

Computers and Copyright

In creating the Commission, Congress directed that two broad subjects concerning computers and copyright be addressed: the creation of new works with computer assistance and the use of copyrighted works in conjunction with computers. With respect to the second area, the Commission has considered three separate issues: the placement into computers of any copyrighted works, the use of automated data bases, and copyright protection for the intellectual property in computer programs.

Because this study was to be undertaken, Congress included a section in the new copyright law specifying that a copyright owner had the same rights with respect to computer uses of copyrighted works as were available under the copyright law before the effective date of the Act of 1976—existing state statutes, case law, and the provisions of the Copyright Act of 1909.³⁶ The legislative history of the 1976 Act clearly shows that Congress intended that the provision be continued, eliminated, or modified, based upon the Commission's recommendations.³⁷

Background

From the Renaissance through the Industrial Revolution to the present, technological developments have consistently extended society's power to control natural phenomena and to shape its own destiny. The rapid developments in communications and information technology of the past three decades have immeasurably expanded and extended the power of human communication.

One of the most important contributions to

the communication and information revolution has been the digital computer. Animated by elements of human creative genius, these machines are opening new avenues for recording, storing, and transmitting human thought. New means of communication transcend words fixed on paper or images on film and permit authors to communicate creatively, adaptively, and dynamically with their audience.

The first commercial computers, built shortly after World War II, were based largely on vacuum tubes and were so expensive that only the government or the largest corporations could even consider owning them. To function, the typical early computer required an environment in which temperature and humidity were carefully monitored. It was controlled by programs created by its manufacturer and users exclusively for that particular computer.

Subsequent generations of computers have been characterized by dramatic reductions in the size, energy requirements, and price for a given amount of computational power. These generations are measured by the changes in the electronic circuitry of the computer. The four generations now generally acknowledged have been based upon vacuum tubes, transistors, printed circuits, and integrated circuits, respectively.

Foundation for the Recommendations

Computer Programs³⁸

Computer programs are a form of writing virtually unknown twenty-five years ago. They consist of sets of instructions which, when

³⁶ 17 U.S.C. § 117.

³⁷ House Report, *supra* note 1, p. 116.

³⁸ Separate opinions by Commissioners Nimmer, Hersey, and Karpatkin follow in this chapter.

properly drafted, are used in an almost limitless number of ways to release human beings from such diverse mundane tasks as preparing payrolls, monitoring aircraft instruments, taking data readings, making calculations for research, setting type, operating assembly lines, and taking inventory. Computer programs are prepared by the careful fixation of words, phrases, numbers, and other symbols in various media. The instructions that make up a program may be read, understood, and followed by a human being. For both economic and humanitarian reasons, it is undesirable for people to carry out manually the process described in painstaking detail in a computer program. Machines, lacking human attributes, cannot object to carrying out repetitious, boring, and tedious tasks. Because machines can and do perform these tasks, people are free to do those other things which they alone can do or in which they find a more rewarding expenditure of their efforts.

Great changes have occurred in the construction of computers, as well as in the media in which programs are recorded. Periodic progress has seen the development, utilization, and, in some cases, passage into obsolescence of bulky plug boards, punched paper cards and tape, magnetic tapes and disks, and semiconductor chips. It should be emphasized that these developments reflect differences only in the media in which programs are stored and not in the nature of the programs themselves.

The evolution of these media is similar to that of devices for playing recorded music. Circuit boards may be compared to music boxes, and punched paper to piano rolls, while magnetic disks and tapes store music and programs in precisely the same manner. Both recorded music and computer programs are sets of information in a form which, when passed over a magnetized head, cause minute currents to flow in such a way that desired physical work is accomplished.

The need for protecting the form of expression chosen by the author of a computer program has grown proportionally with two related concurrent trends. Computers have become less cumbersome and expensive, so that individuals can and do own computers in their homes and offices with more power than the first commercial computers, while at the same time, programs have become less and less frequently

written to comply with the requirements imposed by a single-purpose machine.

Just as there was little need to protect the ridged brass wheel in a nineteenth-century music box, so too was there little reason to protect the wired circuit or plug boards of early computers. The cost of making the wheel was inseparable from the cost of producing the ridged final product. The cost of copying a reel of magnetic tape, whether it contains a Chopin *étude* or a computer program, is small. Thus, the following proposition seems sound: if the cost of duplicating information is small, then it is simple for a less than scrupulous person to duplicate it. This means that legal as well as physical protection for the information is a necessary incentive if such information is to be created and disseminated.

This proposition is the underlying principle of copyright, but from 1908 until early 1972 the copyright laws of the United States did not reflect its acceptance with respect to one form of expression: recorded sounds. Because the Supreme Court held in 1908 that since a piano roll was not readily perceptible to human eyes it was not a copy of the music it rendered on a player piano, there was almost "open season"—at least in terms of federal law—on the duplication of piano rolls, shellac and vinyl records, and audio tape recordings.³⁹ Certain states made it illegal to duplicate such works, but federal copyright remained almost powerless in this area. While this rule was often criticized, its effect was apparently not too deleterious to producers of recorded sounds, so long as the cost of disk duplication made commercial piracy an expensive undertaking. Records and piano rolls were doubtless duplicated and sold, but on a less than threatening scale. The development of inexpensive transistorized tape recording equipment and its use by organized pirates posed serious economic problems for either the 1908 rule or the recording industry. But the principle persevered and finally prevailed in the Sound Recording Act of 1971, which provided sanctions against those who engage in the unauthorized duplication of sound recordings.⁴⁰

As the number of computers has increased

³⁹ *White-Smith Music Pub. Co. v. Apollo Co.*, 209 U.S. 1 (1908).

⁴⁰ P.L. 92-140, 85 Stat. 391 (1971).

dramatically, so has the number of programs with which they may be used. While the first computers were designed and programmed to perform one or a few specific tasks, an ever increasing proportion of all computers are general-purpose machines which perform diverse tasks, depending in part upon the programs with which they are used. Early programs were designed by machine manufacturers to be used in conjunction with one model or even one individual computer. Today, many programs are designed to operate on any number of machines from one or more manufacturers. In addition, and perhaps even more importantly, there is a growing proportion of programs created by persons who do not make machines. These people may be users or they may be—and increasingly are—programmers or small firms who market their wares for use by individual machine owners who are not in a position to write their own programs. Just as Victrola once made most of the first record players and records, so too did early machine manufacturers write most of the first programs. Victrola's successor, RCA, still produces sound recordings (but, interestingly enough, not phonographs), but so do hundreds of other firms. If present computer industry trends continue, it is all but certain that programs written by nonmachine manufacturers will gain an increasing share of the market, not only because writing programs and building machines are two very different skills that need not necessarily occur simultaneously, but also because program writing requires little capital investment.⁴¹

The cost of developing computer programs is far greater than the cost of their duplication. Consequently, computer programs, as the previous discussion illustrates, are likely to be disseminated only if:

1. the creator may recover all of its costs plus a fair profit on the first sale of the work, thus leaving it unconcerned about the later publication of the work; or

2. the creator may spread its costs over multiple copies of the work with some form of protection against unauthorized duplication of the work; or

3. the creator's costs are borne by another, as, for example, when the government or a foundation offers prizes or awards; or

4. the creator is indifferent to cost and donates the work to the public.

The consequence of the first possibility would be that the price of virtually any program would be so high that there would necessarily be a drastic reduction in the number of programs marketed. In this country, possibilities three and four occur, but rarely outside of academic and government-sponsored research. Computer programs are the product of great intellectual effort and their utility is unquestionable. The Commission is, therefore, satisfied that some form of protection is necessary to encourage the creation and broad distribution of computer programs in a competitive market.

The Commission's conclusion is that the continued availability of copyright protection for computer programs is desirable.⁴² This availability is in keeping with nearly two centuries' development of American copyright doctrine, during which the universe of works protectible by statutory copyright has expanded along with the imagination, communications media, and technical capabilities of society.

This conclusion is in accord with the recommendations of groups studying this issue for the United Kingdom and the World Intellectual Property Organization.⁴³ Both studies recommended that computer programs be afforded protection to a degree that is virtually identical to American copyright.⁴⁴ A Canadian study

⁴² The Copyright Office presently accepts computer programs for registration. (See this chapter under Statutory Copyrightability of Programs and Appendix A under Eighty-eighth Congress, 1964 Revision Bill.)

⁴³ COPYRIGHT AND DESIGNS LAW: REPORT OF THE COMMITTEE TO CONSIDER THE LAW ON COPYRIGHT AND DESIGNS (H.M.S.O., 1976) (frequently known as the Whitford Committee Report); MODEL PROVISIONS ON THE PROTECTION OF COMPUTER SOFTWARE (1978).

⁴⁴ A recent study for the World Intellectual Property Organization (WIPO) notes that "in a number of countries it would already be possible to give such protection [to programs] on the basis of current legislation on copyright . . . and consequently special legislation would not be necessary. In various countries including the United States . . . there would seem to be no particular desire to set up special provisions to protect software" (Kolle, *Computer Software Protection—Present Situation and Future Prospects*, 1977 COPYRIGHT 72).

⁴¹ For a discussion of barriers to entry in the hardware and software markets, see this chapter under Economic Effects of Program Copyright.

reached the opposite conclusion, and an Australian report considered computer issues outside its terms of reference.⁴⁵

The Commission also believes that the effects of the recommendations pertaining to computer programs made in this report, as well as those pertaining to the other computer-related subjects within the Commission's jurisdiction, should be periodically reviewed. This could be accomplished on a smaller scale than that undertaken by the Commission but should be performed well and often enough to prevent the copyright law from becoming as anachronistic as did the 1909 Act.

The Commission is unanimous in its belief that computer programs are entitled to legal protection. But the unanimity has not extended to the precise form that protection should take.⁴⁶ The law as it exists today with respect to the protection of computer programs is not totally clear. What is clear is that today there are different and often conflicting methods used by proprietors to attempt to protect their products. These include patent and copyright—exclusively federal statutory methods; trade secret law—derived from statutory and judicial state law; and unfair competition—based on elements of common law and federal statute.⁴⁷

To provide reasonable protection for proprietors without unduly burdening users of programs and the general public, the following statements concerning program copyright ought to be true:

1. Copyright should proscribe the unauthorized copying of these works.
2. Copyright should in no way inhibit the rightful use of these works.
3. Copyright should not block the development and dissemination of these works.
4. Copyright should not grant anyone more economic power than is necessary to achieve the incentive to create.

Relatively few changes in the Copyright Act of 1976 are required to attain these objectives, and

the promulgation of regulations by the Copyright Office will ease the burden of compliance for both copyright owners and users.

Recommendations for Statutory Change

To make the law clear regarding both proprietors' and users' rights, the Commission suggests that the following changes to the Copyright Act of 1976 be made:

1. That section 117 as enacted be repealed.
2. That section 101 be amended to add the following definition:

A "computer program" is a set of statements or instructions to be used directly or indirectly in a computer in order to bring about a certain result.

3. That a new section 117 be enacted as follows:

§ 117: Limitations on exclusive rights: computer programs

Notwithstanding the provisions of § 106, it is not an infringement for the rightful possessor of a copy of a computer program to make or authorize the making of another copy or adaptation of that computer program *provided*:

(1) that such a new copy or adaptation is created as an essential step in the utilization of the computer program in conjunction with a machine and that it is used in no other manner, or

(2) that such new copy or adaptation is for archival purposes only and that all archival copies are destroyed in the event that continued possession of the computer program should cease to be rightful.

Any exact copies prepared in accordance with the provisions of this section may be leased, sold, or otherwise transferred, along with the copy from which such copies were prepared, only as part of the lease, sale, or other transfer of all rights in the program. Adaptations so prepared may be transferred only with the authorization of the copyright owner.

The 1976 Act, without change, makes it clear that the placement of any copyrighted work into a computer is the preparation of a copy and, therefore, a potential infringement of copyright. Section 117, designed to subject com-

⁴⁵ KEYES and BRUNET, COPYRIGHT IN CANADA: PROPOSALS FOR A REVISION OF THE LAW (1977); REPORT OF THE COPYRIGHT LAW COMMITTEE ON REPROGRAPHIC REPRODUCTION (1976).

⁴⁶ See this chapter for the separate opinions of Commissioners Nimmer, Hersey, and Karparkin.

