phage DNA maturation and particle assembly will all be advanced by knowledge of the components of the replicative machinery.

References and Notes

1. M. J. Chamberlin, *Annu. Rev. Biochem.* **43**, 721 (1974).
2. A. Kornberg, *DNA Synthesis* (Freeman, San Francisco, 1974).
3. J. D. Gross, *Curr. Top. Microbiol. Immunol.* **57**, 39 (1972).
4. T. Komano and H. Sakai, in *Molecular Biology Meeting of Japan* (Kyoritsu Shuppan, Tokyo, 1972); D. Beyersmann, W. Messer, M. Schlicht, *J. Bacteriol.* **118**, 783 (1974).
5. K. G. Lark, *Nat. New Biol.* **240**, 237 (1972).
6. M. L. Gefter, Y. Hirota, T. Kornberg, J. A. Wechsler, C. Barnoux, *Proc. Natl. Acad. Sci. U.S.A.* **68**, 3150 (1971).
7. A. Klein and F. Bonhoeffer, *Annu. Rev. Biochem.* **41**, 301 (1972).
8. W. Wickner, D. Brutlag, R. Schekman, A. Kornberg, *Proc. Natl. Acad. Sci. U.S.A.* **69**, 965 (1972).
9. J. H. Weiner, D. Brutlag, K. Geider, R. Schekman, W. Wickner, A. Kornberg, in *Methods in Molecular Biology*, R. B. Wickner, Ed. (Dekker, New York, 1974), vol. 7.
10. W. Strätling, F. J. Ferdinand, E. Krause, R. Knippers, *Eur. J. Biochem.* **38**, 160 (1973); D. C. Hinkle and C. C. Richardson, *J. Biol. Chem.* **249**, 2974 (1974); H. Shizuya and C. C. Richardson, *Proc. Natl. Acad. Sci. U.S.A.* **71**, 1758 (1974).
11. T. Kornberg and A. Worcel, *Proc. Natl. Acad. Sci. U.S.A.* **71**, 3189 (1974).
12. D. Brutlag, R. Schekman, A. Kornberg, *ibid.* **68**, 2826 (1971).
13. P. A. Williams, H. W. Boyer, D. R. Helinski, *ibid.* **70**, 3744 (1973).
14. R. Schekman, W. Wickner, O. Westergaard, D. Brutlag, K. Geider, L. Bertsch, A. Kornberg, *ibid.* **69**, 2691 (1972).
15. O. Westergaard, D. Brutlag, A. Kornberg, *J. Biol. Chem.* **248**, 1361 (1973).
16. G. N. Godson, *Virology* **58**, 272 (1974).
17. A. Sugino and R. Okazaki, *Proc. Natl. Acad. Sci. U.S.A.* **70**, 88 (1973).
18. G. Magnusson, V. Pigiet, E.-L. Winnacker, R. Abrams, P. Reichard, *ibid.*, p. 412.
19. J. A. Huberman, H. Horwitz, R. Minkoff, M. A. Wagar, *Cold Spring Harbor Symp. Quant. Biol.* **38**, 323 (1973).
20. R. B. Wickner, M. Wright, S. Wickner, J. Hurwitz, *Proc. Natl. Acad. Sci. U.S.A.* **69**, 3233 (1972).
21. S. Wickner, M. Wright, J. Hurwitz, *ibid.* **70**, 1613 (1973); S. Wickner, I. Berkower, M. Wright, J. Hurwitz, *ibid.*, p. 2369; M. Wright, S. Wickner, J. Hurwitz, *ibid.*, p. 3120.
22. R. Schekman, A. M. Weiner, J. H. Weiner, A. Kornberg, in preparation.
23. K. Zechel, J.-P. Bouche, A. Kornberg, in preparation.
24. N. Sigal, H. Delius, T. Kornberg, M. L. Gefter, B. Alberts, *Proc. Natl. Acad. Sci. U.S.A.* **69**, 3537 (1972).
25. W. Wickner, R. Schekman, K. Geider, A. Kornberg, *ibid.* **70**, 1764 (1973).
26. W. Wickner and A. Kornberg, *J. Biol. Chem.* **249**, 6244 (1974).
27. T. Kornberg and M. L. Gefter, *ibid.* **247**, 5369 (1972).
28. K. Geider and A. Kornberg, *ibid.* **249**, 3999 (1974).
29. J. H. Weiner and A. Kornberg, in preparation.
30. H. F. Tabak, J. Griffith, K. Geider, H. Schaller, A. Kornberg, *J. Biol. Chem.* **249**, 3049 (1974).
31. J. Hurwitz, S. Wickner, M. Wright, *Biochem. Biophys. Res. Commun.* **51**, 257 (1973).
32. W. Wickner and A. Kornberg, *Proc. Natl. Acad. Sci. U.S.A.*, in press.
33. ———, *ibid.* **70**, 3679 (1973).
34. M. Goulian and A. Kornberg, *ibid.* **58**, 1723 (1967).

35. Abbreviations: ATP, GTP, UTP, CTP, adenosine, guanosine, uridine, and cytidine triphosphates; dATP, dGTP, TTP, and dCTP, the corresponding deoxynucleoside triphosphates; dNTP, deoxynucleoside triphosphate; rNTP, ribonucleoside triphosphate; SS, single-stranded DNA; RF, replicative-form DNA.

Copyright: Its Adequacy in Technological Societies

The traditional copyright concept may not be appropriate to knowledge management in a technological society.

Nicholas L. Henry

Marshall McLuhan, communications theorist cum English teacher, has contended that, "in the age of Xerox, every man is a publisher." Rightly or wrongly, McLuhan points up a growing problem of public policy: How to promote both the origination and the accessibility of information in a society increasingly permeated by new information technologies and increasingly dependent on the use of information?

The dilemma is exquisite. On the one hand, the producers of society's knowledge must have economic incentives to produce knowledge. This incentive traditionally has been provided by copyright law. The fundamental thesis of the copyright concept is that the more a knowledge-producer sells of his product, the more he should be compensated. In this fashion, both the individual knowledge-originator and the whole of society will benefit; the producer of information will gain by royalty checks, and the society will gain by acquiring new knowledge. To assure the durability of this arrangement, copyright relies on the device of exclusive licensing; that is, authors, because they invest time and effort, and publishers, because they risk capital, possess the exclusive right to sell the author's work on the open market.

On the other hand, new information technologies have increased and facilitated the accessibility and utility of information dramatically. Technology is the only means that society has for bringing the publication inflation under control; it is the only means that may enable information users to obtain the information that they need, when they need it, an in a parsimonious way, without having to wade through useless data that slow, if not stop, research and knowledgeable decision-making. Moreover, control over the information explosion that technology gives us is becoming increasingly critical in an increasingly complex and interrelated society; if public policies are to be responsive, properly focused, and impactful, then the information on which those policies are founded must be readily accessible and germane to the public problem. In this sense, the reduction of "noise" in the social system assumes a growing importance for public policy-makers if their policies are to have "economy"—that is, be free from spillover effects.

Information technologies, notably photocopying, microphotography, computer-based information storage and retrieval systems, cable television, and microwave communications, may succeed in reducing systemic noise. Information technologies also may succeed in undermining the economic incentive of knowledge-producers to continue producing knowledge. With every man a publisher, traditional publishing houses no longer control the technical means of knowledge production that they once did. Therein lies our dilemma.

It is my purpose in this article to discuss the utility of copyright as a public policy for knowledge management

The author is assistant professor of political science, University of Georgia, Athens 30602.

in a society that possesses a high level of information technology. By knowledge management, I mean public policy for the production, dissemination, accessibility, and use of information. I suggest that, in the way that it was conceived originally, copyright may not be the optimal means of encouraging, researching, writing, and disseminating new ideas in a society characterized by a high level of information technology, and I propose steps that could be taken now to solve some of the problems of knowledge management.

The Development of U.S. Copyright Law as a Response to Technology

In the West, copyright is distinctly related to the acceptance of John Locke's philosophy that a primary function of government is the protection of property, and to the exceptional profitability that was typical of publishing at the beginning of the 18th century. The first copyright law appeared in Queen Anne's England, in 1710, and it marked the initiation of a Western attitude that interrelates protectionism, printing, and intellect.

The law and logic of copyright protection were firmly established in the minds of early American political thinkers before the Republic was founded. Individual petitioners were applying to state legislators for the exclusive right to copy and vend their printed works before the Revolutionary War had run its course.

James Madison, "father of the Constitution," and ever the intellectual, promoted a national copyright act in *The Federalist Papers*. In "No. 43" he wrote the "utility of this power will scarcely be questioned," indicating the almost apolitical character that the English copyright concept already had assumed. Madison added that the "copyright of authors has been solemnly adjudged in Great Britain to be a right of common law. . . . The public good fully coincides with the claims of individuals." It is not surprising that Article 1, Section 8, of Madison's Constitution of 1787 states that Congress shall have the power "to promote the Progress of Science and Useful Arts, securing for limited times to Authors and Inventors the exclusive Right to their respective Writings, and their Discoveries," nor that Congress passed the first Copyright Act in 1790.

