journals in a sample of major research libraries (*18*).

In 1966, the American Book Publishers Council (ABPC) and the American Textbook Publishers Institute (ATPI) sponsored the previously cited Little study in order to determine the impact of technology on publishing. In the same volume in which the Little study appeared, there was an empirical examination of copying practices in American education, which was done by the National Opinion Research Center (NORC) at the request of the ABPC and the ATPI (*19*). The NORC study was essentially a combination of surveys and indicated the widespread growth of photocopying practices in education.

The most prestigious of the surveys, perhaps, appeared the following year. The Committee to Investigate Copyright Problems was awarded a grant by the U.S. Office of Education to examine photocopying practices in libraries. Photocopies in 66 libraries were recorded for 1 month, and an extensive opinion questionnaire was sent to librarians. Former Register of Copyrights Abraham L. Kaminstein has said that the CICP is "probably the only organization that has tried to stay independent, or at least neutral, between the opposing sides," and is unique in that it "has tried to look at the situation and get at the facts" (*20*, pp. 1324–1325). The latest attempt to assess empirically photocopying practices is a 2-week study of photocopying at the University of Toronto Library, which largely validates the CICP's findings (*21*).

These studies are both useful and useless. While they have brought a number of empirical data to light, their conclusions are conflicting. Several of them are vague, not only in methodology, but in scope. Nor do their researchers seem to have precisely the same investigative missions. Most important, however, developing technology tends to date many of the studies' findings. Thus one publisher, for example, has said that: "As a consequence of rapid changes in technology, the cheerfully reassuring Fry report of 1962 on photocopying is obsolete" (*22*, p. 68).

The studies' conclusions can be divided crudely into two camps: pro-user and pro-owner. Pro-user conclusions are apparent or implied in the Freehafer report (1961), the Fry report (1962), the Clarke study (1963), and the Blackburn study at the University of Toronto (1970). Pro-owner conclusions are apparent or implied in the Little report (1966) and the NORC study (1966). The CICP report (1967), while not definitive, does make an effort to avoid recommendations concerning a new copyright law and tries to present only data. But the known sympathies of its authors for a copyright clearinghouse seem to have made copyright users less favorable toward it than owners.

If the various studies point toward a single conclusion, it is that those

copyright owners most alarmed by photocopying are having their works copied least. The ratio of journal titles to books copied was 9 to 1, according to the CICP survey (*14*, table 1; *23*). The majority of all items copied were scientific or technical (41 to 100 percent). More than 80 percent of the material copied is less than 5 years old, according to the CICP. "The number of multiple copies of the same document made for the same client by U.S. libraries is almost negligible." Copying of nonprofit journals dominates copying of profit journals by almost 2 to 1; for books, this ratio is 1 to 2. About 5 percent of the publishers in the United States produce 40 percent of the material copied. Journal articles nearly always are copied whole, and books nearly always are copied in part. The "preponderance" of journals copied are American, according to the CICP survey, although Clarke found that "over fifty percent" of the journals copied were foreign, and that therefore "this could have no influence on American publishers" (*14*, pp. 77, 65, 84, 83, 84; *18*, p. 2626). The CICP findings, however, represent a wider sample.

In summary, therefore, the most likely publisher to have a copy made of his works is a scientific-technical, nonprofit journal publisher in the United States who has been in business only for the last 5 years. Until very recently, this has been the person least concerned with the relation of neopublishing technologies to copyright protection.

The NORC survey provides some more details, particularly in relation to copying practices in higher education, as opposed to elementary and secondary education. It found that copying of published material is considerably greater in colleges than in schools, which tend to photocopy administrative papers. When published works are copied in schools, textbooks are favored, followed by music scores, tests, and answer sheets. College personnel tend to photocopy journals, monographs, and reference books, in that order of frequency (*19*, pp. 182, 183, 205, 213, 221).

Book publishers, largely because they have been politically organized considerably longer than journal publishers, have objected publicly to several of the studies. Law professor Julius J. Marke of New York University notes that book publishers objected to the Fry report on the grounds that it focused on journals and libraries rather than on books and schools (*24*). Since the appearance of the CICP and NORC reports, however, these arguments have been heard with less frequency.