⁴⁷ See this chapter under Copyright and Other Methods Compared.

puter uses of copyrighted works to treatment under the old law, vitiates that proscription, at least insofar as machine-readable versions are not *copies* under the 1909 Act.⁴⁸ Therefore, to prevent any question concerning the impropriety of program piracy and to assure that all works of authorship are treated comparably under the new law, section 117 should be repealed.⁴⁹

Because the placement of a work into a computer is the preparation of a copy, the law should provide that persons in rightful possession of copies of programs be able to use them freely without fear of exposure to copyright liability. Obviously, creators, lessors, licensors, and vendors of copies of programs intend that they be used by their customers, so that rightful users would but rarely need a legal shield against potential copyright problems. It is easy to imagine, however, a situation in which the copyright owner might desire, for good reason or none at all, to force a lawful owner or possessor of a copy to stop using a particular program. One who rightfully possesses a copy of a program, therefore, should be provided with a legal right to copy it to that extent which will permit its use by that possessor. This would include the right to load it into a computer and to prepare archival copies of it to guard against destruction or damage by mechanical or electrical failure. But this permission would not extend to other copies of the program. Thus, one could not, for example, make archival copies of a program and later sell some while retaining some for use. The sale of a copy of a program by a rightful possessor to another must be of all rights in the program, thus creating a new rightful possessor and destroying that status as regards the seller. This is in accord with the intent of that portion of the law which provides that owners of authorized copies of a copyrighted work may sell those copies without leave of the copyright proprietor.⁵⁰

Because of a lack of complete standardization

among programming languages and hardware in the computer industry, one who rightfully acquires a copy of a program frequently cannot use it without adapting it to that limited extent which will allow its use in the possessor's computer. The copyright law, which grants to copyright proprietors the exclusive right to prepare translations, transformations, and adaptations of their work, should no more prevent such use than it should prevent rightful possessors from loading programs into their computers.⁵¹ Thus, a right to make those changes necessary to enable the use for which it was both sold and purchased should be provided. The conversion of a program from one higher-level language to another to facilitate use would fall within this right, as would the right to add features to the program that were not present at the time of rightful acquisition. These rights would necessarily be more private in nature than the right to load a program by copying it and could only be exercised so long as they did not harm the interests of the copyright proprietor. Unlike the exact copies authorized as described above, this right of adaptation could not be conveyed to others along with the licensed or owned program without the express authorization of the owner of the copyright in the original work. Preparation of adaptations could not, of course, deprive the original proprietor of copyright in the underlying work.⁵² The adaptor could not vend the adapted program, under the proposed revision of the new law,⁵³ nor could it be sold as the original without the author's permission.⁵⁴ Again, it is likely that many transactions involving copies of programs are entered into with full awareness that users will modify their copies to suit their own needs, and this should be reflected in the law. The comparison of this practice to extensive marginal note-taking in a book is appropriate: note-taking is arguably the creation of a derivative work, but unless the note-taker tries to copy and vend that work, the copyright owner is unlikely to be very concerned. Should proprietors feel strongly that

⁴⁸ If they are not, then their unauthorized duplication would not be an infringement, just as the unauthorized duplication of sound recordings was largely without the scope of copyright before February 15, 1972. (See this chapter under Computer Programs.)

⁴⁹ This appears consistent with congressional intent that section 117 should only be effective pending the Commission's report. (See House Report, *supra* note 1, p. 116.)

⁵⁰ 17 U.S.C. § 109(a).

⁵¹ 17 U.S.C. §§ 101 and 106(2).

⁵² *Grove Press, Inc., v. Greenleaf Publishing Co.*, 247 F.Supp. 127 (E.D.N.Y. 1965).

⁵³ See this chapter under Recommendations for Statutory Change.

⁵⁴ 17 U.S.C. § 106(2) and *Gilliam v. American Broadcasting Co.*, 192 U.S.P.Q. 1 (2d Cir. 1976).

they do not want rightful possessors of copies of their programs to prepare such adaptations, they could, of course, make such desires a contractual matter.

Recommendation for Regulations

Regulations for notice, deposit, and registration of programs should be promulgated by the Register of Copyrights. Copyright notice in the form prescribed in the 1976 Act should be required on all formats in which a program is marketed.⁵⁵ On copies of programs in a medium capable of being read by the unaided eye, the notice should physically appear before the list of instructions that comprises the program. Those programs that may be read only with the aid of a machine or device should contain notice in the medium of fixation so that the contents of the program cannot be listed without reproducing the notice in the position just described. Further, containers in which copies of such machine-readable programs are sold, leased, or transported should bear notice as should such devices as (1) reels upon which magnetic tape is wound, or (2) semiconductor chips in which programs are stored.

Regulations relating to deposit and registration requirements should promote public access to computer programs while being flexible enough to accommodate future changes in computer technology. In any case, programs are frequently modified and updated to reflect improvements or changes. The repeated deposit of each version of a program would be burdensome to both the program proprietor and the Copyright Office. Several options appear available. A system of temporary deposit, similar to the practice followed with respect to motion pictures, might be appropriate.⁵⁶ In the alternative, permanent deposit of complete copies of original versions of programs could be required, with descriptions rather than complete copies of

amended versions being filed thereafter. In any event, such requirements can be established best by the Copyright Office.⁵⁷

Case for Copyright Protection for Programs

THE CONSTITUTION

Under the Constitution, Congress has the power to grant authors exclusive rights in their writings to promote the progress of science and the useful arts.⁵⁸ On many occasions since 1790, Congress has exercised that power: first by creating a Copyright Act, and thereafter by periodically revising it and expanding its scope. That the word *writing* in the Constitution has broad and dynamic meaning may be seen in the nature of works that have been found constitutionally copyrightable. Notwithstanding the apparent distinction between them and literal writings, photographs, commercial art, motion pictures, and sound recordings have all been found to be writings.⁵⁹

Judge Learned Hand, in an opinion which has been characterized as the "touchstone" for interpreting the constitutional writing requirement,⁶⁰ found copyrightable a series of meaningless words coined by a copyright claimant for use as a code for sending cables.

If . . . models or paintings are "writings," I can see no reason why [the coined] words should not be such because they communicate nothing. They may have their uses for all that, aesthetic or practical, and they may be the production of high ingenuity, or even genius. . . . [O]ur Constitution [does not] embalm inflexibly the habits of 1789 . . . its grants of power to Congress comprise, not only what was then known, but what the ingenuity of men should devise thereafter.⁶¹

⁵⁵ Such notice must consist of the word *Copyright*, the abbreviation *Copr.* or the symbol ©, together with the year of first publication and the name of the copyright owner. 17 U.S.C. § 401(b).

⁵⁶ The Copyright Office has a long-established practice of returning deposit copies of motion pictures to the depositor after registration. The copies are returned subject to recall by the Library of Congress for addition to its film collection.

⁵⁷ The Copyright Office has adopted regulations which generally comport with these suggestions, the text of which is found in Appendix J for notice, 37 C.F.R. § 201, and for deposit, 37 C.F.R. § 202.

⁵⁸ U.S. Const., Art. I, § 8, cl. 8.

⁵⁹ *Burrow-Giles Lithographic Co. v. Sarony*, 111 U.S. 53 (1884); *Bleistein v. Donaldson Lithographing Co.*, 188 U.S. 239 (1903); *Kalem Co. v. Harper Bros.*, 222 U.S. 55 (1911); and *Goldstein v. California*, 412 U.S. 546 (1973).

⁶⁰ 1 *Nimmer on Copyright* § 8.1 (1976).

⁶¹ *Reiss v. National Quotation Bureau, Inc.*, 276 Fed. 717, 719 (S.D.N.Y. 1921).

As previously noted, a program is created, as are most copyrighted works, by placing symbols in a medium. In this respect, it is the same as a novel, poem, play, musical score, blueprint, advertisement, or telephone directory. However, it is not the same as a phonorecord or videotape. Those works are created by shaping physical grooves or electromagnetic fields so that when they are moved past sensing devices, electric currents are created which, when amplified, perform physical work. Notwithstanding these apparent differences, all these works are writings in the constitutional sense and eligible for copyright if Congress so provides.

CONGRESS

One of the most noticeable developments in American copyright law since 1790 has been its frequent expansion so that, after its most recent revision, it embraces "original works of authorship . . . [including] literary works, musical works, . . . dramatic works, . . . pantomimes and choreographic works, pictorial, graphic and sculptural works, motion pictures and sound recordings."⁶² This is a significant change from the subject matter of the Act of 1790: "any map, chart, book or books now printed."⁶³ Over time, this short list has been lengthened by the following additions:

- 1802 Designs, engravings, and etchings⁶⁴
- 1831 Musical compositions⁶⁵
- 1856 Dramatic compositions⁶⁶
- 1865 Photographs and negatives⁶⁷
- 1870 Statuary and models⁶⁸
- 1909 All the writings of an author⁶⁹
- 1912 Motion pictures⁷⁰
- 1972 Sound recordings⁷¹
- 1976 Original works of authorship⁷²

It should be noted that neither this list nor the list in the 1976 Act is an attempt by Congress to delineate every specific work for which copy-

right is available. Rather, the 1909 and 1976 Acts were designed to reflect the breadth of copyright's scope, while the specific emendations of other years were attempts to accommodate new technologies or to rectify restrictive judicial constructions. On no occasion in American history has copyright protection been withdrawn from a class of works for which it has been available.

STATUTORY COPYRIGHTABILITY OF PROGRAMS

This expansion of American copyright unquestionably has already encompassed computer programs. In 1964, the Register of Copyrights announced that computer programs would be accepted for registration, provided that (1) they contained sufficient original authorship, (2) they had been published, and (3) copies submitted for registration were in human-readable form.⁷³ The Register acknowledged that there might be two grounds for doubt about the registrability of programs: they might not be within the concept of "writings of an author" and machine-readable versions might not be "copies" of the program. Registration, therefore, was made contingent upon the presence of authorship and the deposit of human-readable copies. Because publication was a prerequisite for federal copyright under the 1909 Act and because few programs until recently have been mass-marketed, only some two thousand programs were registered under the statute.⁷⁴ The new law, under which publication, registration, and direct human readability are not prerequisites to copyright, provides that federal copyright exists in any literary work from the moment it is fixed.⁷⁵ That dramatic change in the law and the growing trend toward mass-marketed programs mean that copyright is likely to be increasingly important in protecting computer programs, particularly those of small entrepreneurs who create their works for individual consumers and who can neither afford nor properly use other forms of protection.⁷⁶

⁶² 17 U.S.C. § 102(a).

⁶³ 1 Stat. 124.

⁶⁴ 2 Stat. 171.

⁶⁵ 4 Stat. 436.

⁶⁶ 11 Stat. 139.

⁶⁷ 13 Stat. 540.

⁶⁸ 16 Stat. 212.

⁶⁹ 35 Stat. 1076.

⁷⁰ 37 Stat. 488.

⁷¹ 85 Stat. 391.

⁷² 17 U.S.C. § 102(a).

⁷³ Copyright Office Circular 31D (January 1965).

⁷⁴ The number of programs in which copyright was asserted was likely much larger. Inasmuch as registration neither was nor is a prerequisite to copyright, there is no way ever to know the number of copyrighted programs in existence.

⁷⁵ 17 U.S.C. § 102(a).

⁷⁶ For a discussion of these forms, see this chapter under Copyright and Other Methods Compared.

The Register's 1964 determination has never been challenged. Although this hardly is dispositive, it was clearly the intent of Congress to include computer programs within the scope of copyrightable subject matter in the Act of 1976. Certain proponents of program copyrights have suggested amending the law to include programs in the list of copyrightable works.⁷⁷ In discussing the expansive history of American copyright, the House and Senate, in identical language, state why that is unnecessary:

The history of copyright law has been one of gradual expansion in the types of works accorded protection, and the subject matter affected by this expansion has fallen into two general categories. In the first, scientific discoveries and technological developments have made possible new forms of creative expression that never existed before. *In some of these cases the new expressive forms—electronic music, filmstrips, and computer programs, for example—could be regarded as an extension of copyrightable subject matter Congress had already intended to protect, and were thus considered copyrightable from the outset without the need of new legislation.* In other cases, such as photographs, sound recordings, and motion pictures, statutory enactment was deemed necessary to give them full recognition as copyrightable works [emphasis added].⁷⁸

Thus, Congress is on record regarding not merely the issue of program copyrightability but also the ease with which programs fit into copyright.

Unlike the cases of such apparent non-writings as photographs, sound recordings, and motion pictures, no changes in the law, according to Congress, were necessary to afford copyright protection to programs. As to the location of programs within the classes of copyrightable works set out in section 102(a), the House Report makes it clear that Congress perceived programs to be "literary works":

The term "literary works" does not connote any criterion of literary merit or qualitative value: it includes catalogs, directories, and similar factual, reference, or instructional works and compilations of data. *It also includes computer data bases and computer programs to the extent that they incorporate authorship in the programmer's*

expression of original ideas, as distinguished from the ideas themselves [emphasis added].⁷⁹

Thus, it is clear that those who wrote the Copyright Act of 1976 and those who have administered portions of the 1909 Act concur in the position that programs are copyrightable. Action by either Congress or the courts would be necessary to change this.⁸⁰ The Commission, of course, has not felt itself bound by these prior legislative or administrative determinations of program copyrightability.

Copyright and Other Methods Compared

The purpose of copyright is to grant authors a limited property right in the form of expression of their ideas. The other methods used to protect property interests in computer programs have different conceptual bases and, not surprisingly, work in different ways. An appreciation of those differences has contributed to the Commission's recommendation that copyright protection not be withdrawn from programs. Patents are designed to give inventors a short-term, powerful monopoly in devices, processes, compositions of matter, and designs which embody their ideas. The doctrine of trade secrecy is intended to protect proprietors who use a "formula, pattern, device or compilation of information" in their business "which gives [them] an opportunity to obtain an advantage over competitors who do not know or use it."⁸¹ Unfair competition is a legal theory which, among other things, proscribes misrepresentation about the nature and origin of products in commerce. Each of these forms of protection may inhibit the dissemination of information and restrict competition to a greater extent than copyright.

In certain circumstances, proprietors may find patent protection more attractive than copyright,

⁷⁹ *Supra* note 1, p. 54.