Since then, United States copyright law has been revised three times: in 1831, in 1870, and in 1909. Copyright laws in this country have stood unrevised for periods of roughly 40 years, with the exception of the current act, which has survived intact for more than 60 years. Perhaps the most notable trend in these revisions is that the period of copyright duration has increased steadily. Copyright protection has been extended from 2 years, to 14, to 21, to 28, to its present 56 (provided the copyright is renewed). The current revision bill would extend this period to the author's lifetime plus 50 years, a duration amounting to approximately 76 years on the average (*1*).

The last revision, in 1909, began at least 8 years earlier, when the first Register of Copyrights, Thorvald Solberg, suggested the need for revision in each of his annual reports from 1901 through 1904. President Theodore Roosevelt called for a new copyright law in December 1905. The 1909 act was a response to "modern conditions," as President Roosevelt called them. Roosevelt had drawn attention to the fact that American "copyright laws urgently need revision . . . they omit provision for many articles which, under modern reproductive processes, are entitled to protection" (*2*). Notably, the new law of 1909 did not meet copyright owners' demands in this respect. An editorial in *Publishers' Weekly* stated that the act had made "an important stride in American copyright, though it falls far short of the aims and hopes of the friends of copyright" (*3*). One wonders what, precisely, the friends of copyright had in mind. The act defined copyright (as it still does) as the "exclusive right" of the copyright proprietor "to print, reprint, publish, copy and vend the copyrighted work." Such a definition is, to put it mildly, a no-nonsense statement.

In 1955, Congress commissioned the U.S. Copyright Office to initiate studies on the possibility of a revised copyright law. Thirty-four scholarly articles were subsequently produced by the office. In their acceptance of the decision to alter national law, these articles marked the end to any possibility for a privately negotiated agreement between copyright owners and users over the roles of new information technologies in copyright arrangements; they also marked the beginning of a long, occasionally vituperative, occasionally statesmanlike political controversy. This controversy continues today.

The Extent of Copyright

Just as copyright concepts have become firmly entrenched in the U.S. code over the years, growing quantities of information in the polity have come under the purview of copyright realities. In 1968, annual copyright registrations exceeded the 300,000 mark for the first time, and an approximate total of 10 million items were copyrighted from 1897, when the present registration system began, to 1958 (*4*). At present, there are about 6,600,000 items of intellectual property in this country that are protected by copyright. Not only are books, essays, periodicals, and poems copyrighted but musical scores, songs, textile designs, games, maps, architectural drawings, works of art, reproductions of art, ornamental designs, scientific drawings, illustrations, computer programs, television shows, photographs, prints, motion pictures, records, commercial prints, labels, jewelry designs, and foreign works are registered as well. These creations may be protected from free use by copyright whether they ever are disseminated by their owners or not.

Actually, copyright protection can extend to works never registered formally by the U.S. Copyright Office nor even covered by the current copyright law. The hazy legal area of "common law copyright," a device favored by many states, protects materials not published. Common law copyright usually is thought of as extending to manuscripts, but it can extend to other creations as well until they are published, in which event statutory law applies.

What constitutes "publication" is vital to common law copyright, and is a point that remains unsettled. Making copies freely available is considered to be unequivocal "general publication," and is protected by statute. But when a writer circulates a limited number of copies for a specific purpose, it is called "limited publication." Limited publication is protected by common law copyright (*5*). Copyright of some variety would appear to affect virtually every intellectual creation in the United States that is produced in a tangible format.

In fact, there is reason to believe that copyright could be extended to intangible "formats." In Denmark and Sweden, readers who borrow books from public libraries pay a toll to copyright owners for the act of reading their works. The rationale behind

this "public lending right" is that small populations and languages of restricted use necessitate an additional means of support for copyright owners. Nevertheless, recent developments in the United Kingdom and in this country indicate the predisposition of English-speaking copyright owners for a "general lending right" or a "binding right." The appearance in books of versos which state that the volume is not to be "lent, resold, hired out or otherwise circulated" in any other than its present binding without the consent of the publisher, attests to such an attitude on the part of copyright proprietors (*6*).

Copyright and Social Issues

The emergence of "neopublishing" technologies (photocopying, computer reformatting, and microphotographing published information, or "boosting" copyright programs and data through cable television companies) in the face of an extensive and rigidly written copyright law has given rise to at least three related social issues: public policy toward freedom of information and research, social innovation, and private property. Do the premises and logic of copyright work against the public interest in these areas of the public's business?

Research, information, and innovation are closely interrelated issues; the social dynamics of one may not be altered without altering the patterns of the remaining two. It seems likely that the ability to perform research, transmit information derived from research, and thus to lay the groundwork for social innovations through science, public policy, or whatever, has been eased by neopublishing technologies. The worry that technology is robbing our ablest writers and foremost publishers of substantial support in the form of royalty checks has not, as yet, been demonstrated. Nor, for that matter, has it been shown that copyright is obstructing research, information, and innovation. But no one reasonably can doubt that both these situations could change. Neopublishing practices and techniques could burgeon to the point of obliterating writing and publishing as profitable enterprises, and the courts could enforce the letter of copyright law to the point of intimidating users who reprint and copy copyrighted information—acts that are expressly prohibited by the 1909 law (*7*, *8*).

Copyright and Market Power

The role of copyright as it pertains to property is more distinguishable than its effects on social issues, and warrants separate discussion. The assumption that copyrighted information is private intellectual property and thus, like land, subject to the perquisites of its owner, is an important one. On it rest the legal sanctions of the state that prohibit the unauthorized copying of information protected by copyright, thereby restricting the completely free use of knowledge. Neopublishing technologies not only have undercut owners' control of information, but in the process have reduced the potency of the state to enforce its own laws. By implication, these technologies have called into question the ability of the state generally to protect the property of its citizens.

But can information ever really be "property"? And, if it is, should it be?

The notion that copyright sanctions a property right is supported by copyright owners. The reasoning here is that the author owns his writing because he wrote it, much like General Motors Corporation owns a Chevrolet prior to sale because it made the car. In the same vein, the publisher owns the copyrighted work because (i) the author gave him his permission to sell his creation, (ii) the publisher also has made a product by converting a manuscript into a format fit for sale, and (iii) the publisher has invested and risked his capital to so convert it.

Users of copyrighted material have not had the temerity to deny flatly that copyright protects property. Rather, they say that copyright protects a nasty kind of property: monopoly. It is argued that the benefits offered by education can never be fully realized so long as "profiteers" control the knowledge market.

The "1972 Industry Statistics" published by the Association of American Publishers states that 1972 pretax profits of adult hardbound tradebook publishers as a percentage of sales was 7.0 percent for science, social science, and technology book publishers; 9.1 percent for juvenile tradebook publishers; 12.5 percent for mass-market paperback publishers (9 such publishers responding) and "elhi" (for elementary and high school) textbook publishers (24 responding); 12.8 percent for medical book publishers; a 13.2 percent profit was reaped by the sundry book clubs, and college textbook publishers topped the list with 13.4 percent in profits (32 such publishers responding). Moreover, book sales are comparatively sluggish during the 1970's in comparison to the 1960's, when college textbook publishers, for example, raked in 19.7 percent in 1968 pretax profits, and sales rates often jumped at a rate of 9 percent a year. Still, total receipts by American book publishers in 1972 was a record-breaking $3,177,200,000, despite declining sales in a few areas (*9*).

Books designed to convey ideas dominate the marketplace. In 1972, the books published by academic presses, professional books (for example, law, medicine, business, social science, science, and technology), elhi texts, and college texts accounted for approximately 45 percent of all book sales in 1972; by comparison, the combined sales of adult and juvenile tradebooks (both hardbound and paperbound) and mass market paperbacks comprised only 30 percent of all domestic sales in 1972 (*10*). As an article in *Publishers' Weekly* concluded, the "book industry's stake in education is enormous," for the area accounted for a whopping 67 percent of total sales in this country in 1972 (*11*). Of all books sold in the United States during that year 51 percent were channeled through schools and similar institutions (23 percent), college stores (17 percent), and libraries (11 percent).

College textbook publishers consistently reap the highest profits of any category of book publishers, and there is reason to believe that free competition is limited in this area—an area vital to the transmission of sophisticated thinking in virtually every field of human endeavor. Stephen Breyer, a Harvard law professor, has analyzed the profits of college textbook publishers and concluded that the average profits skimmed from the college texts are at least 50 percent greater than the average profits in manufacturing. He attributes these extraordinarily fat profits in part to teachers who are "fairly insensitive to price" because they do not buy texts themselves (*12*).