Book publishers also contend that, because of the heavy initial costs of books, photocopying and other forms of neopublishing represent a serious threat to the origination of knowledge. A single high school textbook can require an investment of $50,000, while a "series of elementary school textbooks will require as much as $1 million investment before it is ready for marketing" (*22*, p. 68); a new encyclopedia recently required $7 million in make-ready costs (*25*). Furthermore, it is argued, risks in the book publishing business are high. Publisher Lee C. Deighton contends that there "can be no way to know in advance that a book . . . will sell." Whereas other industries can test a product on the market, publishers cannot until they have a full stock in warehouses, ready for sale (*22*, p. 68).

Despite the facts that books are copied rarely, compared to journals, that trade books are seldom copied at all, and that approximately one-third of the portions of books that are copied are published by nonprofit organizations (according to the CICP survey), book publishers are prone to cite the Little report, which projected a rise in book copying and a decrease in photocopying costs. Deighton stated in 1965 that "it is now possible to copy certain books at a cost less than the purchase price" (*26*). That same year, the ATPI, in a letter to Senator John McClellan, chairman of the subcommittee on patents, trademarks, and copyrights, submitted that 1964 per-page costs of textbook publishing were consistently higher than a photocopy of the same text: college texts had a per-page cost of $.008, high school texts of $.006, and elementary school texts of $.007—a photocopy of any text costs $.005 per page (*27*).

As far as college texts are concerned, a recent campus survey conducted by Gilbert Youth Research, Inc., for the college division of the Association of American Publishers and the National Association of College Stores indicates that photocopying cuts very little into textbook sales. Students estimated that they spent an average of $72 on books for the fall term of 1971, half of which was for assigned texts. Of those students who did not buy required books, 42 percent read the material in the college library, 41 percent borrowed a friend's copy, 12 percent went to the public library, and only 8 percent made a photocopy. The average university faculty member spent $115 in 1971 for professional books, and usually relied on library copies, reprints, and free desk copies from publishers to supplement his reading. If college textbook sales begin to decline in the future, the study concludes, it will probably be a result of decreasing importance of textbooks for teaching purposes; about 60 percent of the faculty interviewed (68 percent of younger faculty members) foresee such a decrease (*28*).

Journal publishers appear to have considerably more reason for believing that photocopying will affect their profits. Researchers for the Fry report investigated three kinds of damage that the publishers of scientific and technical journals might sustain: damage to reprint and back-issue sales, damage to advertising, and damage to circulation.

The reprint, according to the Fry survey, is still the medium of communication most preferred by scientists (73 percent of the sample favored it), and photocopying has not substantially damaged reprint sales. Advertising losses resulting from photocopying are "the problem of the commercial publisher," whose periodicals are copied considerably less often than those of nonprofit journal publishers. The advertising argument holds that no one will place advertisements because users will not photocopy them. The Fry staff did not empirically analyze this argument, nor has anyone else (*12*, pp. 55, 58).

The complaint that photocopying may diminish the circulation of some periodicals is worthy of further examination. According to the Library of Congress, three journals are born and one dies every day (*10*, p. 94). Journal publishing, it may be presumed, is a marginal operation, and any financial loss, caused by inroads on circulation, that is attributable to photocopying should be prevented if the dissemination of information is to be continued unhindered. This is particularly true of nonprofit journal publishers, who bear the brunt of photocopying practices.

Traditionally, and somewhat surprisingly, nonprofit journal publishers have not subscribed to this view. The Fry survey, which was the earliest investigation (1962) of the attitudes of periodical publishers, stated that the majority of journal publishers polled "encourage photoduplication of their journal articles" because they reasoned that the practice actually boosted the

circulations of their publications; it gave them free "advertising" through the distribution of photocopied articles, and librarians would learn of the existence of their journals when patrons requested a copy of an article contained therein. This generalization, however, did not apply to "the giants of the industry," who associated (and continue to associate) photocopying with a loss in issue sales and subscription orders. In the mid-1960's, a survey by the dean of the University of Maryland's School of Library and Information Services validated the Fry findings on the attitudes of journal publishers, but by 1969 a study of 255 periodical publishers indicated a possible shift in attitude. Although 72 percent of the respondents extended overall permission to a librarian's request to make five photocopies of single articles for reserve use, a majority of these attached "certain conditions" to their permission, and 16 percent flatly refused permission (*29*).