⁸⁰ In deciding whether a class of works is copyrightable, courts have displayed a certain willingness to accept the practices of the Copyright Office. See *Goldstein v. California*, 412 U.S. 546, 568-69 (1973), in which the Supreme Court discussed the Register's position on copyright in sound recordings; and *Eltra v. Ringer*, 194 U.S.P.Q. 198 (E.D. Va. 1976), *aff'd* 198 U.S.P.Q. 321 (4th Cir. 1978), in which copyright for typefaces was rejected in large part due to the Copyright Office practice.

⁸¹ Restatement, Torts, § 757, comment b (1939).

⁷⁷ Transcript, CONTU Meeting No. 6, p. 13.

⁷⁸ Senate Report, *supra* note 1, pp. 50-51; House Report, *supra* note 1, p. 51.

since it gives them the right not only to license and control the use of their patented devices or processes but also to prevent the use of such devices or processes when they are independently developed by third parties. Such rights last for seventeen years. The acquisition of a patent, however, is time consuming and expensive, primarily because a patentee's rights are great and the legal hurdles an applicant must overcome are high. A work must be useful, novel, and nonobvious to those familiar with the state of the art in which the patent is sought.⁸² The applicant must prove these conditions to the satisfaction of the Patent and Trademark Office or, failing that, to the Court of Customs and Patent Appeals or the Supreme Court.

It is still unclear whether a patent may ever be obtained for a computer program. On three occasions the Supreme Court has considered cases involving program patents.⁸³ In each it has found the programs before it to be ineligible for such protection. However, the Court has never addressed the broader question whether programs are patentable subject matter. The holdings of these three cases, although carefully limited in scope, make it appear that it would be difficult for any applicant to secure a patent in a program, since novel and useful mathematical formulas may not be patented and since useful "post-solution applications" of them meet the same fate.⁸⁴ In most countries where the patent question has been answered, it has been held that programs are ineligible for patent protection.⁸⁵ Even if patents prove available in the United States, only the very few programs which survive the rigorous application and appeals procedure could be patented. Once such protection attached, of course, all others would be barred from using the patented process, even if independently developed.

⁸² 35 U.S.C. §§ 101, 102, and 103.

⁸³ *Gottschalk v. Benson*, 409 U.S. 63 (1972); *Dann v. Johnston*, 425 U.S. 219 (1976); and *Parker v. Flook*, —U.S.—, 98 S.Ct. 2522 (1978).

⁸⁴ *Benson and Flook*, *supra* note 83.

⁸⁵ See the decision of the Supreme Court of the Federal Republic of Germany in *Siemens AG v. AEG Telefunken*, June 22, 1976; the discussion in Pagenberg, *Patentability of Computer Programs on the National and International Level*, 5 INT'L. REV. OF INDUST. PROP. & COPYRIGHT LAW 1 (1974); and the new patent convention adopted by the European Economic Community which explicitly excludes computer programs from patent protection.

Trade secrecy is a doctrine known in every American jurisdiction. As a creature of state statute or common law it differs somewhat from state to state.⁸⁶ The premise on which trade secrecy is based is this: if a business maintains confidentiality concerning either the way in which it does something or some information that it has, then courts should protect the business against the misappropriation of that secret. Although many proprietors feel secure when using trade secrecy, there are several problems they must face with respect to its use in protecting programs. Because secrecy is paramount, it is inappropriate for protecting works that contain the secret and are designed to be widely distributed.⁸⁷ Although this matters little in the case of unique programs prepared for large commercial customers, it substantially precludes the use of trade secrecy with respect to programs sold in multiple copies over the counter to small businesses, schools, consumers, and hobbyists. Protection is lost when the secret is disclosed, without regard to the circumstances surrounding the disclosure. The lack of uniform national law in this area may also be perceived by proprietors as reducing the utility of this method of protection.

From the user's standpoint, there are additional drawbacks. Users must cover the seller's expenses associated with maintaining a secure system through increased prices. Their freedom to do business in an unencumbered way is reduced, since they may need to enter into elaborate nondisclosure contracts with employees and third parties who have access to the secrets and to limit that access to a very small number of people. Since secrets are by definition known to only a few people, there is necessarily a reduced flow of information in the marketplace, which hinders the ability of potential buyers to make comparisons and hence leads to higher prices.⁸⁸

Experts in the computer industry state that a further problem with respect to trade secrecy

⁸⁶ See Bender, *Trade Secret Software Protection*, 3 COMPUTER L. SVC. § 4-4, art. 2 (1977); and NYCUM, *THE CRIMINAL ASPECTS OF COMPUTER ABUSE* (Stanford Research Institute, 1976).

⁸⁷ See MILGRIM, *TRADE SECRETS*, § 2.05[2] (1976).

⁸⁸ SAMUELSON, *ECONOMICS*, 10th ed. (1976) 48; BRAUNSTEIN, ET AL., *ECONOMICS OF PROPERTY RIGHTS AS APPLIED TO COMPUTER SOFTWARE AND DATA BASES* (1977).

is that there is much human effort wasted when people do for themselves that which others have already done but are keeping secret. This was emphasized in the reports to the Commission prepared by the Public Interest Economics Center and the New York University economists.⁸⁹

The availability of copyright for computer programs does not, of course, affect the availability of trade secrecy protection. Under the Act of 1976 only those state rights that are equivalent to the exclusive rights granted therein (generally, common law copyright) are preempted.⁹⁰ Any decline in use of trade secrecy might be based not upon preemption but on the rapid increase in the number of widely distributed programs in which trade secret protection could not be successfully asserted.

The common law doctrine of unfair competition of the misappropriation variety is based upon the principle that one may not appropriate a competitor's skill, expenditure, and labor. It prohibits false advertising and the "passing off" of another's work as one's own. While there is a small body of federal unfair competition law,⁹¹ it is largely a state doctrine with the same lack of national uniformity that besets trade secrecy. Although unfair competition may provide relief ancillary to copyright in certain situations, its scope is not as broad, and it seems unlikely that it alone could provide sufficient protection against the misappropriation of programs. For example, the unauthorized copying of any work for any purpose could be a copyright infringement without amounting to unfair competition.

Table 1 presents some of the considerations weighed by the Commission in reaching its conclusion. The answers to such economic questions as the effect of protection on the market and the opportunity it creates for an uncompetitive rate of return tend to show that, of the various potential modes of protection, copyright has the smallest negative impact.

Scope of Copyright in Programs

This section of the report will explain the extent and limitations of a copyright for a com-

puter program. The discussion of what rights copyright proprietors have and how those rights are limited does not depend upon the Commission's proposal but is based upon various currently existing copyright doctrines.

The rights of any copyright owner are set out in section 106 of the Act of 1976. Many of the other sections of Chapter 1 of that act place limitations on those rights. Cases construing previous copyright acts also serve to define the bounds of copyright under the new law, at least when the new law does not end the vitality of those cases. Before examining the specific rights found in section 106, it is necessary to determine whether a work *is* copyrighted. If it is not, then the rights of a copyright owner are of no consequence.

Section 102(a) provides the basis for determining whether a work is copyrightable.⁹² The rule is simple: a copyrightable work is an original work of authorship fixed in a tangible medium of expression.⁹³ There is a wealth of judicial interpretation behind the word *original*. Suffice to say that a work is original if it "[o]wes its origin to the author, i.e., is independently created, and not copied from other works."⁹⁴

A description of what may not be copyrighted—ideas, procedures, processes, systems, methods of operation, concepts, principles, or discoveries—is found in the same section of the copyright law.⁹⁵ Because the distinction between copyrightable computer programs and uncopyrightable processes or methods of operation does not always seem to "shimmer with clarity" it is important that the distinction between programs and processes be made clear.⁹⁶ There is a venerable copyright case and recent congressional language which make the distinction in the copyright sense relatively easy to articulate. In *Baker v. Selden*, the Supreme Court held that a

⁹² The term *copyrightable* is less accurate under the new law than under the old, but the concept may be useful. Since copyright now exists from the instant a work is fixed, all copyrightable works are perforce copyrighted.

⁹³ 17 U.S.C. § 102(a)

⁹⁴ 1 *Nimmer on Copyright*, § 10.1 (1976), citing *Alfred Bell & Co., Ltd., v. Catalda Fine Arts, Inc.*, 191 F.2d 99 (2d Cir. 1951) and *Wihitol v. Wells*, 231 F.2d 550 (7th Cir. 1956).

⁹⁵ 17 U.S.C. § 102(b).

⁹⁶ *Parker v. Flook*, *supra* note 83, at 4791-92.

⁸⁹ See Appendix H for a description of these reports.

⁹⁰ 17 U.S.C. § 301(a).

⁹¹ See 15 U.S.C. § 1125(a), and Allison, *Private Cause of Action for Unfair Competition under the Lanham Act*, 14 AM. BUS. L. J. 1 (1976).

TABLE 1
CHARACTERISTICS OF PROTECTIVE MECHANISMS

Considerations	Copyright	Patent	Trade Secrecy
<i>General</i>			
National uniformity	Yes	Yes	No
Protection effective upon	Creation of work	Successful prosecution of application	Entrance into contractual relationship
Cost of obtaining protection	Nil	Moderate	Moderate
Term of protection	Life plus 50 years or 75 years	17 years	Possibility of both perpetual protection and termination at any time
Cost of maintaining protection ¹	Nil	Nil	Significant
Cost of enforcing rights against violators ²	Moderate	Moderate	Higher
Availability of (a) statutory damages (b) attorney's fees from infringers	(a) Yes (b) Yes	(a) No (b) Yes	(a) No (b) No
Protection lost by	Gross neglect	Unsuccessful litigation	Disclosure
<i>Software, including effects of Commission proposals</i>			
Consistency with other copyright areas	Yes	No	No
Availability of protective mechanism for some programs ³	Yes	Unclear	Yes
Universal availability of protective mechanism for all programs ⁴	Yes	No	No
"Process" protectible	No	Yes	Yes
Suited to mass distribution	Yes	Yes	No

¹ Once copyright or patent is secured, it costs little or nothing to keep it in force; on the other hand, expensive security measures must be taken to avoid losing a trade secret. At least part of the cost of this security is passed on to the user.

² Copyright and patent infringers in some instances may be persuaded to comply without the institution of a lawsuit. If litigation is necessary, it may be expensive, but in copyright and patent cases, attorneys' fees may be awarded to successful plaintiffs. At trial, the proprietor bears the burden of proving that the trade secret is valid; in patent cases, there is a presumption of validity; and in copyright actions, a registration certificate is prima facie evidence of the copyright's validity. The proof of the validity of a trade secret may be expensive and difficult, as it almost necessarily involves the retention of expert witnesses. Although witnesses may be needed in copyright and patent suits, in those cases there will have been at least some compliance with federal law regarding public notice of claimed rights before the lawsuit is initiated. A suit to enforce a trade secret, even though successful, may destroy the secret if it is offered into evidence and becomes part of the public record of the trial.

³ As of the present, serious doubt exists whether programs are proper subjects for patent protection. (See this chapter under Copyright and Other Methods Compared.)

⁴ Even if programs are patentable, only those that are truly novel and nonobvious will be protected. Trade secrecy is, of course, unavailable when the contents of a program have been disclosed.

valid copyright in a book describing a system of accounting, based upon the now-universal T-accounts, did not bar others from using that accounting system.⁹⁷ This holding is often misconstrued as imposing a limit on the copyrightability of works which express ideas, systems, or processes. As Professor Nimmer observes, "the rationale for the doctrine of *Baker v. Selden* in no event justifies the denial of copyrightability to any work."⁹⁸ The case properly stands for the proposition that using the system does not

infringe the copyright in the description. This rule is found in section 102(b) of the new law. Both Houses of Congress agreed as to its application to computer programs:

Section 102(b) is intended, among other things, to make clear that *the expression adopted by the programmer is the copyrightable element in a computer program*, and that the actual processes or methods embodied in the program are not within the scope of the copyright law [emphasis added].⁹⁹

⁹⁷ 101 U.S. 99 (1879).

⁹⁸ 1 Nimmer on Copyright, § 37.31 (1976).

⁹⁹ Senate Report, *supra* note 1, p. 54; House Report, *supra* note 1, p. 57.

Copyright, therefore, protects the program so long as it remains fixed in a tangible medium of expression but does not protect the electro-mechanical functioning of a machine. The way copyright affects games and game-playing is closely analogous: one may not adopt and republish or redistribute copyrighted game rules, but the copyright owner has no power to prevent others from playing the game.¹⁰⁰

Thus, one is always free to make a machine perform any conceivable process (in the absence of a patent), but one is not free to take another's program. This general rule is subject to exceptions which restrict the power of copyright owners. These exceptions might be thought of as the "insufficient intellectual labor" exception and the "idea-expression identity" exception. Although they lead to similar results, they are really slightly different.

Apparent works of authorship may not qualify for copyright if they are not "the fruits of intellectual labor."¹⁰¹ This reasoning has barred copyright for blank forms for recording data¹⁰² and for instructions of the rankest obviousness and simplicity, such as "apply hook to wall."¹⁰³ This exception would mean that a "program" consisting of a very few obvious steps could not be a subject of copyright.