Moreover, the Hunt survey (*12*) of 1968 indicated that the 12 largest publishers of college textbooks (each with annual sales in excess of $6 million) accounted for 81 percent of all college text sales reported. The Bureau of the Census stated in 1963 that the eight largest textbook publishers (elhi and college texts were not distinguished)

accounted for 54 percent of all sales, and that the eight largest general book publishers printed 46 percent of the market's books (*1*, p. 319).

Finally, all segments of book publishing are given a quantum of market power by copyright that is denied to other industries. While copyright does not restrict competition among different book titles, it does prevent free competition between copies of the same title and, more importantly, allows a house to accumulate exclusive licenses to publish. Such a power, for example, permits a publisher to build "stables" of prestigious authors. Status-laden stables of authors tend to attract novice writers with promising manuscripts which, in turn, inhibits the entrance of new publishers into the marketplace, since they are less likely to get first crack at reading the best new efforts. When entry becomes difficult (and the high profits of college text publishers indicate that an entry barrier may indeed exist for publishers in this field), established publishers find it easier to resist demands for higher royalties from "their" authors, and also to raise prices on their books. Restricting royalties and raising prices can limit both the numbers of titles produced and the books circulated.

Monopolistic tendencies are indicated in other areas of commercial information dissemination as well. Economist Jesse W. Markham has observed that while there are roughly 900 publishing houses in the United States, almost "the entire output of high-speed digital computers is in the hands of about eight companies" (*13*). Relatedly, a recent suit brought by the Federal Trade Commission against Xerox Corporation alledges that Xerox controls two-thirds of the photocopier market in the United States.

Significantly, patterns of knowledge creation in the electronic-based information industry are quite different from those in traditional publishing. Usually, a limited number of corporate employees produce data for their firms in the computer industry, while thousands of free-lance agents market their wares to people with printing presses in the publishing trade. This bureaucratic character of the information industry gives private management a much more far-reaching control over the sources of society's information (in this case, corporate employees) than is present in traditional publishing. And, the fantastic growth of the electronic information-processing industry would indicate that this system of a newly bureaucratized means of knowledge production will become increasingly widespread in society, yet will not necessarily be dispersed among a greater number of companies.

Ideas as Property

If the production of printed knowledge is based on a control of property (whether property is defined as books or employees) that has monopolistic overtones, it does not follow that ideas, as expressed by writing, must be "property" too, and that therefore public policy toward information must be founded on a proprietary premise.

The reasoning underlying the notion that an intellectual creation is property has been discussed. But it can be reasoned at least equally soundly that an intellectual creation is not property.

Property, as it normally is understood, is something tangible, substantial, and, as such, measurable and divisible —land, for instance. When these criteria are applied to thoughts, however, they seem grotesquely ill-suited. Do the precious, abstracted distinctions that an English teacher makes between words and phrases in a poem by T. S. Eliot strike us as "tangible"? "Substantial"? Can his distinctions be measured and divided into quantifiable parts, as land can be? Can any idea be so parceled? No. At best an idea can be parsed, but only when it is in the format of a sentence. And what about ideas in other formats, such as painting or sculpture? Can we divide works in those formats and still retain their respective "ideas"? Not many people would be willing to buy a piece of canvas cut from Picasso's *Guernica*, nor would they be willing to buy half an idea drawn from Joyce's *Portrait*. A parcel of land, however, or even part of a car, is quite another matter.

Even when we rely on the more technical conceptualizations of property developed by economists, we find that the concept of "intellectual property" is unsatisfactory. By "private property," economists mean goods that a person may dispose of as he sees fit. While books and essays may be disposed of in this manner, ideas cannot. Can we believe, for instance, that American policy-makers saw fit to dispose of the idea of a hydrogen bomb to the Russians in the early 1950's? "Public property," on the other hand, belongs to the government, and the government may dispose of it. The notion that certain ideas "belong" to the government, and thus may be harbored or distributed by it, would seem to warrant an abrupt termination of this line of logic for reasons of potential censorship and excessive secrecy.

Finally, "common property" refers to goods that belong to all, and thus are controlled by no one. This would appear to be a more fruitful approach, except that it disallows remuneration to those who create ideas. Common property, because it is open to all, ultimately is consumed by all; for example, the oceans and air are common properties that soon may be "consumed" (that is, effectively destroyed) by those who use them as bins for their pollutants. To treat ideas as common property by never paying for their production in forms capable of dissemination, conceivably could result in the partial destruction of idea-origination.

Ideas, it would appear, are not property. They are, at best, "products" that can be owned only when rendered into those particular formats that are protected by copyright law.

Given this, the question still to be addressed is: Why has the notion that ideas constitute property endured for more than 250 years? One reason for this endurance is the presence of certain moral justifications that intellectual creations ought to be owned by their creators; that is, authors should be rewarded for the fruits of their labor. But this contention does not demonstrate that the sum a writer receives under present copyright arrangements is any more "just" than it would be under a different system of compensation.

A second ethical justification is that society ought to reward the authors of great works. Copyright, of course, does not do this. Instead, it rewards popularity, and the writer of lasting art is compensated only when he is fortunate enough to be appreciated by (or sold to) the "great unwashed," as well as by his fellow artists. The fact that Thomas Wolfe and James Joyce were living from hand to mouth on small royalty checks at the height of their popularity is hardly a reason to maintain the status quo.

More pointedly, the belief that intellectual creations are property has survived as an operating premise of the law because it has been extremely efficient economically. When printing was the only information technology

of any significance, 18th-century policymakers conceived of an arrangement for knowledge dissemination and compensation in society that was elegant in its absence of centralization and administration. Lawyers set up the machinery by granting exclusive rights to copy to those who wrote and to those who controlled presses; Adam Smith's "invisible hand" took care of the details. As Madison noted, copyright provided an efficient means of achieving the constitutional goal of promoting science and useful arts because it was one of those fortuitous policies in which the ends of the individual citizen and the goals of the collectivity could be made synonymous. Copyright, in short, was not a bad idea at the time.

Today, however, all of us can print, and relatively cheaply. Presses, as a means of production, no longer are controlled only by those who have invested their capital in them. Everyone has access to some form of publishing instrument. As a result, the continuance of copyright on the logic that it is the most efficient public policy for information creation and distribution no longer seems valid.

The Dysfunctions of Copyright: The Public Domain Policy

Concrete indications of policymakers' cognizance that copyright may be inadequate in a technological society are clearly visible. The most outstanding of these recognitions is Section 8 of the Copyright Act of 1909, which states that "No copyright shall subsist . . . in any publication of the United States Government, or any reprint, in whole or in part. . . ." This clause amounts to exempting all U.S. government publications from copyright restrictions on the ground that such publications are in the public domain. At the time of this writing, the exemption is continued in Section 105 of the present (1974) Copyright Law Revision Bill (S. 1361), which states: "Copyright protection . . . is not available for any work of the United States Government, but the . . . Government is not precluded from receiving and holding copyrights transferred to it by assignment, bequest, or otherwise."

This clause was not always in U.S. copyright laws. Traditionally, it was assumed that federal publications were in the public domain. It was at the turn of the century when one congressman, James D. Richardson, compiled a book entitled *Messages and Papers of the Presidents*, and printed it at government expense under his own copyright. Richardson "earned" $11,320 in royalties and, in the process, initiated a Senate investigation which concluded that "the law as it stands is sufficient to deny copyright to any and every work issued as a government publication" (*14–16*). Nevertheless, it was thought prudent to state this point explicitly when the law was revised in 1909.

Today, government publishing is big business. The federal patron spends more than $18 billion annually on research and development projects. According to the Organization for Economic Cooperation and Development (OECD) the U.S. government financed 64 percent of all R & D projects in the nation in 1965, although it performed directly only 15 percent; industry conducted 70 percent of government-sponsored research and universities 12 percent. The OECD estimates that the federal government spent nearly $275 million on disseminating scientific and technical information in 1967, of which $80 million was spent directly on the publication and dissemination of information (*17*). In 1971 alone, the U.S. Government Printing Office sold 78 million copies of its publications for $22 million, while the U.S. Information Agency had, by the same year, distributed a total of 19,220 editions amounting to 157,200,000 copies in 57 languages on a worldwide basis (*18*). The U.S. government publishes approximately 100,000 reports a year, plus 450,000 books, articles, and papers.

Recognition by the copyright law itself that copyright is, in instances of documents in the public domain, a policy not in the public interest serves as a remarkably candid statement on the part of policy-makers relative to the inadequacy of copyright as an information policy. A panel of leading editors and scholars recently noted that the "Federal Government is today the major source of information in practically every field of endeavor" (*19*), emphasizing that the exemption of publicly sponsored information from copyright restraints is not a minor one.