There are indications of growing concern and possible pro-owner sentiments among nonprofit journal publishers. The American Institute of Physics (whose seven member societies publish 35 journals) and the American Chemical Society (representing 20 publications) have filed *amicus curiae* briefs on the behalf of the plaintiff in the Williams & Wilkins suit. The American Council of Learned Societies (with 34 member organizations) has long been pro-owner in its position, and 14 academic and publishing societies (several of which are pro-owner in their views) recently formed a copyright study group that is sponsoring a two-volume treatise, compiled by the Cambridge Research Institute, on the topic of copyright revision. Still, it would be premature to state categorically that the scholarly associations and nonprofit journal publishers are pro-owner; a number of library, dental, medical, and educational organizations have filed pro-user *amicus curiae* briefs in the Williams & Wilkins case, among them the Modern Language Association, the American Library Association, the National Education Association, the American Council on Education, and the History of Science Association.

Part of this ambiguity in the attitude of nonprofit journal publishers toward the role of photocopying and information dissemination stems from a cloudy correlation between the number of subscribers that a nonprofit journal has and its potential for financial survival. A 1962 National Science Foundation survey of 262 representatives of scientific journals revealed that 211 were published by nonprofit scientific societies, 18 by university presses, and 33 by commercial publishing firms. The society journals, which comprised more than 80 percent of the sample, derived only 41 percent of their annual incomes from subscriptions. Journals published by university presses received 56 percent of their income from subscribers, and no figure was given for the commercially published journals (*11*, p. 335). The major (and rising) source of income, certainly for nonprofit scientific journals, is the page charge (*30*). The page charge, which nearly always is underwritten by the federal government, amounts to a public subsidizing of information origination.

This lack of reliance on circulation for funds would seem to call into question the argument that information production and dissemination hinge on readers paying directly for what they read. Moreover, because a majority of publishers of nonprofit journals still seem to believe that photocopying encourages their circulation (although this view may be in a process of change), copying technologies would appear, in general, to benefit the dissemination of information published in periodicals.

What the preceding studies do not analyze are the economic effects of photocopying on copyright users. Nevertheless, photocopying has benefits, and some costs, for users, although these are not easily quantified. Librarians, in particular, have derived benefits from photocopying. The cost of circulating books, a function that includes replacing vandalized pages and lost volumes, can account from 20 to 50 percent of a library's budget (*31*). Presumably, photocopying can reduce this portion of the budget because it reduces the need to circulate volumes and provides a substitute for the razoring out of pages by patrons. A survey conducted at the Universtiy of British Columbia indicated that 3.5 percent of the 181 library patrons queried admitted they would "steal or tear out the wanted pages" if photocopying machines were unavailable (*32*).

How much the emergence of photocopying has contributed to useful research and man's understanding of himself and the world is difficult, to say the least, to measure. Some kinds of scholarship, usually those that involve rare books, could not be accomplished without photocopying. As an example, Charles W. Shilling, director of the George Washington University Biological Sciences Communications Project, has assembled a team that is trying to compile complete, annotated bibliographies of the literature on the baboon and chimpanzee. The project involves "xeroxing all the world's literature in this particular field," a task that "could definitely not be accomplished, no matter how much time and money was available" without photocopies; the team has often relied on copying books only one copy of which exists in the United States (*33*).

An intriguing question in this regard is "Which would suffer more, research or publishing, if photocopying were not available?" The question is, of course, not easily answered, but the survey taken at the University of British Columbia indicated that research and library budgets might be affected more adversely than publishers' profits. Of the photocopy users who were asked what they would do without photocopiers, 72 percent said they would copy by hand, 19 percent said they would forget the whole matter, 5.5 percent would attempt to purchase, and the remainder would rip out the desired pages (*32*).