The "idea-expression identity" exception provides that copyrighted language may be copied without infringing when there is but a limited number of ways to express a given idea. This rule is the logical extension of the fundamental principle that copyright cannot protect ideas.¹⁰⁴ In the computer context this means that when specific instructions, even though previously copyrighted, are the only and essential means of accomplishing a given task, their later use by another will not amount to an infringement. In discussing an insurance company's use of a lawyer's copyrighted forms, a federal court of appeals stated in *Continental Casualty Co. v. Beardsley*:

[T]he use of specific language . . . may be so essential to accomplish a desired result and so

integrated with the use of a . . . conception that the proper standard of infringement is one which will protect as far as possible the copyrighted language and yet allow the free use of the thought beneath the language. *The evidence here shows that [the company] insofar as it has used the language of [the lawyer's] forms has done so only as incidental to its use of the underlying idea. . . . In so doing it has not infringed* [emphasis added].¹⁰⁵

The emphasized language from the *Beardsley* decision indicates that copyright protection for programs does not threaten to block the use of ideas or program language previously developed by others when that use is necessary to achieve a certain result. When other language is available, programmers are free to read copyrighted programs and use the ideas embodied in them in preparing their own works.¹⁰⁶ This practice, of course, is impossible under a patent system, where the process itself is protected, and difficult under trade secrecy, where the text of a program is designed not to be revealed.

Programs are a relatively new type of writing, and how copyright protects them is not universally understood. Because programs are used in

¹⁰⁵ 253 F.2d 702, 706 (2d Cir. 1958); see also, *Harcourt, Brace & World, Inc. v. Graphic Controls Corp.*, 329 F.Supp. 517 (S.D.N.Y. 1971).

¹⁰⁶ The availability of alternative noninfringing language is the rule rather than the exception. The following colloquy to that effect took place at the tenth Commission meeting (Transcript, CONTU Meeting No. 10, pp. 44-45):

Commissioner Miller: How many different ways are there to produce a program . . . ?

Dan McCracken [vice-president of the Association for Computing Machinery]: An infinite number in principle, and in practice dozens, hundreds.

Miller: So it is comparable to the theoretically infinite number of ways of writing *Hamlet*?

McCracken: I believe so. It is not really true that there is a very restrictive way to write a program [which might make it] not copyrightable. I don't believe that at all.

Miller: When you say "infinite," I assume that along that scale there are increases and decreases in the efficiency with which the machine will operate?

McCracken: Perhaps.

Miller: In all of the programs that we have been talking about this morning, with particular reference to . . . compiler programs, does it continue to be true that there are an infinite number of ways of writing particular programs to do particular jobs?

McCracken: Yes. . . . There are hundreds of [different] compiler [programs for] going from FORTRAN to some machines. . . .

¹⁰⁰ 1 *Nimmer on Copyright*, § 37.83 (1976).

¹⁰¹ Trade-Mark Cases, 100 U.S. 82 (1879).

¹⁰² *Brown Instrument Co. v. Warner*, 161 F.2d 910 (D.C. Cir. 1947).

¹⁰³ *E. H. Tate Co. v. Jiffy Enterprises, Inc.*, 16 F.R.D. 571 (E.D. Pa. 1954).

¹⁰⁴ See 2 *Nimmer on Copyright*, § 166 (1976) and 17 U.S.C. § 102(b).

conjunction with machines, there has not been universal agreement concerning the propriety of copyright protection. Programs should no more be considered machine parts than videotapes should be considered parts of projectors or phonorecords parts of sound reproduction equipment. All three types of works are *capable* of communicating with humans to a far greater extent than the coined code words discussed by Judge Hand in *Reiss v. National Quotation Bureau*.¹⁰⁷ In all three instances, the medium in which copyrighted material is stored is moved past a sensing device at a set speed, causing electric current to flow, and ultimately resulting in the movement of machine parts to print words, display pictures, or create sounds. All of these events may occur through the use of machines without placing copyrighted works in them. A typist may create a printed document that is indistinguishable from computer output; a television system may produce pictures without the use of a fixed work; and instruments may be used to create the sounds which are found on phonorecords. All that copyright protection for programs, videotapes, and phonorecords means is that users may not take the works of others to operate their machines. In each instance, one is always free to make the machine do the same thing as it would if it had the copyrighted work placed in it, but only by one's own creative effort rather than by piracy.

It has been suggested by Vice-Chairman Nimmer in his separate opinion that programs be copyrighted only when their use leads to copyrighted output.¹⁰⁸ If this approach were adopted, it would make a program for text editing or the production of graphics copyrightable. It would, however, exclude a program which might be used to assist traffic flow in rush hours or to monitor the vital signs of patients under intensive care. This distinction is not consistent with the design of the Act of 1976, which was clearly to protect all works of authorship from the moment of their fixation in any tangible medium of expression. Further, it does not square with copyright practice past and present, which recognizes copyright protection for a work of authorship regardless of the uses to which it may be put. The copyright status of the

written rules for a game or a system for the operation of a machine is unaffected by the fact that those rules direct the actions of those who play the game or carry out the process. Nor has copyright been denied to works simply because of their utilitarian aspects. It follows, therefore, that there should likewise be no distinction made between programs which are used in the production of further copyrighted works and those which are not. Should such a distinction be made, the likelihood is that entrepreneurs would simply require that programs produce a written and, by that token, an unquestionably copyrightable version of their output to obtain copyright in the programs themselves. Although the distinction tries to achieve the separation of idea from form of expression, that objective is better realized through the courts exercising their judgment in particular cases.

The Commission has considered at length the various forms in which programs may be fixed. Flow charts, source codes, and object codes are works of authorship in which copyright subsists, provided they are the product of sufficient intellectual labor to surpass the "insufficient intellectual labor" hurdle, which the instructions "apply hook to wall" fail to do.¹⁰⁹ They may not be copied unless such copying is authorized by the proprietor of the copyright therein or by law. That protection continues as long as the program remains fixed in a tangible medium, up to the period provided in the Act of 1976.¹¹⁰

That the words of a program are used ultimately in the implementation of a process should in no way affect their copyrightability. Traditional works have led to processes both more rigid and more flexible than those to which computer programs lead. When a phonorecord or motion picture is used in conjunction with a

¹⁰⁹ A flow chart is a graphic representation for the definition, analysis, or solution of a problem in which symbols are used to represent operations, data flow, or equipment. A source code is a computer program written in any of several programming languages employed by computer programmers. An object code is the version of a program in which the source code language is converted or translated into the machine language of the computer with which it is to be used.

¹¹⁰ For the works of individuals, life plus fifty years. For the works of employed, pseudonymous, or anonymous authors, seventy-five years. 17 U.S.C. § 302.

¹⁰⁷ *Supra* note 61.

¹⁰⁸ See this chapter under the Concurring Opinion of Commissioner Nimmer.

properly working machine, the same result will occur on the first, the second, or the thousandth running. The chorus will remain silent until the fourth movement of Beethoven's Ninth Symphony, and Bogart will stay in *Casablanca* forever. A similar rigidity is found when a copyrighted chart is used to determine the sine of a fifty-degree angle. The process is virtually immutable. That is less true when a program is used, since it contains alternative branches selected only after use has begun, meaning that the process may be different with every use.

The text of the new copyright law makes it clear that the placement of a copyrighted work into a computer—or, in the jargon of the trade, the “inputting” of it—is the preparation of a copy. This may be ascertained by reading together the definitions of *copies* and *fixed* found in section 101. In pertinent part, they read as follows:

“Copies” are material objects . . . in which a work is fixed. . . .

A work is “fixed” . . . when its embodiment in a copy . . . is sufficiently permanent or stable to permit it to be perceived, reproduced, or otherwise communicated for a period of more than transitory duration.

Because works in computer storage may be repeatedly reproduced, they are fixed and, therefore, are copies.¹¹¹

It is difficult, either as a matter of legal interpretation or technological determination, to draw the line between the copyrightable element of style and expression in a computer program and the process which underlies it. Some examples how copies of programs may be made may help to explain the nature of this problem and to place it in its proper perspective.

A computer program may be misappropriated in a variety of ways. In the first and most straightforward instance, the program listing or the programmer's original coding sheets might be photocopied, which would clearly be an infringement. The unarguably copyrightable writing has been taken. But, what if the program, rather than being recorded on paper, is recorded

on magnetic tape or disk? If the tape is used without authorization to produce a printed, human-readable version of the program, again an infringement has occurred. Should the result be different if the tape is copied? That copy may still be used to prepare a printed version at will. There is a one-to-one correspondence between the printed characters on paper and the magnetized areas of the tape. The tape is simply a version of the program from which a human-readable copy may be produced with the aid of a machine or device.

When a program is copied into the memory of a computer, it still exists in a form from which a human-readable version may be produced. That is, the copy in the computer's memory may be duplicated, just as a version listed on paper or coded on magnetic tape may be. Only when the program is inserted—instruction by instruction—into the processing element of the computer and electrical impulses are sent through the circuitry of the processor to initiate work is the ability to copy lost. This is true at least under the present state of technology. If it should prove possible to tap off these impulses then, perhaps, the process would be all that was appropriated, and no infringement of the copyright would occur.

The movement of electrons through the wires and components of a computer is precisely that process over which copyright has no control. Thus, copyright leads to the result that anyone is free to make a computer carry out any unpatented process, but not to misappropriate another's writing to do so.

Drawing the line between the copyrightable form of a program and the uncopyrightable process which it implements is simple in the first instance described above. But the many ways in which programs are now used and the new applications which advancing technology will supply may make drawing the line of demarcation more and more difficult. To attempt to establish such a line in this report written in 1978 would be futile. Most infringements, at least in the immediate future, are likely to involve simply copying. In the event that future technology permits programs to be stated orally for direct input to a computer through auditory sensing devices or permits future infringers to use an author's program without copying, difficult questions will arise. Should a line need to

¹¹¹ Insofar as a contrary conclusion is suggested in one report accompanying the new law, this should be regarded as incorrect and should not be followed, since legislative history need not be perused in the construction of an unambiguous statute. Cf. House Report, *supra* note 1, p. 53, with the plain language in the statute defining *fixed*.

be drawn to exclude certain manifestations of programs from copyright, that line should be drawn on a case-by-case basis by the institution designed to make fine distinctions—the federal judiciary.

Economic Effects of Program Copyright

That copyright gives authors exclusive rights in their writings seems to cause some to equate it with all monopolies. This has led to the fear that protection for programs may give the copyright owner the power to dominate the program market, the machine market, or both.

To begin with, it is necessary to distinguish between those lawful monopolies whose existence is permitted or even encouraged on policy grounds and unlawful monopolies which are declared to be inimical to the public good. Permitted monopolies generally are found in regulated industries, such as public utilities, in which economies of scale are so great that the existence of more than one firm makes little sense and in which regulation, when properly accomplished, prevents such abuses as monopoly pricing or refusals to deal. Such limited monopolies as patents and copyrights are encouraged while the public interest is protected in various ways. Protection of the general good is found in the limited term and stringent standards associated with patents, the proscription of the protection of ideas under copyright, and the refusal to allow the extension of patents or copyrights beyond their limited scopes. This last matter may be the heart of the concern about the economic effects of program copyright.

The utilization of lawful patents to attempt to monopolize unpatented processes has been consistently found unlawful.¹¹² Because copyright grants no monopoly over ideas, a parallel line of cases does not really exist, but in certain instances courts have reached similar results. In a leading copyright-antitrust case, Judge Frank outlined how competing public interests could be balanced:

We have here a conflict of policies: (a) that of preventing piracy of copyrighted matter and (b) that of enforcing the anti-trust laws. We must

¹¹² *Morton Salt Co. v. G. S. Suppiger Co.*, 314 U.S. 488 (1942); *Mercoid Corp. v. Mid-Continent Investment Co.*, 320 U.S. 661 (1944).

balance the two, taking into account the comparative innocence or guilt of the parties, the moral character of their respective acts, the extent of the harm to the public interest, the penalty inflicted on the [copyright owner] if we deny it relief. As the defendants' piracy is unmistakably clear, while the [owners'] infraction of the anti-trust laws is doubtful and at most marginal, we think the enforcement of the first policy should outweigh the enforcement of the second.¹¹³

Thus, it is not the fact of a constitutional and statutory monopoly which is disfavored, but only abuses of the lawful monopoly.¹¹⁴

One of the hallmarks of a competitive industry is the ease with which entrepreneurs may enter into competition with firms already doing business. The absence of significant barriers to entering the program-writing market is striking. There are several hundred independent firms whose stock in trade is computer programs.¹¹⁵ New software firms may be formed with few people and little money; entry into the market has thus far been fairly easy.¹¹⁶ None of the evidence received by the Commission suggests that affording copyright to programs would in any way permit program authors to monopolize the market for their products. Nor is there any indication that any firm is even remotely close to dominating the programming industry.

The effect of program copyright on the retail prices of consumer goods and services is so small as to be undetectable. Across a wide variety of industries, packaged software amounts to between one and two percent of data processing expenses, which themselves comprise a like percentage of a firm's gross income. This has led one commentator to describe data processing costs as a whole as "a noise-level expense, probably less than the phone bill of an average company."¹¹⁷ Thus, from each one hundred dollars

¹¹³ *Alfred Bell & Co. v. Catalda Fine Arts, Inc.*, 191 F.2d 99, 106 (2d Cir. 1951).

¹¹⁴ For another case in which the same court refused to permit a copyright owner to use his lawful monopoly to the detriment of the public, see *Rosemont Enterprises, Inc. v. Random House, Inc.*, 366 F.2d 303 (2d Cir. 1966).