Because the exemption is not small, pressure has been brought on policymakers to weaken its applicability. In 1965, the U.S. Office of Education (USOE) took a strong stand on the right of government to deprive copyright status from works it had funded by inserting in the *Federal Register* a ruling that stated: "Material produced as a result of any research activity undertaken with any financial assistance through contract with or project grant from the Office of Education will be placed in the public domain [and] . . . will be available to conventional outlets of the private sector for their use." The USOE statement affected a publishing industry of roughly $1 billion in magnitude, which is about what American schools spend annually on teaching materials. USOE itself regularly distributes about $100 million a year in research funds (*20*).

While the USOE policy did not represent a change in law, it did signify a change in fact. The USOE traditionally had permitted its researchers to copyright their products, although it also required the researcher to give the government a royalty-free license to use his work as it chose, and to authorize others to do so as well. Copyright was a frail instrument in these cases, but nevertheless was thought by some researchers and publishers to be worthwhile and binding. The new ruling changed this impression.

Publishers responded by arguing that copyrighting and commercially distributing works financed by taxpayers was indeed in the public interest because it expanded the works' audience, saved the taxpayers' money by placing distribution costs on private firms, increased the works' availability, and prevented the distortion of material.

The reasoning behind these arguments is not entirely clear. For example, the publishers' contention that copyrighted commercial publications would be more widely read than uncopyrighted government publications is at least questionable. Some of the all-time best sellers in America have been government documents: more than 13 million copies of *Infant Care* have been sold, 7.6 million copies of *Your Federal Income Tax*, 7.4 million copies of *Prenatal Care*, and 5.7 million copies of *Your Child from One to Six*. While these publications are all-time best sellers for the Government Printing Office, it should be noted that a best seller in commercial circles usually is defined as any book that sells more than 50,000 copies, and considerably less for certain kinds of books.

Moreover, publishers have derived profits from uncopyrighted government documents without copyrighting their own versions: the Warren Commission's report (from which five publishing houses made money), the Surgeon General's report on smoking, and the

report of the President's Commission on Civil Disorders are examples. Not long ago, AMS Press announced that it was reprinting the 39 volumes of congressional hearings on *The Pearl Harbor Attack* and the 42 volumes of *The Nuremberg Trials*, both of which originally were published by the government but are now out of print. Respective prices for the buckram-bound sets will be $1890 (or nearly $41 per book) and $1300 (or $31 per book). True, the circulation of government publications may be promoted by private publishers, but publishers hardly seem excluded from profits by the absence of copyright.

Publishers also contend that distribution of government-sponsored research through private firms saves public money. This argument assumes that the Superintendent of Documents oversees a losing operation, which he does not; generally, the superintendent makes a profit (excluding, of course, authorship, editing, and "makeready" costs, which are borne by the public agency sponsoring the research). More significantly, Senator Russell B. Long has observed that for the federal government both to finance the research and secure private profits by extending copyright protection to the same research "is tantamount to saying the Government should finance the building of highways and then permit private companies to charge toll" (*21*).

The Dysfunctions of Copyright: Copyright as a Censor

The argument that extending copyright protection to government research would increase the work's availability by providing firms an incentive to disseminate it seems particularly spurious. As we have already noted, publishers do not need copyright to make a profit by republishing government documents. Moreover, copyright protection currently can endure on any single item for as long as 56 years, and a number of successful lawsuits have been initiated by copyright owners against users of copyrighted material who have tried to shorten that span of time; yet, many researchers enjoy copyright protection even though they never have had their writings distributed by publication. Indeed, copyright owners can, if they see fit, use copyright to prevent the dissemination of their works.

In this vein, copyright is seen by some to be an effective censor of sensitive public documents. Major General C. G. Dodge, the Army's Chief of Information, has written that copyright has prevented the quotation of public material out of context, and thus is beneficial to the public interest in that it has discouraged such practices (*14*, p. 653). Another way of phrasing this viewpoint (which often is supported by copyright owners) is that officialdom may stop the public's use of public information, if such use is inconvenient to particular bureaucrats. Further, it is noteworthy that the Soviet Union regards copyright as a most effective censor. The Soviets set up a new copyright agency as a result of Moscow's signing the International Copyright Convention in 1973. Boris D. Pankin, head of the agency, has stated that all Russian works to be published abroad first must go through his office: Should a Russian author circumvent the copyright agency, he would be subject to prosecution. Western observers have charged that Pankin's agency will be used to keep political dissidents from publishing abroad.

Dodge's statement leads to the final argument of publishers: that copyright prevents an author's ideas and material from being distorted by more shallow intellects. A more reasonable view would be that since no scholar can claim ultimate wisdom, "tampering" with his ideas is as likely to lead to beneficial results as it is to detrimental ones. In any event, the fact that innovation may be encouraged in the absence of copyright would seem sufficient cause to risk a few misrepresentations of research.

If the arguments of publishers against a public domain policy are less than watertight, publishers nevertheless have been able to gain two legal victories. The first was a relatively minor concession by the USOE in 1968, which amounted to a somewhat more flexible doctrine on what kinds of government-funded research could be defined as being in the public domain. According to the new USOE statement, exemptions to normal public domain criteria will be granted to works for which it can be shown that copyright offers essentially the only feasible route for getting the material published, and the USOE may use its own judgment to limit the duration of copyright. The second concession to owners is more substantial and is found in the definition of "a work of the U.S. Government," as stated in the current Copyright Law Revision Bill. Such a work is defined in Section 101 as one "prepared by an officer or employee of the U.S. Government as part of his official duties"; the definition omits reference to outside research funded in part by federal agencies, which account for roughly 85 percent of federal R & D activities. The new phrase represents a change from present law, which defines a work of the U.S. government as a publication, rather than as a work of a federal employee doing his duty.

While the USOE's modified public domain policy and the proposed definition of a work of the U.S. government would seem to be concessions of some advantage to the friends of copyright, it nonetheless stands that the basic view of the federal establishment is anti-copyright in terms of originating and disseminating information that is financed by taxpayers. The predominant attitude is reflected in the recently reaffirmed decision by the National Institutes of Health (NIH) to permit the copyrighting of NIH-funded research by investigators and journals, but to simultaneously stipulate the government's right to publish, translate, and distribute that same research unconditionally, and to authorize others to do so, without payment of any kind to any coypright owner.

The Dysfunctions of Copyright: The "For-Profit" Limitation

Another indication of official recognition that copyright is not always the optimal policy toward publicly accessible information is the "for-profit" clause of the current Copyright Act. The for-profit limitation (also called the "not-for-profit" principle) authorizes nonprofit, public performances of nondramatic literary and musical copyrighted materials without requiring the permission of the copyright owner. Educators long have assumed that the for-profit limitation protected educational uses of copyrighted works from infringement suits, but this is a point that remains judicially unsettled. Although the Register of Copyrights recommended the not-for-profit principle be retained, it has been deleted from the current Copyright Law Revision Bill as a result of an agreement in 1966 between copyright owner and users.

Nevertheless, despite the formal deletion by Congress of a not-for-profit

principle in the present revision bill, the thinking that nonprofit educational and scholarly activities should be protected from copyright-induced inhibitions is reflected in numerous other sections of the bill. The Copyright Law Revision Bill of 1974 has clauses in it that specifically exempt a substantial portion of library photocopying from infringement suits (although not, it should be noted, "systematic reproduction or distribution of single or multiple copies"), omit restrictions on student uses of information storage and retrieval systems, exclude instructors, librarians, and archivists who copy protected material in good faith from prosecution by copyright owners, give statutory recognition to the judicial doctrine of fair use, and establish a moratorium on copyright infringement suits involving information storage and retrieval systems until further study of new data technologies can be made. The reasoning behind all these clauses is that nonprofit uses of copyrighted information are involved, and they would seem to amount to a de facto (if not, perhaps, de jure) recognition by legislators of this facet of the traditional for-profit limitation so long a part of American copyright law.

The Dysfunctions of Copyright: The "Fair Use" Doctrine

A further indication of recognition by policy-makers that copyright arrangements do not facilitate the transmission of knowledge in all circumstances has come from the courts. The judicial doctrine of "fair use" is a powerful anticopyright tool, the origins of which can be traced back as far as 1841 in this country (*22*).

Fair use represents an effort on the part of the courts to ameliorate the effects of a literal interpretation of what the Copyright Act of 1909 says "copyright" means. The General Counsel of the Copyright Office characterizes fair use as a "safety valve" on the rigidity of the law's definition of copyright. He observes that if "the author's exclusive rights were absolute, if they restricted every use of his work, then copyright would indeed become a roadblock to the growth and spread of learning and culture. To achieve the purposes stated in the Constitution, the works of authors must be made available for use by the public while, at the same time, the author enjoys such exclusive rights as will give him a just reward for his contribution to society" (*23*).