Relying on the University of British Columbia's figures and recalling that scientific-technical information is copied most heavily, one can estimate the costs involved by imagining a situation in which roughly three-quarters of the engineers who needed to photocopy a page or two instead sat down and wrote the material by longhand. Assuming that an engineer's time is worth $15 an hour in "an ordinary industrial complex" (*34*, p. 72), it would be far more economical to have him photocopy, even at a dollar a sheet, than to have him painstakingly transcribe by hand.

On the other hand, the 5.5 percent of copyright users who would be willing to buy the original source in the absence of photocopying opportunities (presuming the source was available when needed, if it were available at all) might amount to a respectable increase in sales. Sales mean royalties, and royalties have sometimes been essential to a writer's livelihood. Novelist Herman Wouk has observed that James Joyce and Thomas Wolfe, even at the height of their popularity, were living "from hand to mouth" on small royalty checks (*35*, p. 111).

Most writers, however, are not a

Joyce or a Wolfe, and they tend to write while holding down a regular job to pay the bills. A 1965 survey by the Authors Guild indicated that the average income authors derived from writing was about $3000 a year. An 8-to-5 job was a necessity to nearly all the writers questioned, and teaching was one of the most preferred occupations (*36*). One might speculate from this and other indicators that writers like Joyce and Wolfe—men who dedicated their lives to writing—are on the wane and that intellectual creativity of even the most humanistic sort is becoming bureaucratized in businesses, laboratories, and universities.

More lucrative (and certainly more feasible) than banning photocopiers to increase royalties would be establishing a copyright clearinghouse. Such a clearinghouse could, in theory, charge the user at the photocopier by recording what was copied. The clearinghouse would tally, for a particular period, the number of times an author's works were copied and the number of pages copied, and it would reimburse him and his publisher accordingly from the charges collected by the photocopying machines. A variant of this procedure would be to run periodic checks on what kinds of material were being copied and in what proportions of total copying; authors and publishers would be paid royalties collected at copying machines in accordance with the category of literature to which they contributed.

At first glance, such a scheme sounds horrendous in terms of equity among data-producers and administrative headaches. A copyright clearinghouse would require dimes to collect pennies; it reeks of "administrivia." On second glance, however, a copyright clearinghouse is quite plausible, particularly when one considers the administrative potential of computer technology and the use and distribution of photocopying machines in the United States. The CICP survey notes that most published material is copied in libraries (*14*, p. 70). The 15,500 public school systems with centralized libraries and the 22,500 remaining libraries in this country offer an existing, coherent system that provides an administrative basis for a copyright clearinghouse. Certainly the American library system is at least as well organized as are U.S. radio stations, which are subject to parallel regulations of the American Society of Composers, Authors, and Publishers.

Nevertheless, the costs of a clearinghouse, whatever its structure, are high. If it is based on individual subscriptions, annual costs could reach $300 million (*11*, p. 317). A minimum cost of $10 million is theoretically possible, but this could inhibit the dissemination of written works far more effectively than the possible loss of a few royalty payments. In short, a copyright clearinghouse could boost the transaction costs (that is, the administrative costs incurred in obtaining permission from an owner to copy his product) inherent in any copyright policy. Currently, transaction costs are low and are regulated largely by market mechanisms and by free access to photocopiers; with a clearinghouse, such costs easily might soar.

In summation, the economics of photocopying, while unclear in several respects, indicates that the financial incentive to write has not been affected measurably by copying machines. Nor have publishing interests in general suffered any serious monetary losses because of photocopying. Conversely, research costs may have been reduced by photocopying, a factor that should promote information production. But it should be reiterated that this situation is not static, and it is the potential use of photocopying, more than any other single factor, that concerns copyright owners.