¹¹⁵ Harvey, *The Developing Software Industry*, INFOSYSTEMS 34 (July 1976).

¹¹⁶ Computer Sciences Corporation, which has over \$100 million in annual sales, is said to have been founded on a capital investment of less than \$1,000.

¹¹⁷ McLaughlin, 1976 *DP Budgets*, DATAMATION 52 (February 1976).

of income, a firm is likely to spend between one and two dollars on data processing, of which from one to four cents are spent on packaged software. There is no easy way to separate out the costs of protection from that figure, but it is clear that such costs are miniscule when compared to a firm's total operating expenses.

The market for computer hardware has been characterized by severe but not insurmountable barriers to entry. Economies of scale are very great; a firm must be prepared to invest tremendous amounts of money in creating, building, and marketing machines.¹¹⁸ Natural barriers to entry, such as economies of scale, should not receive the opprobrium properly reserved for anti-competitive conspiracies. Barriers erected by present members of an industry may well be—and frequently are—antitrust violations.

The inability of hardware firms to dominate the software market was recognized by the Public Interest Economics Center, when it stated:

[W]hatever their historical dominance, the hardware corporations lack the ability to control entry into the software market, and . . . their market shares are being steadily eroded by the independents. Thus, we can tentatively conclude that protection of software . . . serves to benefit consumers by enhancing competition and increasing long-run supply.¹¹⁹

In the market for computers, monopolistic practices have been attacked by the Department of Justice on numerous occasions. As the result of an early consent decree, IBM, the largest firm in the industry, has agreed to sell its equipment instead of only leasing it. In 1969, immediately after the Justice Department filed its antitrust suit, IBM stopped selling its machines and programs as a package, thus ending a tying arrangement, the legality of which had been questioned. The government is currently prosecuting that action against IBM through which it seeks the division of IBM into several firms, much as resulted in the *Standard Oil* case.¹²⁰ This relief,

as is typically the case in an antitrust action, is directed toward the sources of a firm's alleged dominance of an industry. It is interesting to note that neither the government nor any private antitrust plaintiffs has ever argued that IBM's assertion of copyright in its programs is even remotely related to its alleged anticompetitive behavior.

Successful antitrust attacks where copyright was important to the cause of action apparently have occurred only with respect to performing rights organizations. Both ASCAP and BMI operate under consent decrees which resulted from Justice Department actions directed toward the monopoly created when performance rights not only were pooled but were available exclusively from the pool. The resulting settlements permitted the pooling to continue upon the provision that customers could go to individual proprietors as well as to the defendants to obtain performance rights. Another attack on ASCAP demonstrated again that it is not the copyright monopoly which is disfavored, but rather attempts to extend that right to acquire monopoly power in the market. When a music publisher who belonged to ASCAP sought damages for infringement from film exhibitors who had without license shown films containing the plaintiff's music on the soundtrack, in denying the relief sought, the court ruled:

Refuge cannot be sought in the copyright monopoly which was not granted to enable plaintiffs to set up another monopoly, nor to enable the copyright owners to tie a lawful monopoly with an unlawful monopoly and thus reap the benefits of both.¹²¹

The policy implications of such cases seem clear and correct: the lawful copyright monopoly may not be used other than as intended. A copyright owner may monopolize his expression but not the market in which it is purveyed. To suggest, as does the Public Interest Economics Center (PIE-C), that no "large" hardware manufactures be permitted to assert copyright in programs they write is to propose an instrument of dubious legality and effectiveness.¹²² Certainly any large firm could create a separate entity to do its program-writing to avoid any proscription of its ownership of program copy-

¹¹⁸ Amdahl Corporation, a newcomer to the market for large computers, spent five years and \$45 million before shipping its first order. *Can Amdahl Live with IBM's New Strategy?*, BUSINESS WEEK 56B (August 5, 1977).

¹¹⁹ PIE-C Report, *supra* note 21, at IV-13.

¹²⁰ *Standard Oil Co. v. United States*, 221 U.S. 1 (1911).

¹²¹ *M. Witmark & Sons v. Jensen*, 80 F.Supp. 843, 848-49 (D. Minn. 1948).

¹²² PIE-C Report, *supra* note 21, at IV-13.

rights. The PIE-C proposal may be less than relevant to the extent that it might lull its advocates into a false sense of having dealt with the problem of industrial concentration when they have not. Being against bigness at all costs should not be a substitute for analytical action on behalf of the general public and consumers.

On the whole, the direct approach against alleged monopolists seems far superior to fighting perceived economic evils on copyright grounds. The enforcement and, where necessary, emendation of present antitrust laws is more appropriate to the problem, if any, than the invention of a class of works which are generally copyrightable but not when their authors are disfavored, for whatever well-intentioned reasons. In the patent and copyright antitrust cases, there is no language suggesting that statutory protection should be unavailable to the defendants, notwithstanding the proof that they had abused their lawful monopolies. To create such a remedy on bald suspicion would indeed be unjust.

Cultural Effects of Program Copyright

The introduction of new means of communication with their attendant new modes of expression often raises questions regarding the intrinsic values of such works. The works of Beethoven, Chopin, Stravinsky, and Hindemith all enjoyed less than immediate success. Early works of all of these innovative composers were condemned for being outside what was then felt to be the cultural mainstream. But, as perceptions have changed, the contributions these composers made to breaking with tradition and enriching the breadth of expression in our musical heritage have overcome the barriers to new ideas which traditionalists would have imposed.

The history of copyright legislation and the interpretations courts have given to the Copyright Clause all demonstrate that there is no basis, as some would suggest, for the imposition of a standard of literary or artistic merit for determining copyrightability. The perils of such an approach have long been recognized. Mr. Justice Holmes, in upholding copyright in a chromolithographed circus poster, said:

It would be a dangerous undertaking for persons trained only in the law to constitute themselves final judges of the worth of pictorial illustrations,

outside of the narrowest and most obvious limits. At the one extreme some works of genius would be sure to miss appreciation. Their very novelty would make them repulsive until the public had learned the new language in which their author spoke. It may be more than doubted, for instance, whether the etchings of Goya or the paintings of Manet would have been sure of protection when seen for the first time. At the other end, copyright would be denied to pictures which appealed to a public less educated than the judge. Yet if they command the interest of any public, they have a commercial value—it would be bold to say that they have not an aesthetic and educational value—and the taste of any public is not to be treated with contempt.¹²³

This principle has been consistently followed in cases emphasizing that "[a]ll that is needed to satisfy both the Constitution and the statute is that the 'author' contributed something more than a 'merely trivial' variation, something recognizably 'his own'." [footnote omitted].¹²⁴ These judicial opinions clearly illustrate that courts have assiduously avoided adopting the critic's role in evaluating the aesthetic merits of works of authorship. To attempt to deny copyrightability to a writing because it is capable of use in conjunction with a computer would contravene this sound policy. Where could a meaningful line of demarcation be drawn? Between flow chart and ~~and~~ source code? Between source code and object code? At the moment of input into a computer or microprocessor? The Commission believes that none of these is appropriate. The line which must be drawn is between the expression and the idea, between the writing and the process which is described. This proposal acknowledges the propriety of keeping cultural value judgments out of copyright. The only legitimate question regarding copyrightability is: Is the object an original work of authorship?

The Copyright Clause of the Constitution empowers Congress to establish a patent and copyright system to improve the general public welfare, by "[p]romoting . . . the progress of Science and Useful Arts." Patent protects inventions, and copyright protects the writings of

¹²³ *Bleistein v. Donaldson Lithographing Co.*, 188 U.S. 239, 251-52 (1903).

¹²⁴ *Alfred Bell and Co. v. Catalda Fine Arts, Inc.*, 191 F.2d 99, 102-3 (2d Cir. 1951).

authors. As previously discussed, the term *writing* has been liberally construed to embrace the fruits of intellectual and aesthetic labor embodying any modicum of original effort. Copyright protects a wide range of works; some with great cultural value, such as the novels of Pulitzer Prize winners and Nobel Laureates, original paintings, award-winning movies, and masterful musical compositions. It likewise shields works of little or no aesthetic merit: advertising copy, picture postcards, videotaped wrestling matches, violent and sexually explicit films, and the most banal popular music. The contribution of these latter works to our culture is at best questionable. Neither the Supreme Court nor any governmental or private body has been able to assess the social or cultural impact of sexually explicit materials, let alone the cultural impact of the protection of such works by copyright. Their contribution to the quality of life is not quantifiable; their effect may not even be qualitatively identifiable. The kinds of qualitative impacts which computer software may have on the quality of life may, at least, be described.

Declining costs and improved performance of electronic hardware are bringing powerful miniature computer systems into small businesses and the home. These computers and the more powerful and cheaper generations of similar systems which will follow have the potential to enrich our lives and aid in communication among humans in ways as yet inconceivable. Personalized high-quality education, at present available only to the wealthy, will be within the reach of the small school system and the average consumer in the home. Health care in public clinics will be provided on a more individualized, personal basis by using computers to aid the physician in communicating with his patient through complete and accurately maintained medical records. Leisure time may be enriched by both studying and game-playing on home computer systems. The possibilities provided by the technology are virtually limitless. They are dependent only on the ingenuity employed in developing the programs that enable humans to communicate their ideas to one another through the intermediation of the machine and on the willingness of creators of such works to disseminate them at reasonable prices. In considering the quality of life in this country, failing to weigh the positive contributions of computers

and the programs with which they are used would indeed be a mistake.

At the same time, any dehumanizing effects which might be attributable to the increasing impact of computer uses upon society are utterly unrelated to the mode of protection employed to safeguard program language. It is clear that the uses to which computers are put depend entirely upon the intent of their users and not at all upon the mechanisms designed to protect programs. To say that copyright for programs somehow is responsible for social problems ostensibly caused by computer uses is akin to arguing against copyrights for the worst of television shows or against patent protection for components of gas-guzzling cars on the grounds that such works are detrimental to American culture.

Concurring Opinion of Commissioner Nimmer

I concur in the Commission's opinion and in its recommendations regarding software. I do, however, share in a number of the doubts and concerns expressed in Commissioner Hersey's thoughtful dissenting opinion.¹²⁵ What is most troubling about the Commission's recommendation of open-ended copyright protection for all computer software is its failure to articulate any rationale which would not equally justify copyright protection for the tangible expression of any and all original ideas (whether or not computer technology, business, or otherwise). If *literary works* are to be so broadly construed, the Copyright Act becomes a general misappropriation law, applicable as well in what has traditionally been regarded as the patent arena, and, indeed, also in other areas to which neither copyright nor patent law has previously extended. This poses a serious constitutional issue in that it is arguable that such an approach stretches the meaning of *authors* and *writings* as used in the Copyright Clause of the Constitution beyond the breaking point. Apart from the constitutional issues, it raises policy questions, the full implications of which remain murky at best. Still, at this time, knowing what we now know about the nature of the computer

¹²⁵ See this chapter under Dissent of Commissioner Hersey.

industry, its needs, and its potential for great contributions to the public welfare, I am prepared, on balance, to support the Commission's conclusions and recommendations.

At the same time I should like to suggest a possible line of demarcation which would distinguish between protectible and nonprotectible software in a manner more consistent with limiting such protection to the conventional copyright arena. This suggestion is made not because I recommend its immediate implementation, but rather because it may prove useful in the years to come if the Commission's recommendation for protection of all software should prove unduly restrictive. In such circumstances it may prove desirable to limit copyright protection for software to those computer programs which produce works which themselves qualify for copyright protection. A program designed for use with a data base, for example, would clearly be copyrightable since the resulting selection and arrangement of items from such data base would itself be copyrightable as a compilation. Thus, a program designed for use in conjunction with a legal information retrieval system would be copyrightable, since the resulting enumeration of cases on a given topic could claim copyright. A program designed for a computer game would be copyrightable because the output would itself constitute an audiovisual work. (For this purpose the fact that such audiovisual work is not fixed in a tangible medium of expression, and for that reason is ineligible for copyright protection should not invalidate the copyright in the computer program as long as the program itself is fixed in a tangible medium of expression.) On the other hand, programs which control the heating and air-conditioning in a building, or which determine the flow of fuel in an engine, or which control traffic signals would not be eligible for copyright because their operations do not result in copyrightable works. The fact that such a program might also provide for a printout of written instructions (which would be copyrightable) would only render protectible that particular aspect of such a program.

The distinction here suggested appears to me to be consistent with the recognized copyrightability of sound recordings. It sometimes has been argued that while printed instructions tell *how* to do work, computer programs actually

do the work. But this is also true of sound recordings, which in a sense constitute a machine (the phonorecord) communicating with another machine (the record player). A sound recording contained in a phonorecord does not tell a record player *how* to make sounds which constitute a Cole Porter melody. Rather, it activates the record player in such manner as actually to create such a melody. But Commissioner Hersey has made another and most important distinction. "The direct product of a sound recording, when it is put in a record player, is the sound of music—the writing of the author in its audible form."¹²⁶ The point is that the operation of the sound recording produces a musical work which itself is copyrightable. That is sufficient to render the sound recording itself copyrightable quite apart from the separate copyright in the musical work. This principle is directly analogical to the distinction suggested above with respect to computer programs.

Dissent of Commissioner Hersey

This dissent from the Commission report on computer programs takes the view that copyright is an inappropriate, as well as unnecessary, way of protecting the usable forms of computer programs. Its main argument, briefly summarized, follows.