No one ever has really defined fair use. It does not appear in the U.S. Copyright Act, but is simply (again in the words of the General Counsel) a result of "the necessity for interpreting the exclusive right to 'copy' as being subject to a rule of reason, without which copyright could become an intolerable restraint on the public's use of copyrighted material" (*23*, p. 13). The Register of Copyrights, in his 1961 report on copyright law revision, stated that the "term eludes precise definition: broadly speaking, it means that a reasonable portion of a copyrighted work may be reproduced without permission when necessary for a legitimate purpose which is not competitive with the copyright owner's market for his work." The Register also noted that to determine whether a specific use of copyrighted work was fair use or infringement, the courts generally relied on four criteria: "(1) the purpose of the use, (2) the nature of the copyrighted work, (3) the amount and substantiality of the material use in relation to the copyrighted work as a whole, and (4) the effect of the use on the copyright owner's potential market for his work." While these bases of judicial decision may vary and interrelate, the fourth criterion—"the competitive character of the use—is often the most decisive" (*24*).

How the doctrine of fair use affects users of information technologies, notably library and education interests, remains unclear. Borge Varmer, author of the study on library photocopying commissioned by the Register of Copyrights, states that "the justification for the photocopying of copyrighted material would seem to be found in the doctrine of 'fair use'" (*25*), a notion that the Register's report echoes. Walter L. Pforzheimer, a trustee of the Yale University Library and a recognized authority on copyright law, takes a counterview. He argues that if "there is one thing which library photocopying is *not*, it is *not* fair use within any judicial usage of that doctrine." Furthermore, contends Pforzheimer, "the replication of copyrighted material as now practiced by libraries seems to be a violation of the copyright law, and in extreme cases carries severe overtones of unfair competition" (*26*).

In terms of scholarly interests, it also has been argued that fair use justifies copying for educational purposes. The Register's report of 1961 stated that the general scope of fair use could be indicated by the quotation of short passages in a scholarly or technical work, or reproduction by a teacher or student of a small part of a work to illustrate a lesson, among other examples (*26*, p. 24). But, in conjunction with problems of library copying, authorities differ as to whether fair use has any relation to the scholarly use of copyrighted material. An observer who is at once a librarian, educator, and publisher asserts that fair use has no relation whatsoever with the "private use" of material, by which he means copying of copyrighted material for research purposes. Private use is legitimate under copyright law, but should not be confused with the concept of "public use" of copyrighted works, which is included under the doctrine of fair use. Public use questions arise when material is copied and subsequently published to the extent that it is in unfair competition with the copyright owner (*27*).

Arguments revolving around whether fair use is or is not relevant to photocopying and other information technologies may prove moot. Congress appears to be acting on the assumption that fair use is pertinent to photocopying, and has issued statements to that effect. Of particular interest in this regard are House reports No. 2237 and No. 83 and Senate report No. 93–983 (*28*). These documents reiterate the guidelines regarding fair use that are found in the Register's report of 1961, although Senate report No. 93–983 is the more recent and cogent. The reports make it clear that photocopying by educators and librarians is to be governed by judicial interpretations of fair use. Senate report No. 93–983 indicates that fair use is intended in part to protect teachers who photocopy works for classroom use and who are doing so in good faith: Section 107 of the present Copyright Law Revision Bill "makes it clear that, assuming the applicable criteria are met, fair use can extend to the reproduction of copyrighted material for purposes of classroom teaching" (*29*).

The views of copyright users, particularly of educators, toward the doctrine of fair use occasionally seem ambiguous. Over the years, users of copyrighted material have uttered sentiments that betray both love and hate for the concept. Harry N. Rosenfield, counsel for educators in the copyright

dispute, has at once spoken of its "wholly inadequate helpfulness" and also has referred to the doctrine as "a constant and continuing right" (*30*). Nevertheless, it is clear that user interests require a statutory provision on fair use that incontrovertibly protects limited educational and scholarly copying.

In summary, while fair use remains an elusive concept, it seems destined for statutory inclusion in a copyright revision bill as a protection against infringement suits for educational, scholarly, and informational uses of copyrighted works. The four criteria used in determining its applicability in particular infringement cases will be subject to further refinement and relative balance by the courts. Nevertheless, fair use stands as additional official testimony that copyright is not inevitably the maximum means of creating and disseminating information.

The public domain policy, the for-profit limitation, and the fair use doctrine (including the notions of public and private use), amount to officially sanctioned statements of some significance which question the validity of copyright in terms of the public interest. The public domain policy is of greatest concern to the executive branch of government, the not-for-profit principle is centered in the legislative branch, and the fair use doctrine is the contribution of the judicial branch. Copyright affects all branches of government, and all branches of government have taken substantial exception to it as an adequate policy for knowledge management. Of such significance, in fact, are these three exceptions that a consideration of modifications and alternatives to copyright seems in order.

Traditional Copyright: Proposed Modifications and Alternatives

In 1967, an Ad Hoc Task Group of the Federal Council for Science and Technology listed 20 proposals that ranged from the elimination of copyright to its extension to virtually all informational forms (*31*). The assessment was thought necessary in view of emerging neopublishing practices and technologies. But even in the absence of new information technologies, at least two modifications of copyright would seem worthy of further discussion: the reduction of copyright duration and the institution of nonexclusive licenses to publish.

Abbreviating Copyright Duration and Nonexclusive Licensing

A copyright duration of the present 56 years appears somewhat excessive. It obstructs the republishing of information even when the original owner no longer disseminates it (or never disseminated it), and it gives exclusive control of knowledge to copyright owners for more than half a century. A less lengthy period would facilitate the distribution of information.

Voices being heard today argue that a long copyright duration not only should be retained but extended—from the current 56 years possible to the author's lifetime plus another half-century. The reasoning here is that the widows, widowers, and children of authors may be supported. Yet few—very few—authors take advantage of the present law as a means of supporting their spouses and progeny after their deaths. In fact, only 15 percent of all copyrights are renewed. In other words, 85 percent of all copyright owners appear content to make do with a copyright lasting 28 years rather than the 56 that are available to them. In sum, the trend toward long periods of copyright duration seems increasingly dysfunctional as a public policy for knowledge management.

Exclusivity of licensing is the chief cause of monopolistic overtones in the copyright industry. By granting an exclusive license to a publisher to disseminate his work, an author permits that publisher to decide how much he should be paid for his effort. The publisher need not concern himself that a competitor will offer "his" author more remuneration because the law grants him an exclusive license to publish the work for 28 and possibly 56 years, once the author signs the contract.

A nonexclusive license to publish would be more beneficial to authors than the present arrangement. Although it is possible that the excessive market power possessed by some book publishers has resulted in more profits for their authors by restricting entry into publishing, it seems probable that competition among publishers for valuable works would increase authors' revenues generally and book circulation as well. This could be accomplished by allowing authors to sign with a second publisher, provided that the second publisher reimburse the initial publisher for makeready costs not yet recouped. Or, an initial publisher might be granted an exclusive license for a short period of time designed to reduce his financial risk, after which the author could let out his work for new bids (*32*). Nonexclusive licensing is a modification of copyright that offers some potential for increasing the income of authors while facilitating the dissemination of knowledge.

Media-Tailored Copyright

In terms of new information technologies, a number of persons interested in the dissemination and control of knowledge have proposed multiple concepts of copyright, with each concept tailored to the particular medium to which it is applied. John Stedman of the American Association of University Professors and Attorney Charles H. Lieb have argued that "it will not be helpful to lump all kinds of publishing into one indistinguishable mass and to treat them all alike" (*33*). Attorney Bella L. Linden (*34*) has suggested "the possible need for two laws, one a traditional copyright law for individual authors, and 'another to cover kinds of information, kinds of distribution and manipulation, and kinds of storage.'"

The notion of copyright laws tailored to media appears to be a legal echo of McLuhanesque perceptions of communications. Marshall McLuhan has made a case that no message is precisely transferable from one medium to another and that, in a very real sense, the medium creates a new message and new conditions for the originator and recipient of the message. Thus, not only is the medium the message, but the experience, the "massage" of the artist and public.

The idea of tailored copyrights has not yet been thought through. Nevertheless, tentative suggestions generally view photocopying and information storage and retrieval systems as concepts that theoretically can be administered under a single principle of knowledge management. Statutory fair use appears to be the most likely de facto (if not de jure) copyright "law" for neopublishing technologies, which currently has any chance for actual inclusion in the U.S. code. Abe A. Goldman of the Copyright Office has stated that "perhaps the extent of permissible reproduction by the computer will involve the same sort of fair use considerations as are presently to be seen in the problem of photocopy-

ing" (*23*, p. 17). Ralph S. Brown, Jr., of the Yale Law School, has noted that: "Practically, ephemeral projections from photocopies and from computers should be treated alike, with considerable scope for fair use, and a library privilege of display to readers if the work displayed is legitimately in the possession of the library" (*35*). Paul G. Zurkowski of the Information Industry Association has suggested "format copyright," statutory encouragement of licensing for reformatting data, and an identification numbering system for books as "post-Gutenberg copyright concepts." These updated versions of copyright would coexist in tandem with traditional copyright, which Zurkowski believes to be more author- than publisher- or neopublisher-oriented (*36*).