A Policy Suggestion

Until very recently, the Committee on Scientific and Technical Information was formally responsible for coordinating national information policies in science. The reorganization of the White House science advisory staff a few months ago has left most observers wondering what will become not only of the committee's traditional role, but of the future of science information policy. At this writing, the Office of Science Information Services of the National Science Foundation would appear to be the most probable inheritor of the committee's duties, but the belief of its head that the committee will be used on a "need basis" and that an "ad hoc" arrangement seems preferable to "maintaining a large number of panels and holding meetings on a fixed schedule" (*37*) would appear to diminish the significance of science information policy as it relates to copyright.

The proposed National Commission on New Technological Uses of Copyrighted Works (Title II of the 1973 Copyright Revision Bill) may be, with a few modifications, an alternative agency for planning a reconciliation between copyright owners and users of scientific and technical information. At present, the commission is designed to write "recommendations" concerning "changes in copyright law" that would be equally beneficial to copyright owners and users in light of neopublishing practices, as well as to collect data on the new technologies themselves, all within a 3-year period; membership would include authors, publishers, educators, librarians, and the public.

With minor adjustments, the commission could become a prime designer and coordinator of federal information policies. Essentially, the commission should be kept small, should tie in with a greater number of relevant agencies than now suggested (*38*), should be made permanent, should include professions and groups currently excluded from membership (such as computer, photocopying, microwave, cable television, broadcasting, microfilming, scientific, and research interests), and should be of blue-ribbon quality. In addition, technological uses of copyrighted works in connection with "face-to-face teaching activities" should be reincluded in the commission's purpose. Such activities, which are taken to mean primarily photocopying practices in schools, have been deleted from the commission's purview largely at the insistence of organized education. Photocopying patterns in education should be reinstated as a topic of study, however; to exclude from the commission's scope a practice that is causing major concern among copyright owners is to examine piecemeal a problem that demands systemic analysis.

The commission also should be prepared to promote major proposals for information management that bear scant relation to the traditional copyright concept. Cable television, photocopying, microfilming, and computing are light-years removed from printing. Copyright was an admirable public policy for printing; indeed, copyright and printing are economic, social, and technological concepts that are inextricably intertwined. Today, however, copyright may not be an adequate public policy for the dissemination of information and the encouragement of its origination.

The commission should be ready to formulate information policies for specific user communities in conjunction

with particular national goals. The users of most immediate prominence are scientific researchers, engineers, and technicians; educational and training specialists; planners and public policy-makers; and the general media consumer. Federal policies should consider (i) assuring the availability of adequate scientific, technological, educational, economic, social, and political information; (ii) assuring cross-national access to data; (iii) identifying various kinds of information (for example, scientific, social, secret, or public) and determining relations among them; (iv) assuring that information of high quality is selected, analyzed, and made available for all public purposes and to all sectors of the public; (v) continuing study of user practices and of new information systems; (vi) continuing training of information specialists and managers; and (vii) financially encouraging research and authorship in conjunction with information systems and networks (*39*). These guidelines for a public policy for information are metasystemic in design, yet highlight those concerns that are currently important.

Summary

Photocopying, computing, and other neopublishing technologies may threaten the traditional foundations of the creation of knowledge and simultaneously promise ever-faster creation of scholarly insights and social decision-making. Conversely, copyright law maintains accepted patterns of data-production and may hinder increased rates of research and information-based decision-making. These are multiple dilemmas, and must be faced squarely in formulating new policies for new technologies.