In the early stages of its development, the basic ideas and methods to be contained in a computer program are set down in written forms, and these will presumably be copyrightable with no change in the 1976 Act. But the program itself, in its mature and usable form, is a machine-control element, a mechanical device, which on constitutional grounds and for reasons of social policy ought not be copyrighted.

The view here is that the investment of creative effort in the devising of computer programs does warrant certain modes of protection for the resulting devices, but that these modes already exist or are about to be brought into being under other laws besides copyright; that the need for copyright protection of the machine phase of computer programs, quite apart from whether it is fitting, has not been demonstrated to this

¹²⁶ See this chapter under Issue of Communication.

Commission; and that the social and economic effects of permitting copyright to stand alongside these other forms of protection would be, on balance, negative.

The heart of the argument lies in what flows from the distinction, raised above, between the written and mechanical forms of computer programs: admitting these devices to copyright would mark the first time copyright had ever covered a means of communication, not with the human mind and senses, but with machines.

ARE MATURE PROGRAMS "WRITINGS"?

Programs are profoundly different from the various forms of "works of authorship" secured under the Constitution by copyright. Works of authorship have always been intended to be circulated to human beings and to be used by them—to be read, heard, or seen, for either pleasurable or practical ends. Computer programs, in their mature phase, are addressed to machines.

All computer programs go through various stages of development. In the stages of the planning and preparation of software, its creators set down their ideas in written forms, which quite obviously do communicate to human beings and may be protected by copyright with no change in the present law.

But the program itself, in its mature and usable form, is a machine-control element, a mechanical device, having no purpose beyond being engaged in a computer to perform mechanical work.

The stages of development of a program usually are: a definition, in eye-legible form, of the program's task or function; a description; a listing of the program's steps and/or their expression in flow charts; the translation of these steps into a "source code," often written in a high-level programming language, such as FORTRAN or COBOL; the transformation of this source code within the computer, through intervention of a so-called compiler or assembler program, into an "object code." This last is most often physically embodied, in the present state of technology, in punched cards, magnetic disks, magnetic tape, or silicon chips—its mechanical phase.

Every program comes to fruition in its mechanical phase. Every program has but one pur-

pose and use—one object: to control the electrical impulses of a computer in such a particular way as to carry out a prescribed task or operation. In its machine-control form it does not describe or give directions for mechanical work. When activated, it does the work.

An argument commonly made in support of the copyrightability of computer programs is that they are just like ordinary printed (and obviously copyrightable) lists of instructions for mechanical work. The computer report calls programs forms of writing which "consist of sets of instructions."¹²⁷ But this metaphor does not hold up beyond a certain point. Descriptions and printed instructions tell human beings how to use materials or machinery to produce desired results. In the case of computer programs, *the instructions themselves eventually become an essential part of the machinery that produces the results*. They may become (in chip or hardware form) a permanent part of the actual machinery; or they may become interchangeable parts, or tools, insertable into and removable from the machine. In whatever material form, the machine-control phase of the program, when activated, enters into the computer's mechanical process. This is a device capable of commanding a series of impulses which open and close the electronic gates of the computer in such order as to produce the desired result.

Printed instructions explain *how* to do something; programs are *able* to do it. The language used to describe and discuss computer programs commonly expresses this latter, active, functional capability, not the preparatory "writing" phases. For example, the Commission's report on new works uses the following verbs to characterize the doings of various programs in computers: *select, arrange, simulate, play, manipulate, extract, reproduce*, and so on.¹²⁸ It is not said that the programs *describe* or *give instructions* for the functions of the computer. They *control* them. This is the mechanical fact.

Issue of Communication

The Commission report on computer programs suggests that musical recordings also do work, analogous to what we have been describing. "Both recorded music and computer pro-

¹²⁷ See this chapter under Computer Programs.

¹²⁸ See this chapter under New Works.

grams are sets of information in a form which, when passed over a magnetized head, cause minute currents to flow in such a way that desired physical work is accomplished."¹²⁹ But these are radically different orders of work, and the difference touches on the very essence of copyright.

We take it as a basic principle that copyright should subsist in any original work of authorship that is fixed in any way (including books, records, film, piano rolls, videotapes, etc.) which communicate the work's means of expression. But a program, once it enters a computer and is activated, does not communicate information of its own, intelligible to a human being. It utters work. Work is its only utterance and its only purpose. So far as the mode of expression of the original writing is concerned, the matter ends there; it has indeed become irrelevant even before that point. The mature program is purely and simply a mechanical substitute for human labor.

The functions of computer programs are fundamentally and absolutely different in nature from those of sound recordings, motion pictures, or videotapes. Recordings, films, and videotape produce for the human ear and/or eye the sounds and images that were fed into them and so are simply media for transmitting the means of expression of the writings of their authors. The direct product of a sound recording, when it is put in a record player, is the sound of music—the writing of the author in its audible form. Of film, it is a combination of picture and sound—the writing of the author in its visible and audible forms. Of videotape, the same. But the direct product of a computer program is a series of electronic impulses which operate a computer; the "writing" of the author is spent in the labor of the machine. The first three communicate with human beings. The computer program communicates, if at all, only with a machine.

And the nature of the machine that plays the second recording is fundamentally and absolutely different from that of the machine that uses software. The record player has as its sole purpose the performance of the writing of the author in its audible form. The computer may

in some instances serve as a storage and transmission medium for writings (but different writings from those of the computer programmer—i.e., data bases) in their original and entire text, in which cases these writings may be adequately secured at both ends of the transaction by the present copyright law. But in the overwhelming majority of cases its purposes are precisely to use programs to transform, to manipulate, to select, to edit, to search and find, to compile, to control and operate computers and a vast array of other machines and systems, with a result that the preparatory writings of the computer programmer are nowhere to be found in recognizable form, because the program has been fabricated as a machine control element that does these sorts of work. It is obvious that the means of expression of the preparatory writing—that which copyright is supposed to protect—is not to be found in the computer program's mechanical phase.

An appropriate analogy to computer programs, in their capacity to do work when passed over a magnetized head, would be such mechanical devices as the code-magnetized cards which open and close locks or give access to automated bank tellers. These are not copyrightable.

But a more telling analogy, since it speaks to the supposed instructional nature of programs, is afforded by that relatively primitive mechanical device, the cam. A cam, like a mature computer program, is the objectification of a series of instructions: "Up, down, up, down . . .," or "In, out, in, out. . . ." A cam may be the mechanical fixation of rather intricate and elegant instructions. A cam controlling a drill may embody such instructions as: "Advance rapidly while the hole is shallow, pause and retract for a short distance to clear chips, advance more slowly as the hole goes deeper, stop at a precise point to control the depth of the hole, retract clear of the hole, dwell without motion while the work piece is ejected and another loaded; repeat procedure." (Computer programs can and do embody precisely similar instructions.) But although such a cam was originally conceptualized, described, and written out as this series of instructions for desired work and is, in its mature form, the material embodiment of the instructions, capable of executing them one by one, no one would say (as the Commission now says of another form of "in-

¹²⁹ See this chapter under Computer Programs.

structions"—the mature computer program) that it is a literary work and should be copyrighted.

To support the proposition that programs are works of authorship the report says that "the instructions that make up a program may be read, understood, and followed by a human being," and that programs "are *capable* of communicating with humans. . . ." ¹³⁰ Programmers may and sometimes do read each other's copyrightable *preparatory* writings, the early phases of software, but the implication of these statements is that programs in their machine form also communicate with human "readers"—an implication that is necessarily hedged by the careful choices of the verbs *could be* and *are capable of*; for if a skilled programmer can "read" a program in its mature, machine-readable form, it is only in the sense that a skilled home-appliance technician can "read" the equally mechanical printed circuits of a television receiver.

It is clear that the machine control phase of a computer program is not designed to be read by anyone; it is designed to do electronic work that substitutes for the very much greater human labor that would be required to get the desired mechanical result. In the revealing words of the report, programs "are used in an almost limitless number of ways to release human beings from . . . diverse mundane tasks. . . ." ¹³¹ The Commission report thus recommends affording copyright protection to a labor-saving mechanical device.

IS COPYRIGHT PROTECTION NEEDED?

We may agree with a memorandum of the Commission's Software Subcommittee that computer programs "are the result of intellectual endeavors involving at least as much human creativity as the preparation of telephone books or tables of compound interest"—or, we may add (thinking of the mechanical phases of programs), as the design of high-pressure valves for interplanetary rockets or of special parts for racing cars for the Indianapolis 500. The investment in these endeavors, often dazzling in their

intricacy and power, does indeed warrant legal protection of the resulting devices.

But is copyright a necessary form of protection? According to the evidence placed before the Commission it is not. In all the months of its hearings and inquiries, this Commission has not been given a single explicit case of a computer "rip-off" that was not amenable to correction by laws other than copyright. Interestingly, this exactly parallels the experience of the World Intellectual Property Organization (WIPO) in its search for a model form of protection for computer programs.¹³² Alistair J. Hirst, attending the WIPO discussions as representative of the International Confederation of Societies of Authors and Composers, noted in an article of June 1978:

At no stage in the meetings of the Group was any convincing case ever made out for the proposition that computer software did actually *need* any additional legal protection; the most the representatives of the computer industry could say was that they "would *like* some further form of legal protection." No documented instances of piracy were adduced; and there was no serious suggestion that technological progress in the software field had been inhibited by any shortcomings there might be in the legal protection presently available.¹³³

CONTU has had precisely the same lack of evidence on this score. A book recently published,¹³⁴ describing a large number of computer crimes committed in this country, cites no single piracy or other misappropriation that would have fallen under copyright law. A study of 168 computer crimes by the Stanford Research Institute,¹³⁵ made available to the Commission, also failed to turn up any single such case.

It appears that the existing network of technological, contractual, nondisclosure, trade-secret, common-law misappropriation, and (in a few instances) patent forms of protection, possibly to be joined soon by Sen. Abraham Ribicoff's Computer System Protection Act—to

¹³² Ibid.

¹³³ CISAC document no. C.JL/78/45.266, p. 2.

¹³⁴ WHITESIDE, *COMPUTER CAPERS: TALES OF ELECTRONIC THIEVERY, EMBEZZLEMENT AND FRAUD* (1978).

¹³⁵ PARKER, *COMPUTER ABUSE* (Stanford Research Institute, 1973).

¹³⁰ See this chapter under Computer Programs and under Scope of Copyright in Programs.

¹³¹ See this chapter under Computer Programs.

say nothing of laws on fraud, larceny, breaking and entering, etc.—will be wholly adequate, as they apparently have been up to now, to the needs of developers.¹³⁶

LEGISLATIVE INTENT AND THE CONSTITUTIONAL BARRIER

"It was clearly the intent of Congress," the report says "to include computer programs within the scope of copyrightable subject matter in the Act of 1976."¹³⁷ This intent was by no means clear. It is true that in several places in the legislative reports there are passing references to computer programs which seem to assume their copyrightability under the 1909 Act and, by extension, the 1976 Act. Before these reports, the only authority for considering them potentially copyrightable was the Register of Copyright's letter of May 19, 1964—itsself hedged with doubt whether programs were within the category of "writings of an author" in the constitutional sense. And even these legislative reports contain cautionary language on computer programs, to the effect that they would be copyrightable only "to the extent that they incorporate authorship in the programmer's expression of original ideas, as distinguished from the ideas themselves."¹³⁸ Section 117 of the new copyright law provided for a moratorium precisely awaiting the conclusions of this Commission, and it indicates beyond a doubt that Congress has not reached the point of clear intention at least with respect to the use of copyrighted works.

The legislative history of the new law can give little comfort to any who would suggest that a thoughtful legislative judgment had been made about the propriety of copyright protection for computer programs. Where the Commission report finds the legislative history disconcerting, it simply avers, on its own authority, that the House Report "should be regarded as incorrect and should not be followed."¹³⁹

Even if the legislative intent were unmistakable, there would remain the distinct possibility

of a constitutional barrier to the copyrighting of computer programs. It is an underlying principle of copyright law, expressed in section 102(b) of the 1976 Act, that copyright does not extend to "any idea, procedure, process, system, method of operation . . . regardless of the form in which it is described, explained . . . or embodied in such work." This section of the statute is intended to recognize the distinction between works conveying descriptions of processes and works which are themselves the embodiment of a system or process. In *Baker v. Selden*, the Supreme Court found that, as a matter of constitutional law, the latter are not protected by copyright.¹⁴⁰

That decision has been consistently applied to deny copyright to utilitarian works—not those, like phonorecords, which contain expression made perceptible by the use of a machine, but rather those which exist solely to assist a machine to perform its mechanical function. Professor Nimmer, while criticizing some interpretations of the *Baker v. Selden* decision, recognized that it properly bars copyright protection for a work embodying a method of operation when duplicated of necessity in the course of its use.¹⁴¹ This dissent urges the view (to which Commissioner Nimmer's concurrence, above, seems to lend further weight) that computer programs are exactly the type of work barred from copyright by these considerations.

DISTORTION BY SHOEHORN

We now come to two technical points that arise in the Commission's position on computer programs, matters that we stress here at some length as two examples of the forcible wrenching that is involved in fitting the mature computer program into copyright law—and consequent distortions of traditional copyright usages. It is urged that such distortions, with the formidable power of the computer industry behind them, must in the long run tend to corrupt and erode the essential purposes of copyright.