Computerized Accounting Systems and Group Purchasing

Alternatives to copyright also have been forwarded. In Julius J. Marke's opinion, alternative means of compensating authors will develop naturally because "technological breakthrough will change the concept of author protection. . . ." He foresees authors selling their wares directly to information-system operators, with remuneration based on use rather than on sales. Marke envisions a system in which scholarly works would be programmed into a highly sophisticated, national information network that tallied use units and compensated authors through prearranged accounting procedures. He concludes his scenario by positing users as subscribers to information networks (primarily students, teachers, and researchers), with dues to the system paid by a "library fee" (*16*, p. 104).

Breyer states that "the case for copyright in the book trade is not a strong one generally and is even weaker for some parts of the trade." Nevertheless, Breyer concedes that, in the absence of copyright, other means might be deemed necessary to assure compensation for "an initial publisher of, say, a text with a long time horizon and large initial expenses," although he is not at all certain that even this kind of hypothetical situation would require a formal means for sustaining the book publisher's revenue. In any event, Breyer suggests that buyers, individually or in groups, might contract to buy the book in advance of publication, before copying is possible. Or, government subsidies could assure high-cost ventures by book publishers. Of these possibilities, Breyer favors the former; the facts that 23 states already adopt elementary textbooks at the state level, and 18 states adopt high school texts in the same fashion, indicate that book purchasers could organize without too much difficulty. Conversely, government subsidies entail the risk of censored information (*37*).

The Page Charge and Extending Copyright to Personal Behavior

Federally subsidized and disseminated information and the corresponding censorship risk are worth further examination. The developing reliance on the "page charge" by publishers of scientific and technical journals would appear to indicate that at least one system of originating and disseminating information, without copyright and through federal subsidies, not only has evolved but has confronted the problems of government censorship as well. The page charge is a fee paid by research sponsors to journal publishers, usually on the basis of how many pages are required to print the research; its purpose is to aid in information distribution by covering publication costs. The practice began overtly in 1930, when the American Physical Society authorized the editors of *The Physical Review* to charge $2 a page to institutions whose research results the editors printed. Today, page charges range from $10 to $75, and a 1966 survey of 362 journals sponsored by the National Science Foundation showed that 76 of them levied page charges, while 17 more billed for "excess" pages (*38*).

Few nonprofit scientific journals rely on subscriptions as their principal source of income. The major (and rising) source of income is the page charge. A 1966 survey by the Council of Biology Editors determined that page charges accounted for 25 to 100 percent of the publication costs incurred by the journals they printed. In 1961, page charges met an average of nearly 36 percent of total publication costs for ten journals published by the American Institute of Physics, but in 1971 it was stated that about 80 percent of the publishing costs in physics are absorbed by the page charge (*39*).

The subscription price remains the second largest source of journal income, however, and there is a direct relationship between it and the page charge. Science journal editors who have experimented with reducing or eliminating page charges have found it necessary to raise subscription rates—unless they also derive considerable revenues from advertising. Higher subscription prices have not served to increase the circulation of information (*38*).

When a journal requests a page charge, it usually is the federal government that receives the bill. Page charges are a standard budgetary item in federal grant requests by scientists. Pressure for government-provided page charges began as early as 1947, and a sampling of grant budgets in the National Institutes of Health for fiscal year 1970 revealed that approximately 85 percent of the grantees requested publication costs. Such expenditures accounted for roughly 1.5 percent of the total awards, or from $4 to $6 million in a budget of $400 million (*38*, pp. 64, 67). In 1961, the Federal Council for Science and Technology officially sanctioned the idea that research is incomplete until published, and established standards for the budgeting and payment of page charges by federal agencies, research grantees, and government contractors. These standards are followed today, and have been adopted throughout the federal bureaucracy.

In brief, the current, operative system of federally supported journal publication has the advantage of avoiding both overtones of censorship and copyright restrictions. No central bureau oversees page charges and thus particular journals cannot be favored. Yet, privately operated journals are receiving substantial federal subsidies in order to maximize information dissemination.

Most of the preceding modifications and alternatives to the traditional copyright principle imply a reduction of its applicability to new information forms. One suggestion, however, that seems worth further exploration advocates an extension of copyright's applicability. Robert P. Henderson, vice president of Honeywell Information Systems, recently urged the Senate Subcommittee on Constitutional Rights to make "personal information" a "property right." Such a definition would permit citizens access to all data banks and dossiers,

in order to "determine for themselves when, how, and what information is communicated to others." Citizens would have recourse to the courts in the event they disagreed with how their personal information was used (*40*).

Henderson's view amounts to a novel interpretation of copyright, but one that nonetheless is in tune with the current informational problems of American society. Henderson is saying that what a citizen *does* is "copyrightable" by the citizen who does it, but those who compile records of what that citizen does should not have their works protected by copyright. Because the citizen has copyrighted, in effect, his behavior, he may disseminate records of his behavior as he sees fit.

A Cybernetic Approach to Knowledge Management

The many modifications of and alternatives to copyright as a knowledge management policy in a knowledgeable society that have been forwarded would seem to indicate its waning legitimacy in a number of circles. A systems approach in formulating policies for knowledge management is needed because knowledge itself is distributed throughout a network of what cyberneticist Stafford Beer calls "esoteric boxes" in society. The esoteric box is "an identifiable social institution," such as a firm, a profession, or a social service, that is "internally autonomous and self-organizing and self-regulating." Esoteric boxes have their own histories and recondite mores; they process things (including people), yet remain unaltered themselves because each esoteric box "is a strongly robust system in equilibrium." Esoteric boxes, rather than responding to changes in the religious, legal, and moral framework around them, instead "are putting up the shutters and seeking to maintain themselves as integral systems. . . . This will not work." Linkages between esoteric boxes (for example, credit systems and balances of payments, which involve relations between the "boxes" of economics, banking, and business) are as tenuous and unstable as the boxes themselves are robust and stable. Thus, any information management policy must be metasystemic in design; that is, it must be constructed in such a fashion as to define and institutionalize the "strings and networks" between esoteric boxes in order to bring about a degree of social stability (*41*).

From the standpoint of cybernetic theory, Beer's policy analysis stresses the need for metasystemic information policies that logically should emphasize technology assessment in their design. Technology assessment has been ignored in the copyright proceedings thus far. It cannot be ignored any longer in terms of neopublishing practices. To sidestep the social assessment of information technology would be to revert to America's current nonpolicy on technology in general—what McDermott so aptly has dubbed "laissez innover." Laissez innover is McDermott's term for a policy attitude which implicitly states that unrestricted technological advances will solve social dysfunctions caused by technology, much as American capitalists of the 19th century believed that a laissez-faire policy on the part of government would solve social problems caused by business (*42*).

There are at least two possible bodies that potentially could provide overall technology assessment for knowledge management. One of these is the proposed National Commission on New Technological Uses of Copyrighted Works, which is a part of the current Copyright Law Revision Bill. With some modifications, it could furnish a needed forum for the resolution of a variety of neopublishing issues (*43*). The other is the recently established Office of Technology Assessment, which has the potential advantage of being able to develop a working rapport directly with Congress in forming a public policy for knowledge management. Still other units with considerable potentiality in this area are the Science Policy Research Division of the Congressional Research Service, the President's Office of Telecommunications Policy, and the Federal Communications Commission.

Nevertheless, until we have more technology assessment, technological forecasting, and general research on new information technologies, it seems wisest for policy-makers to take no strong stands. This means that copyright should neither be extended nor retracted in scope, although the reduction of duration might be deemed advisable. In any event, we still are obligated to find out what the relations between copyright law and neopublishing practices really are and to investigate them in some detail, and on a continuing basis.

Conclusion

What the United States does about the data explosion is likely to be copied on a global basis. America is the archetype of the coming technological society; we have all the advantages of being first, but others may avoid our mistakes. Let us hope that our errors are few.