References and Notes

1. See, for example, M. Blaisdell, in *Copyright Law Revision* (Government Printing Office, Washington, D.C., 1960), pp. 21–59; F. Machlup, *The Production and Distribution of Knowledge in the United States* (Princeton Univ. Press, Princeton, N.J., 1962); E. F. Denison, *Sources of Economic Growth in the United States and the Alternatives Before Us* (Committee for Economic Development, New York, 1962); M. Kochen, *Amer. Doc.* **20**, 186 (July 1969).
2. There is a third, officially sanctioned exception to copyright's applicability, and it is contained in the 1909 act: the public domain policy, which excludes government publications and government-sponsored research from copyright on the grounds that registering works of the government would inhibit their dissemination. The public domain policy, however, is not germane here because it would not provide potential relief for the hypothetical library patron, and it is not a potential escape hatch for the public's use of *private* intellectual property.
3. See Federal Council for Science and Technology, Committee on Scientific and Technical Information, Ad Hoc Task Group on Legal Aspects Involved in National Information Systems, *The Copyright Law As It Relates to National Information Systems and Programs* (PB-175 618, Government Printing Office, Washington, D.C., 1967), pp. 43–44.
4. R. A. Dunlop, in *The Information Utility and Social Choice*, H. Sackman and N. Nie, Eds. (American Federation of Information Processing Societies Press, Montvale, N.J., 1970), pp. 25–49.
5. H. M. Zeidler, A. J. Lipinsky, L. J. Moll, E. B. Shapiro, W. A. Kent, J. H. Wensley, *Patterns of Technology and Data Communications* (Report No. 7379B-4, Stanford Research Institute, Stanford, California, n.d.).
6. M. D. Goldberg, in *Copyright Law Revision* (Government Printing Office, Washington, D.C., 1965), part 5, pp. 62–63.
7. A. L. Kaminstein, in *ibid.*, p. 63.
8. This and the following four paragraphs are drawn from B. L. Linden, in *Copyright Law Revision* (Government Printing Office, Washington, D.C., 1966), part 3, pp. 1420–1461.
9. A. G. Oettinger, in *Copyright Law Revision* (Government Printing Office, Washington, D.C., 1967), part 2, pp. 581–588.
10. G. A. Gipe, *Nearer to the Dust: Copyright and the Machine* (Williams & Wilkins, Baltimore, 1967), pp. 181–184.
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12. J. C. Koepke, in *Reprography and Copyright Law*, L. H. Hattery and G. P. Bush, Eds. (Port City Press, Baltimore, 1964), pp. 50–58.
13. J. H. Dessauer, in *Establish a Select Senate Committee on Technology and the Human Environment* (Government Printing Office, Washington, D.C., 1969), pp. 148–152.
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15. Arthur D. Little, Inc., in *An Economic Media-Study of Book Publishing* (American Textbook Publishers Institute and American Book Publishers Council, New York, 1966), pp. 119–163.
16. Joint Libraries Committee on Fair Use in Photocopying, *Spec. Libr.* **52**, 251 (May–June, 1961).
17. George Fry and Associates, *Survey of Copyrighted Material Reproduction Practices in Scientific and Technical Fields* (George Fry and Associates, Chicago, 1962). For a summary of the findings, see Koepke (*12*, pp. 50–58).
18. R. F. Clarke, *Libr. J.* **88**, 2625 (1963).
19. P. Ennis and F. A. Schlipf, in *An Economic Media-Study of Book Publishing* (American Textbook Publishers Institute and American Book Publishers Council, New York, 1966), pp. 165–283.
20. A. L. Kaminstein, quoted in P. M. Boffey, *Science* **160**, 1324 (1968).
21. R. H. Blackburn, *Scholarly Publ.* **2**, 49 (October 1970).
22. L. C. Deighton, in *Copyright Law Revision* (Government Printing Office, Washington, D.C., 1966), part 1, pp. 66–79.
23. Other studies furnish slightly different ratios (for example, the Freehafer report, which states that from 50 to 90 percent of materials copied are from serials), but the general observation that journals are copied more than books holds. Figures and percentages are based on those in the CICP report unless specified otherwise. The other studies are, unless noted to the contrary, in rough agreement with the CICP report.
24. J. J. Marke, *Copyright and Intellectual Property* (Fund for the Advancement of Education, New York, 1967), p. 78.
25. C. H. Lieb, *Publ. Wkly.* (18 September 1967), p. 40.