¹³⁶ 95th Cong., 1st sess., 1977, S. 1766.

¹³⁷ See this chapter under Statutory Copyrightability of Programs.

¹³⁸ House Report, *supra* note 1, p. 54.

¹³⁹ Note 111, *supra*.

¹⁴⁰ 101 U.S. 99 (1879).

¹⁴¹ 1 *Nimmer on Copyright*, § 37.2 (1976).

"Copies"

In its attempts to justify the copyrighting of mechanical devices—the mature phases of computer programs—the Commission's Software Subcommittee was obliged, at successive stages, to resort to certain euphemisms.

The first draft of its report described the usable, mechanical phases of computer programs as *derivative works*—a term traditionally used, with respect to the printed word, for condensations, dramatizations, translations, and so on (each of which has always had to be copyrighted separately from the parental work). When the invalidity of this suggestion became evident, the second draft of the report characterized the programs in their usable machine forms, equally with their written forms, as *literary works*. When the difficulty in maintaining that the mechanical commands on punched cards, magnetic tapes, disks, and printed circuits in chips were identical with programs' preparatory writings had been considered, the third draft of the report brought yet another shift of terms. The mechanical phases of programs were now described as *copies*. On several grounds this euphemism proves as unserviceable as the previous ones. (And so, in this view, will every euphemism that attempts to justify the copyrighting of a machine control element.)

Copies, for the control of which the rights vested in copyright were devised, are defined in the 1976 Act as:

material objects, other than phonorecords, in which a work is fixed by any method now known or later developed, and from which the work can be perceived, reproduced, or otherwise communicated, either directly or with the aid of a machine or device.¹⁴²

This definition has always referred to one form or another of reproduction of an original work, for the purpose of dissemination to and perception by human beings: in plain language, books, monographs, films, prints, and other such replications we all recognize as copies in the true copyright sense. Their uses always involved perception by one human sense or another of the linguistic intentions, the images, or the sounds of the original works. A data base, when keyed or run into a computer, is

being copied in this sense, for the data are maintained in the copy *as* data, and they issue *as* data for human use in the end product. But a program, when keyed or run into a computer, is transformed by a compiler program into a purely machine state. The term *copy* is meaningless for the reason that in this transformation the means of expression of the original work become totally irrelevant. All that matters is the program's functional use.

Furthermore, many programs (in fact, a greater and greater proportion of commercial programs) never are "input" into computers in the conventional sense. They are distributed already transformed into their purely mechanical form as printed circuits on chips in microprocessors. They are, in all but name, hardware. They are no more copies in the copyright sense than are repeatedly stamped-out solid-state circuits of television sets. These programs in microprocessors are built into, or can be clipped into, automobiles, airplanes, telephone and television sets, microwave ovens, games, and an ever-growing number of industrial and home gadgets. How can this vast class of machine-control elements ever be considered *copies* of *literary works*?

We are dealing here with an entirely new technology, one with a highly intricate multiplicity of means of fixation, of transformation, of movement from one medium (of communication) to another (of mechanical function) and back again. The fact that some of these many intricate fixations and changes enable a human-readable version of a program to be stored in a computer parallel to its mechanical variant, or to be reconverted to eye-readable form from its mechanical variant, does not mend at all the basic distortion that arises from this abuse of the term *copies*.

In discussing *copies*, the Commission report admits the central difficulty to which this dissent addresses itself:

[T]he many ways in which programs are now used and the new applications which advancing technology will supply may make drawing the line of demarcation [between the copyrightable form of a program and the uncopyrightable process which it implements] more and more difficult. To attempt to establish such a line in this report written in 1978 would be futile. Most infringements, at least in the immediate future, are likely to involve simple copying. In the event that future technology permits programs to be

¹⁴² 17 U.S.C. § 101.

stated orally for direct input to a computer through auditory sensing devices or permits future infringers to use an author's program without copying, difficult questions will arise.¹⁴³

It is the thesis of this dissent that all such difficulties, present and future, disappear if the euphemism in the word *copies* is recognized for what it is, and if a clear line is drawn forthwith. The line can and should be drawn in 1978. The line should be drawn at the moment of the program's transformation, by whatever present or future technique, to a mechanical capability. This is the moment at which the program ceases to communicate with human beings and is made capable of communicating with machines.

Here is dramatized, in our view, the central flaw—and the subtle dehumanizing danger—of the Commission's position on programs. To call a machine-control element a copy of a literary work flies in the face of common sense. Ask any citizen in the street whether a printed circuit in a microprocessor in the emission control of his or her car is a copy of a literary work, and see what answer you get. But if our government *tells* the citizens in the street that this is so and makes it law, what then happens to the citizen's sense of distinction between works that speak to the minds and senses of men and women and works that run machines—or, ultimately, the citizen's sense of the saving distinction between human beings themselves and machines themselves?

Adaptations

A particularly serious blurring of valid traditional distinctions lies in the report's extension of copyright protection to *adaptations* of programs.¹⁴⁴ There is not merely a question here of unfairness to all other sorts of adaptations, which must be recopyrighted (as in the case, for example, of a telephone directory, which is annually adapted and must be recopyrighted each year). What is shocking, in its transparency, is the reason given by the report for authorizing these adaptations—"to facilitate use."¹⁴⁵

¹⁴³ See this chapter under Scope of Copyright in Programs.

¹⁴⁴ See this chapter under Recommendations for Statutory Change.

¹⁴⁵ *Ibid.*

The transparency lies in the fact that the means of expression of the original program—the only thing in which copyright is reposed—is here again totally irrelevant. The only test the user is required to meet is whether the machine phase of the program, having been adapted, will then *work*. And what will make it work is certainly not its means of expression but its mechanical idea, which remains constant however expressed.

In his testimony before CONTU in Cambridge, Massachusetts, on November 17, 1977, Prof. J.C.R. Licklider of the Massachusetts Institute of Technology raised, as one of his concerns about the idea of copyrighting the mechanical phases of programs, precisely this matter of adaptation.¹⁴⁶ He gave the example in which a protracted program may be taken from "machine language, or FORTRAN, or whatever level . . . to a higher level and back to a lower level," and stressed that all that survives from one version to the other is "the essential underlying idea, not the mode, not the form of expression."

In the present reality of computer usage, particularly in sophisticated operations, a great deal of programming ingenuity goes precisely into various kinds of adaptation, commonly called "program maintenance": new mechanical functions may be added to an existing program; a program may be modified, possibly extensively, to make it workable in a different or more up-to-date computer; or a program may be changed to mesh with other programs in a complex multiprocessor. Under these and many other circumstances, the protection would remain in effect for an underlying idea that was itself being adapted, or perhaps even being transformed into something quite different from the original idea. The mode of expression of the original writing would be long gone. As Licklider pointed out, only the "effect of the action of the program" is of consequence in a series of such changes; programmers, he said, "don't care a thing for the particulars of the expression."¹⁴⁷

The limitations on adaptations suggested in the Commission report will, in the real world

¹⁴⁶ See Transcript, CONTU Meeting No. 18, pp. 130-32.

¹⁴⁷ *Ibid.*, p. 131.

of program maintenance, be unthinkably difficult to police.

By the admission of the word *adaptation*, in this new sense, with no means of test except workability, the Commission has bypassed a fundamental distinction of copyright from other forms of protection and may well have opened the way for covert protection, in the name of copyright, of the underlying mechanical idea or ideas of a program, rather than of its original means of expression.

SOCIAL EFFECTS

Access

The Commission report has based much of its case on its conclusion that copyright would ensure greater public access to innovative programs than would continued reliance on trade-secrecy law.

The evidence the Commission has received casts considerable doubt on this argument. In the first place, the testimony CONTU has heard makes it quite clear that the industry would have no intention of giving up trade-secrecy protection in favor of copyright; to the contrary, every indication is that it would fight hard to assert its undeniable continuing right to the former. It is obvious that the industry, faced with a choice between secrecy and dissemination, as represented in the choice between trade-secrecy laws and copyright, has overwhelmingly opted for the former. From 1964, when the Register first received programs for registration, to January 1, 1977, only 1,205 programs have been registered (and two companies, IBM and Burroughs, accounted for 971 of them). According to International Computer Programs, Inc., which publishes a newsletter on the programming industry, something in the order of 1,000,000 programs are developed each year (taking into account adaptations of existing programs so radical as to make them new programs). There are roughly 300,000 programmers in the United States who spend at least part of their time developing new programs. These figures show how miniscule the industry's interest in copyright has been, and they strongly suggest that such registration as has taken place has been in the nature of bet-hedging, reflecting efforts of major hardware manufacturers to

assert any possible colorable claim to protection, regardless of its real legal merits.

The Commission report recognizes that "the availability of copyright for computer programs does not, of course, affect the availability of trade secrecy protection."¹⁴⁸ It suggests leaving all future "difficult questions" for settlement by the courts on a case-by-case basis.¹⁴⁹

The uncertainty resulting from this situation, as Robert O. Nimtz of Bell Laboratories has pointed out in a response to the Commission's draft report, "would have the unfortunate consequence of driving computer program owners into even deeper secrecy"—by encryption, physical barriers to access, contractual restraints, nondisclosure agreements, and further innovative technical tricks for locking out pirates, thieves, and competitors. "Secrecy will be seen as the only effective protection for their creations."¹⁵⁰ Such being the case, public access to innovative programs would likely be inhibited rather than eased by the addition of the copyright solution to those that already exist and that would continue to exist.

Indeed, it is evident that, with eased requirements for deposit and disclosure, copyright itself would be used as one more device to prevent rather than enable, access to innovative programs—one more device of industrial security. The entitlement of copyright protection to *adaptations* of programs might, under these circumstances, even further inhibit access, insofar as it provided owners with a covert means of protecting the underlying ideas of their program. And the lengthy term of seventy-five years for corporate ownership of copyright would be a negative balance, at the very least, against the presumed "thinness" of the protection.

Economic Costs

All of this, rather than reducing the transaction costs of using and protecting programs, as the Commission argues, would in fact raise the costs: for producers, transacting copyright

¹⁴⁸ See this chapter under Copyright and Other Methods Compared.

¹⁴⁹ See this chapter under Scope of Copyright in Programs.

¹⁵⁰ Nimtz comment, letter to CONTU, August 30, 1977, p. 9.

while spending more and more money looking harder than ever for new and surer forms of secrecy; for users, to whom the added costs of this search and its found devices would be passed along in higher prices; and for the tax-paying public, which would have to bear the costs of the added burdens on the Copyright Office and the courts.

A more likely prospect for the reduction of money costs would lie in the exclusion of usable computer programs from copyright. This would eliminate or diminish the uncertainty as to legal protection available for computer programs. All questions of the constitutionality of such protection would become moot; some of the guesswork which would otherwise have colored all business planning for securing software would be voided.

An additional consideration would be the easing of the administrative burden on the Copyright Office. The office, already monstrously overloaded by administration and regulation of the new law, is presently unsuited for making evaluations of computer programs which might be registered for copyright. Eliminating this responsibility would save a public expenditure and place the costs of commercial protection on those enterprises seeking its benefits.

Concentration of Economic Power

While it has always been the case that corporate entities could be copyright proprietors, the picture CONTU has been given, where rights in computer programs are concerned, is that the proprietor is almost invariably corporate. If there is an individual "author," it will be an author for hire, whose creativity is in strict harness and whose property rights are nonexistent.

The sheer bigness of the corporate enterprise in computers is staggering. According to testimony by Peter McCloskey, president of Computer and Business Equipment Manufacturers' Association (CBEMA), the combined revenues of the forty-two members of that association of manufacturers of computers and related business equipment rose in 1976 to \$32.7 billion; as to software, we heard at one point an estimate of \$17 billion of production in the next

three years.¹⁵¹ The art is growing and changing with blinding speed. In his testimony, Ralph Gomery of IBM suggested, with perhaps a pinch of hyperbole, that if the automobile industry had progressed on the same curve as computers in the last fifteen years, we would now have been able to buy for twenty dollars a self-steering car that would attain speeds up to four hundred miles per hour and be able to drive the length of California on one gallon of gasoline.

In a study funded by this Commission, Harbridge House concluded that the availability of copyright protection for computer software is "of monumental insignificance to the industry."¹⁵² It is important for us to bear in mind that the universe of this study consisted almost entirely of smallish, independent corporate producers. The two trade associations that were most active in pressing their views on this Commission, CBEMA and the Information Industry Association, represent primarily major industrial corporations. The Association of Data Processing Service Organizations, which more than any other trade association represents independent computer program producers, was conspicuously absent from Commission appearances and limited its participation to a written response in support of the Software Subcommittee's recommendations. Such perfunctory participation certainly tends to support the Harbridge House view as to the interest of the independents.

On this point, the WIPO experience strikingly parallels that of CONTU. Alastair J. Hirst writes that a one-sided approach in the WIPO search

was more or less inevitable, given the composition of the Group. It is important to distinguish between the names shown on the list of participating organizations, and the individuals who were most active in directing and moulding the discussion as it proceeded. Of the latter, the most frequent and the best informed grouping was that composed of patent agents and lawyers in the employ of the large computer companies such as ICL and IBM. Even amongst those representing the computer industry, there was a singular lack of representation from the smaller independent software houses, who were intended

¹⁵¹ Transcript, CONTU Meeting No. 6, p. 11.