References and Notes

1. S. Breyer, *Harv. Law Rev.* **84**, 323 (December 1970). Breyer also notes that some calculations indicate that the average copyright duration is more than 86 years.
2. President Theodore Roosevelt's message to Congress of December 1905, quoted in A. Fisher, *Annual Report of the Librarian of Congress for the Fiscal Year Ending June 30, 1959* (Government Printing Office, Washington, D.C., 1960), p. 72.
3. Editorial in *Publ. Wkly.* (3 July 1909), quoted in A. Fisher (*2*, p. 72).
4. A. L. Kaminstein, *Annual Report of the Librarian of Congress for the Fiscal Year Ending June 20, 1968* (Government Printing Office, Washington, D.C., 1969), p. 70; A. Fisher, *Annual Report of the Librarian of Congress for the Fiscal Year Ending June 30, 1958* (Government Printing Office, Washington, D.C., 1959), p. 62.
5. More detailed discussions of common law copyright can be found in M. O. Price, *Library Trends* **8**, 442 (January 1960); K. E. Walden, *J. Patent Office Soc.* **37**, 642 (September 1955).
6. A more complete explanation of variations on the public lending right can be found in V. W. Clapp, *Copyright—A Librarian's View*, prepared for the National Advisory Commission on Libraries (Copyright Committee, Association of Research Libraries, Washington, D.C., 1968), pp. 6–8. Examples of publishers' interests in extending the public lending right to English-speaking countries are: The Arts Council of Great Britain, *The Arts Council and Public Lending Right* (The Arts Council of Great Britain, London, January 1968); The Society of Authors, *Public Lending Right: Outline of Proposals, 1968* (The Society of Authors, London, 1968). The notices advocating general lending rights and binding rights can be found in J. P. Hallet, *Congo Kitabu* (Fawcett, Greenwich, Conn., 1968), title page; G. Brereton, Ed., *Froissart's Chronicles* (Penguin Books, Baltimore, Md., 1968), title page.
7. A perusal of the surveys taken on the kinds of publications most susceptible to reformatting by new information technologies indicates that American "sci-tech" articles less than 5 years old and published in nonprofit journals tend to be "neopublished" more than any other kind of publication. Thus far, the indications are that the new technologies do more to transmit knowledge throughout society than inhibit its origination, although a case can be made that the profitability of the scientific monograph has been affected adversely because of photocopying practices. It is notable in this regard that of the roughly 30 billion photocopies made every year in the United States, about 60 percent of these may be of copyrighted publications. For a review of the societal costs and benefits of the new information technologies, see Henry (*8*).

   The courts have only begun to address the problem of new information technologies and copyright law. The U.S. Supreme Court has taken a "liberal" stance by excluding cable television operators from imposed copyright restraints urged by broadcasters. More recently, on 1 December 1973, the U.S. Court of Claims took a similarly "liberal" stance by overturning the recommendation of its commissioner that the National Library of Medicine (NLM) had to reimburse Williams & Wilkins Company, a publisher in the biomedical field, for the use of Williams & Wilkins' publications in the library's national medical information system. The system is based on an extensive photocopying system,

and the NLM has never paid royalties to copyright owners for the use of their publications.

8. N. L. Henry, *Science* **183**, 384 (1974).
9. C. B. Grannis, "AAP Annual Statistics," *Publ. Wkly.* **204**, 38–40 (30 July 1973).
10. J. P. Dessauer, "Where the bookbuyer's money goes," *ibid.*, pp. 42–43.
11. ———, *ibid.*, p. 43.
12. See Breyer (*1*, pp. 315, 319). Breyer bases his analysis on data obtained from the Hunt survey and the U.S. Federal Trade Commission's "report," in Council of Economic Advisers, *Economic Report of the President, 1970*, p. 263. Loeb, Rhoades and Company, a leading investment firm, confirms the propensity of school boards to be insensitive to price in the assignment of texts. Breyer (*1*, p. 315) quotes page 8 of the firm's 1965 study, *Book Publishing and Federal Aid to Education*, to this effect.
13. J. W. Markham, "Statement," *Copyright Law Revision* (Government Printing Office, Washington, D.C., 1967), part 1, p. 71.
14. H. Brucker, *Sat. Rev.* (11 August 1962), reprinted in *Copyright Law Revision* (Government Printing Office, Washington, D.C., 1967), part 2, pp. 651–654. Details of the Richardson episode are on p. 653.
15. For two relatively detailed treatments of public domain policies see Marke (*16*); and M. B. Schnapper, *Constraint by Copyright: A Report on "Official" and "Private" Practices* (Public Affairs Press, Washington, D.C., 1960).
16. J. J. Marke, *Copyright and Intellectual Property* (Fund for the Advancement of Education, New York, 1967), pp. 1–46.
17. Organization for Economic Cooperation and Development, *Reviews of National Science Policy: United States* (Organization for Economic Cooperation and Development, Paris, 1968), pp. 34 and 226.
18. S. Wagner, "The big clout of government," *Publ. Wkly.* **201**, 88 (10 April 1972).
19. "Legality of governmental copyrighting challenged by leading editors and scholars," reprinted in *Copyright Law Revision* (Government Printing Office, Washington D.C., 1967), part 2, pp. 650–651.
20. W. E. Mylecraine, "Public domain," *Am. Educ.* (November 1965), reprinted in *Copyright Law Revision* (Government Printing Office, Washington, D.C., 1967), part 2, pp. 658–661.
21. R. B. Long, "Statement before the Education Subcommittee, Labor and Public Welfare Committee, U.S. Senate," reprinted in *Copyright Law Revision* (Government Printing Office, Washington, D.C., 1967), part 2, pp. 655–658.
22. Mr. Justice Storey stated in 1841: "We must, in deciding questions of this sort, look to the nature and objects of the selections made, the quantity and values of the materials used, and the degree in which the use may prejudice the sale, or diminish the profits, or supersede the objects of the original work." Quoted in Marke (*16*, pp. 75–76).
23. A. A. Goldman, in *Reprography and Copyright Law*, L. H. Hattery and G. P. Bush, Eds. (Port City Press, Baltimore, Md., 1964), pp. 12–13.
24. "Report of the Register of Copyrights on the General Revision of the U.S. Copyright Law," in *Copyright Law Revision* (Government Printing Office, Washington, D.C., 1961), part 1, pp. 24–25.
25. B. Varmer, in *Copyright Law Revision* (Government Printing Office, Washington, D.C., 1960), study 15, p. 49.
26. W. L. Pforzheimer, in *Reprography and Copyright Law*, L. H. Hattery and G. P. Bush, Eds. (Port City Press, Baltimore, Md., 1964), p. 32. Emphasis is original.
27. R. R. Shaw, in *ibid.*, p. 95.
28. The House reports referred to are in *Copyright Law Revision* (Government Printing Office, Washington, D.C., 1966), report No. 2237 to accompany H.R. 4347, and in *ibid.* (1967), report No. 83 to accompany H.R. 2512, and *Copyright Law Revision* (Government Printing Office, Washington, D.C., 1974), report No. 93–983 to accompany S. 1361 together with additional and minority views.
29. See Senate report No. 98–983, p. 116 in (*28*).
30. H. N. Rosenfield, in *Copyright Law Revision* (Government Printing Office, Washington, D.C., 1964), part 4, p. 220; *Major Problems of Copyright Law as Viewed by the Ad Hoc Committee on Copyright Law Revision* (Ad Hoc Committee of Educational Institutions and Organizations on Copyright Law Revision, Washington, D.C., 1968), p. 17.
31. These prosposals have been categorized by the Ad Hoc Task Group, and are worth discussing briefly here.

A. Proposals emphasizing access:

1) Abolition of copyright.
2) Complete exemptions for information systems and institutions supporting federal programs, because they are "helping to promote progress."
3) Establishment of a not-for-profit exemption.
4) Exemptions for certain types of material, for example, scientific and technical writings. The difficulty here is how to define such material.
5) Exemptions for certain kinds of uses. This is somewhat superior to proposal 4, but would involve problems innate to proposals 2 and 3 in that they could place burdens on nonexempted groups.

B. Proposals addressing the problems of access and compensation:

1) Broad exemptions with arrangements for compensation. (i) Lump sums paid to authors of technical materials. The reasoning here is that since three-quarters of all scientific and technical works are supported by the federal government, the government should pay for them. (ii) Periodic payments to authors and publishers for unrestricted use of "updated tapes" in information systems. (iii) Recognition of the author by requiring reference to him when a certain number of his words are reproduced; this is in itself "a form of compensation."
2) A grant of a moratorium for copyright infringement by nonprofit institutions during a study of the implications of computers for copyright law.
3) Study now, legislate later. Such a course would place nonprofit groups under constraints that could be avoided by establishment of a moratorilm.
4) The institution of statutory licenses and fees for scientific, technical, and education materials and users identified with these fields. Under this proposal, information storage and retrieval systems would make "a reasonable effort" to contact copyright owners, but could use their works whether contact was established or not. Payment (no fines, only normal royalties) would begin when, and if, the proprietors were found. Problems here revolve around defining scientific, technical, and educational materials to be licensed, defining uses and users of such materials, and the setting of fees.
5) The mandating of compulsory licensing and compulsory arbitration between copyright users and owners; that is, bilateral negotiations that would result in private agreements.
6) A copyright clearinghouse, through which users could buy "whole batches of information at once." Difficulties involved in a clearinghouse include the possibility that some owners might decide not to join, and antitrust problems over the control of clearinghouse sales of copyright licenses.
7) Legislate now, with provisions in the law for a moratorium on inputs into information systems and a study of their copyright implications. Such a policy could inhibit the free development of information storage and retrieval systems.