26. L. C. Deighton, *Libr. J.* **90**, 2087 (1965). Recently, librarians have begun questioning more pointedly economies of photocopying practices. It was contended in a recent symposium on copyright that only the prospect of vandalism persuades librarians to maintain photocopiers on their premises. Julius J. Marke observed that "photocopying is not cheap. The talk about 5 cents per page is nonsense . . . librarians now realize that on a cost accounting basis, it probably costs them from 6 to 10 dollars of staff time and resources to arrange for the photocopying of these materials" [J. J. Marke, quoted by S. Keenan and M. C. Stillman, *Drexel Libr. Quart.* **8** (October 1972)], p. 394.
27. American Textbook Publishers Institute, quoted in Marke (*24*, p. 75).
28. *Publ. Wkly.* (3 April 1972), p. 38. Publisher Curtis G. Benjamin of McGraw-Hill argues that the scholarly book, the market for which is related to that for the college textbook, is declining in sales because of photocopying practices [*Amer. Scholar* **41**, 211 (spring 1972)]. He cites an in-house McGraw-Hill study which indicates that copies-per-title-sold of that company's scholarly books have declined steadily during the past 20 years. Moreover, "the rate of decline in the first half of the last decade was twenty-two percent, and that in the second half was thirty percent." Benjamin predicts that, because of photocopying practices, "the scientific and technical monographs will disappear" as commercial publications before the end of the 1970's, while "other classes of scholarly books, including the bread-and-butter university press books, will lose their viability before the end of the 1980's." But, as Benjamin himself notes, he "cannot offer proof of the general point" that "uninhibited photocopying" is causing a sales slump in the scholarly book trade (pp. 214–215).
29. The surveys, in the order cited, are Koepke (*12*, p. 57); P. Wasserman, quoted in Gipe (*10*, p. 75); M. Roberts, *Coll. Res. Libr.* **30**, 222 (May 1969).
30. M. Scal, *Scholarly Publ.* **3**, 62 (October 1971).
31. L. B. Heilprin, *Phi Delta Kappan* **48**, 220 (January 1967).
32. B. Stuart-Stubbs, quoted in Blackburn (*21*, p. 57).
33. C. W. Shilling, quoted in Federal Council for Science and Technology (*3*, p. 49).
34. C. P. Yerkes, in *Reprography and Copyright Law*, L. H. Hattery and G. P. Bush, Eds. (Port City Press, Baltimore, 1964), pp. 69–76.
35. H. Wouk, in *Copyright Law Revision* (Government Printing Office, Washington, D.C., 1966), part 1, pp. 109–111.
36. J. Hersey, in *ibid.*, pp. 102–104.
37. L. G. Burchinal (Office of Science Information Services, National Science Foundation), personal communication, 28 March 1973.
38. Aside from those White House science and technology units that have been recently reshuffled [see D. Shapley, *Science* **179**, 455 (19 → J. Walsh, *ibid.*, p. 456; → N. Wade, *ibid.*, p. 458], there are a number of information management and coordination organizations that function within and without the federal government. Federal agencies of note are the President's Office of Telecommunication Policy; the Federal Communications Commission; the Congressional Research Service (particularly its Science Policy Research Division) and the Copyright Office of the Library of Congress; the Office of Science Information Services of the National Science Foundation; the National Technical Information Service of the Department of Commerce; the information systems and related bureaus in the Office of Education and the National Institutes of Health of the Department of Health, Education, and Welfare; the National Agricultural Library of the Department of Agriculture; and the multiplicity of information retrieval programs in the Department of Defense. Private organizations of note include the various scholarly associations; the International Council of Scientific Unions; the Committee on Scientific and Technical Communication of the National Academy of Sciences–National Academy of Engineering; the United Nations Educational, Scientific, and Cultural Organization; and the Ad Hoc Task Group on Scientific and Technical Information of the Organization for Economic Cooperation and Development. Neither list is complete, but both indicate the many groups concerned with public policy for information and information technology.
39. These recommendations are a modification of those found in the recent report on information policy by the Ad Hoc Task Group on Scientific and Technical Information of the Organization for Economic Cooperation and Development [*Information for a Changing Society* (Organization for Economic Cooperation and Development, Paris, 1971)]. A synopsis of the report has been done by E. L. Brady and L. M. Branscomb [*Science* **175**, 961 (1972)].