C. Proposals giving more emphasis to compensation:

1) Legislate now, study later. A moratorium is preferable to this option, as uninformed legislation could freeze nascent information systems into untoward patterns.
2) Alternative proposals for compensation based on: (i) bilateral negotiations between copyright users and owners; or (ii) contractual royalties; or (iii) established standardized fees and requirements, using a computerized accounting system.
3) Exclusive rights for the copyright owners with no exemptions granted. This is "the opposite end of the spectrum" from proposal 1, under *A*, and equally fallacious in the opinion of the Ad Hoc Task Group.

Of these proposals, the Ad Hoc Task Group favors proposal 2, under *B*: the granting of a moratorium on copyright infringement for nonprofit users during which a study of computers and copyright can be conducted. 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 National Programs*, a study by the Ad Hoc Task Group on Legal Aspects Involved in National Information Systems (PB-75 618, Government Printing Office, Washington, D.C., 1967), pp. 75–81. Unlike photocopying, there are no studies of the use patterns and economic effects of computers on copyright owners.

32. Breyer (*1*, pp. 319–321) has explained the potentialities of nonexclusive licensing in some detail.
33. C. H. Lieb, *Publ. Wkly.* **192**, 42 (18 September 1967).
34. B. L. Linden, quoted in *Publ. Wkly.* **196**, 19 (11 August 1969).
35. R. S. Brown, Jr., in *On Research Libraries*, statement and recommendations of the Committee on Research Libraries of the American Council of Learned Societies, submitted to the National Advisory Commission on Research Libraries, November 1967 (MIT Press, Cambridge, Mass., 1969), p. 91.
36. Zurkowski's proposed "unique identification numbering system" for books is of especial note. This would "facilitate centralized accounting procedures and enable information (document copying) centers to organize literature for quick access in the specific format desired." Publishers in the United Kingdom already have a similar system. See P. G. Zurkowski, *NMA J.* **2**, 71 (winter 1968–1969).
37. See Breyer (*1*, pp. 284, 302, 305, 307, 308). Breyer notes four disadvantages to a system that organizes buyers into groups, all of which he considers either to be surmountable or not genuine liabilities: administrative costs, delegation of purchasing decisions to a small coterie of representatives (thus interfering with individual choice), prepublication payment for books, and "freeloading" (that is, some buyers will wait for others to pay publishers for desired books, thereby avoiding personal outlays yet gaining access to those books after publication). Freeloading is the thorniest problem in Breyer's opinion, but he contends that: "Use of this strategy may lead to a decline in book production, *but only when* understatement of preferences means that insufficient money can be raised to pay an author or publisher what he needs to create the book" (*1*, p. 304). Emphasis is original.
38. M. Scal, *Schol. Publ.* **3**, 63 (October 1971). The study cited is: Biological Sciences Communication Project of the George Washington University, *Scientific Journal Page Charge Practice*, a report prepared for the National Science Foundation (Government Printing Office, Washington, D.C., 1968), p. 167. Usually, the page charge is billed directly to the author, who passes it on to the sponsor of his research.
39. See Scal (*38*, p. 64). Whether or not page charge revenues are rising in proportion to total publication costs is debatable. In late 1968, the American Chemical Society reported a slight decline in page charge income for the year. But a Task Group of the Committee on Scientific and Technical Communication, National Academy of Sciences, noted that while overall page charge revenues did decline in 1968, the trend reversed in 1969. See P. M. Boffey, *Science* **161**, 884 (1968); and Task Group on the Economics of Primary Publication, Committee on Scientific and Technical Communication, National Academy of Sciences–National Academy of Engineering, *Report of the Task Group on the Economics of Primary Publication* (National Academy of Sciences, Washington, D.C., 1970), p. 117.

In terms of the impact of subscription prices on journal circulation, a 1962 survey of 262 representative scientific journals by the National Science Foundation revealed that more than 80 percent (211) were published by nonprofit scientific societies, and that the society-published journals derived only 41 percent of their annual incomes from subscriptions. This surprising lack of reliance on subscriber-based circulations for funds by nonprofit scientific journal publishers would seem

to question the argument that information production and dissemination hinges on information users paying directly for what they use (*1*, p. 335).

Commercial journal publishers evidently are another matter. Charles O. Reville, president of the Williams & Wilkins Company, reports that the average income from the firm's 30 specialty journals breaks down as follows: 65 percent from subscription sale, 21 percent from advertising, 7.5 percent from the sale of author reprints, 4 percent from back volume sales, 1 percent from the sale of commercial reprints, and 1 percent from the sale of mail lists, rights, and microfilm. See C. O. Reville, Jr., *Economics of Scientific Publications* (Council of Biology Editors, Washington, D.C., 1973), p. 7.

40. R. P. Henderson, quoted in *EDP (Electronic Data Processing) Wkly.* **11**, 1 (8 March 1971).
41. S. Beer, in *The Management of Information and Knowledge* (Government Printing Office, Washington, D.C., 1970), No. 15, pp. 60–61.
42. J. McDermott, *N.Y. Rev. Books* (31 July 1969), pp. 25–35.
43. The modifications are listed in detail in Henry (*8*, p. 391).

NEWS AND COMMENT

Cliometrics: Book on Slavery Stirs up a Scholarly Storm

Scholarly wrangles help stave off boredom among the inhabitants of academe's groves; occasionally the scuffling in the shrubbery becomes so animated that it attracts the notice of the passerby.

Such has been the case over a two-volume work called *Time on the Cross*, a book about American slavery published last spring by two University of Rochester economists, Robert W. Fogel and Stanley R. Engerman.

The book is a product of a relatively new methodological approach to economic history, heavily reliant on the use of computers, that has come to be known as cliometrics (after Clio, muse of history). *Time on the Cross* has aroused an enormous amount of attention both within and outside the academic community. The reasons are several. First, it challenges many entrenched assumptions about what may be the most emotionally freighted chapter in America's history. Second, it represents the most flamboyant and extensive application yet to appear of the methods of cliometricians (otherwise known as econometric historians). Finally, or so many critics aver, the authors themselves have inflated and inflamed the controversy by vigorously promoting the book not only within their profession but by arguing their case on television shows and granting interviews to all who seek them. Fogel says, "Stan and I felt we had stumbled on something very important and it should be brought to the public attention." Their more conservative colleagues call it academic hucksterism.

What Stan and Bob stumbled upon was evidence that, in Fogel's words, "the claim that slavery crippled blacks intellectually and culturally is a myth." The authors list ten "common beliefs," relating to the efficiency of the system and the extent to which slaves were "exploited," which they claim their methods of truth seeking have either debunked or at least called into question.

While the authors believe the furor over the book has been occasioned mainly by its conclusions, its critics claim to be more concerned about their use, or misuse, of a fledgling methodology which hitherto has been applied to narrow economic questions.

Econometrics is defined by one writer as "the utilization of mathematics, economics, and statistics in an effort to evaluate economic models empirically with the help of concrete data and to investigate the empirical support of certain economic theories." The post–World War II development of econometrics has been made possible by advancements in computer technology. This quantitative approach is parallel to the efforts of branches of other disciplines such as sociology (as in sociometrics), psychology, and political science to establish a scientific base.

As defined by Fogel, cliometrics is the "systematic application of the behavioral models of the social sciences, and of their related mathematical and statistical methods, to the study of history."

The application of econometrics to history has been part of attempts by economists to broaden the discipline from application to immediate questions to attempts to analyze the larger questions of economic growth and development and the Industrial Revolution in the United States. And, as it happens, the phenomenon of slavery, which Fogel calls "the leading question in American historiography," has become the chief proving ground for the new methodology. Cliometricians have reached some new conclusions that are considerably at variance with traditional historical interpretations—two scholars, for example, have determined that the construction of railroads was not as crucial as previously believed to the economic development of the West. The growth of the methodology has generated a scholarly debate of some years' standing between what might be called the "quantifiers" and the "humanists." The former strive for objectivity by taking masses of data, reducing them to computer fodder, and making what they claim to be logical inferences and deductions from the resulting calculations. The latter also strive for objectivity—but their assumptions are less formally stated (and perhaps, they claim, more complex).

The "cliometric revolution," as some have called it, began officially in the late 1950's with the publication of a paper by two young Harvard graduate students in economics, Alfred H. Conrad and John R. Meyer, on the economics of slavery. The paper was written for Alexander Gerschenkron, who, along with Nobel prizewinner Simon Kuznets, was one of the progenitors of the new methodology. In it, Conrad and Meyer sought to discover whether slavery was a profitable institution or whether it was a racist-colonialist phenomenon that existed for primarily noneconomic reasons and that was therefore on the wane before the Civil War. The latter assumption was popular at the time, but the Conrad and Meyer paper offered firm evidence, in the minds of many scholars, that slavery was indeed a profitable and flourishing, if morally unsupportable, institution for Southern slave owners. The excitement generated over the paper encouraged a flow of similar efforts, many dealing with various aspects of the Southern slave economy.

The current crop of cliometricians is chiefly made up of persons who were graduate students in economics in the late 1950's and early 1960's, so they