¹⁵² LEGAL PROTECTION OF COMPUTER SOFTWARE: AN INDUSTRIAL SURVEY, iii (Harbridge House, 1977).

to be the chief beneficiaries of the new software right: those who had the most influence on the discussions were in fact the representatives of the large companies who are in many ways the economic adversaries of these intended beneficiaries.¹⁵³

Congress is urged to take careful note of this difference. Why do the large industrial corporations press for copyright, while it seems to be a matter of much less concern to the small independents? Is it not evident, from the testimony CONTU received, that the big companies want, by availing themselves of every possible form of protection, to lock their software into their own hardware, while the independents want to be able to sell their programs for use in all the major lines of hardware?

Thus, a warning appears to be in order that the copyrighting of the machine phases of programs would be likely to strengthen the position of the large firms, to reinforce the oligopoly of these dominant companies, and to inhibit competition from and among small independents.

The country has lately seen an alarming trend toward the concentration of economic power in all the communications industries. One company dominates telephonic communication. One company (IBM) dominates the computer hardware field, while three others (Burroughs, Honeywell, and Sperry-Univac) join with IBM to manufacture over 85 percent of large-scale computers. One company (Xerox) dominates photocopying, and, again, three other companies (IBM, Kodak, and 3M) outstrip all others. Three networks dominate television. There are now but six major film distributors. Paperback publishing has become the backbone of the book industry, and there are now but seven leading paperback lines. Industrial conglomerates are buying up these communications leaders horizontally: e.g., Gulf and Western owns both Paramount Pictures and Simon and Schuster, which in turn owns Pocket Books.

If there are social benefits to our nation, as we have always believed, in pluralism, in diversity, in lively competition in the marketplace, and in the rights of the individual to maximum freedom of choice within the limits of the social contract and, above all, to maximum freedom of

speech, then this increasing concentration of corporate power in that most sensitive area in a democracy—the area of communication from one human being to another, from leaders to citizens and vice versa—should surely be a matter of greatest concern.

COMMUNICATION—HUMAN AND MECHANICAL

The aim of all writing, be it for art or use, is communication. Up to this time, as we have seen, copyright has always protected the means of expression of various forms of "writing" which were perceived, in every case, by the human sense for which they were intended: written words by the human eye, music by the ear, paintings by the eye, and so on. Here, for the first time, the protection of copyright would be offered to a "communication" with a machine.

This pollution of copyrighted "writings" with units of mechanical work would affect not only creators but also the general public. Placed beside such traditional end products as books, plays, motion pictures, television shows, dance, and music, under the aegis of copyright, what end products of computer programs would we find?

The overwhelming majority of program applications are mechanical and industrial: the monitoring of an assembly line in a factory; the microprocessors in an automobile; the aiming device of a weapons system; the coordination of approach patterns at an airport. An entire branch of the program industry is devoted to systems software—new techniques for more efficient uses of machines, for more efficient industrial processing.

Progress is progress, and we can guess that we must have all these products of human ingenuity to keep one jump ahead of entropy. It may reasonably be argued, as the Commission report does, that they reduce the load of human labor. But a definite danger to the quality of life must come with a blurring and merging of human and mechanical communication.

As one step in its education, this Commission has had the benefit of a book written by one of our witnesses, Prof. Joseph Weizenbaum of the Massachusetts Institute of Technology, entitled *Computer Power and Human Reason*—a work which is both intricately technical and profoundly humanistic. Something that Professor

¹⁵³ *Supra*, note 133.

Weizenbaum keeps emphasizing over and over again is the extent to which computer scientists, especially those who have worked on so-called artificial intelligence—"and large segments of the general public as well"—have come to accept the propositions "that men and computers are merely two different species or a more abstract genus called 'information processing systems,' " that reason is nothing more than logic, and "that life is what is computable and only that."¹⁵⁴

A society that accepts in any degree such equivalences of human beings and machines must become impoverished in the long run in those aspects of the human spirit which can never be fully quantified and which machines may be able in some distant future to linguistically "understand" but will never be able to experience, never be able to bring to life, never be able therefore to communicate. Those aspects include courage, love, integrity, trust, the touch of flesh, the fire of intuition, the yearning and aspirations of what poets so vaguely but so persistently call the soul—that bundle of qualities we think of as being embraced by the word humanity. This concern is by no means irrelevant to the issue of whether computer programs should be copyrighted. It is the heart of the matter.

RECOMMENDATION

The logical conclusion of this dissent, then, is a recommendation to Congress that:

The Act of 1976 should be amended to make it explicit that copyright protection does not extend to a computer program in the form in which it is capable of being used to control computer operations.

Congress could obtain any technical advice necessary to assist it in reaching an appropriate definition of the cutoff point, the point at which a program ceases being a copyrightable writing and becomes an uncopyrightable mechanical device.

In our discussions, several possibilities have presented themselves: (1) the moment of transformation from "source" to "object" program; (2) the moment of input into a computer or microprocessor; or (3) at the point where a

program goes from "natural language," which any expert reader may at once grasp, to higher-level, formal computer language—this last deriving from Professor Weizenbaum, who writes: "A higher-level formal language is an abstract machine."¹⁵⁵ With rapidly advancing technology, natural language does in some programs already reach to the very moment of entry into the computer. In every case, however, Professor Weizenbaum makes clear, a transformation to a machine state takes place, with a result that when the program is run, communication as we understand it ceases, and what he calls "behavior"—an opening and closing of electronic gates—sets in. Where his book is most eloquent, for our purposes, is in its powerful warning of our loss of humanity if we come to believe, as many already do, that anything like human communication is still taking place, or ever can take place, after this mechanical stage has set in.

Congress should weigh most carefully the heavy responsibility of breaking with tradition and enabling, by law of the land, for the first time ever, copyright protection for communication, not with our fellow human beings, but with machines—thus equating machines with human beings as the intended recipients of the distribution that copyright was designed to foster.

Surely it is especially vital, in a time of hurtling and insatiable technology, that the nation's laws reflect, whenever possible, a distinction between the realm and responsibility of human beings and the realm and responsibility attributed to machines.

Dissent of Commissioner Karparkin

Throughout the Commission's deliberations on computer software, Commissioner Hersey has advocated the point of view expressed in his dissent. While a majority of the Commission has not been persuaded, Commissioner Nimmer shares a number of Mr. Hersey's doubts and concerns, and the late Commissioner Dix, who passed away before the Commission's final report, indicated that he shared them as well.

¹⁵⁴ WEIZENBAUM, COMPUTER POWER AND HUMAN REASON 158, 240.

¹⁵⁵ *Ibid.*, p. 103.

The Commission has respectfully considered and discussed Commissioner Hersey's views. In the course of the many discussions, I have been persuaded that Commissioner Hersey has raised important issues and that they merit serious consideration. Whether that consideration tilts in the direction of a dissent or concurrence is less important than the fact that the issues raised are serious.

Without agreeing with the entire text of Commissioner Hersey's dissent I share his doubts and concerns sufficiently to lead me to add my dissent to his.

Computer Data Bases

The automated data base represents a new technological form of a type of work long recognized as eligible for copyright. Dictionaries, encyclopedias, and tables of numeric information are all forms of data bases which long antedate the computer, and for which copyright protection has been and will continue to be available under the copyright law. Under the new law, a data base is a compilation and thus a proper subject for copyright.¹⁵⁶ This entitlement to copyright is not diminished by the fixation of the data base in a medium requiring the intervention of a computer to communicate its information content.¹⁵⁷ Accordingly, a data base, whether printed in traditional hard copy or fixed in an electromagnetic medium, is protected by copyright under the terms of the new law.¹⁵⁸

¹⁵⁶ 17 U.S.C. § 101 defines *compilation* as: "[a] work formed by the collection and assembling of preexisting materials or of data that are selected, coordinated, or arranged in such a way that the resulting work as a whole constitutes an original work of authorship. The term 'compilation' includes collective works."

¹⁵⁷ 17 U.S.C. § 102(a) provides that: "Copyright protection subsists, in accordance with this title, 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 the aid of a machine or device*" (emphasis added).

¹⁵⁸ The following language makes clear the congressional intent to include computer-readable data bases within copyright by explaining that: "The term 'literary works' does not connote any criterion of literary merit or qualitative value: it includes catalogs, directories, and similar factual references, or instruc-

Computer-readable data bases do differ, of course, from their hard-copy counterparts. Some of these differences raise copyright issues and related policy considerations.¹⁵⁹ Copyright applied to data bases should encourage the development and dissemination of useful stores of information to make this information readily available to the public. In addition, data base proprietors should be encouraged to publish and register their copyrighted works, thereby creating a public record of the existence of the works and, in turn, make possible public awareness and utilization of their works.¹⁶⁰

Repeal of Section 117 of the Copyright Act of 1976 Recommended

The new Copyright Act, in the absence of the limited moratorium imposed by section 117, deals effectively with questions related to copyright protection for automated data bases. For example, under the provisions of section 106, the copying or input of a data base or any other work of authorship embodied in a computer-readable medium is an exclusive right of the copyright owner. Other questions as to the scope of protection to be afforded such works by copyright can and should be repealed upon completion of the Commission's work as was apparently the legislative intent.¹⁶¹

Adoption of Appropriate Registration and Deposit Regulations Recommended

Regulations for registration and deposit of data bases and other works first fixed in computer-readable media should permit and encourage registration and periodic updating of identifying material rather than actual data bases.

tional works and compilations of data. It also includes computer data bases . . ." (House Report, *supra* note 1, p. 54).

¹⁵⁹ Maximization of public access to information contained in automated data bases is cited as a significant goal of a national information policy in the REPORT TO THE PRESIDENT OF THE UNITED STATES ON NATIONAL INFORMATION POLICY 70 (1976), prepared by the Domestic Council Committee on the Right of Privacy, under the chairmanship of then Vice-President Nelson Rockefeller.

¹⁶⁰ Registration and deposit regulations have been adopted by the Copyright Office. See 37 C.F.R. § 202 in Appendix J.

¹⁶¹ House Report, *supra* note 1, p. 116.

There appears no reason to tailor any notice requirements specifically to computer-readable works; general principles contained in the new law seem adequate without being particularly burdensome. Notice appearing on the initial display of any extract or extracts obtained from the data base pursuant to a search should comply with the intent of the statutory notice requirement. A copyright notice may easily be included on the initial display extracted from a data base, and a human-readable notice may also appear on the packaging.

Case for Copyright Protection for Data Bases

The following discussion explains the Commission's agreement with the legislative intent of the new copyright law to grant copyright protection to computer data bases equivalent to the protection accorded compilations in traditional hard-copy format. The problem areas identified and discussed are: (1) What copyright consequences attach to the "input" into a computer of a copyrighted work (perhaps better described as the fixation of a work in a medium capable of use within a computer system)? (2) What rights does the proprietor of copyright in a data base have with regard to the use of extracts provided in response to authorized searches or inquiries made of the data base? and (3) What constitutes publication of a data base, and what legal consequences attach to publication?¹⁶²

THE INPUT ISSUE

The issue whether copyright liability should attach at the input or output stage of use in conjunction with a computer—i.e., at the time a work is placed in machine-readable form in a computer memory unit or when access is sought to the work existing in computer memory—has been the primary source of disagreement regarding copyright protection for works in computer-readable form. This issue provided the major impetus for the introduction of section 117 into

the copyright revision bill.¹⁶³ It appears, nevertheless, that the provisions of the new copyright law offer appropriate and sufficient guidance to determine what acts create copyright liability in this area. The protection afforded by section 106 of the new law seemingly would prohibit the unauthorized storage of a work within a computer memory, which would be merely one form of reproduction, one of the exclusive rights granted by copyright.¹⁶⁴

Considering the act of storing a computerized data base in the memory of a computer as an exclusive right of the copyright proprietor appears consistent both with accepted copyright principles and with considerations of fair treatment for potentially affected parties. Making a copy of an entire work would normally, subject to some possible exception for fair use, be considered exclusively within the domain of the copyright proprietor. One would have to assume, however, that fair use would apply rarely to the reproduction in their entirety of such compendious works as data bases.¹⁶⁵ If a copy of the work is to be stored in a computer and sub-

¹⁶³ 17 U.S.C. § 117 provides as follows: "Notwithstanding the provisions of sections 106 through 116 and 118, this title does not afford to the owner of copyright in a work any greater or lesser rights with respect to the use of the work in conjunction with automatic systems capable of storing, processing, retrieving, or transferring information, or in conjunction with any similar device, machine, or process, than those afforded to works under the law, whether title 17 or the common law or statutes of a State, in effect on December 31, 1977, as held applicable and construed by a court in an action brought under this title."

This section was first introduced in the copyright revision bill in 1969 (see 91st Cong., 1st sess., December 10, 1969, S. 543 [Committee Print]), at which time the impact of the computer, and particularly the "input-output" question, was causing great concern on the part of copyright proprietors. Section 117 was agreed upon by interested parties as a means of permitting passage of the revision bill without committing Congress to a position on the computer-related issue until more study could be undertaken.

¹⁶⁴ It may be that the use of the term *input* to describe the act to which copyright liability attaches has been misleading. A more accurate description of the process by which a work may be stored in a computer memory would indicate that a reproduction is created within the computer memory to make the work accessible by means of the computer.

¹⁶⁵ See 17 U.S.C. § 107 for statutory criteria governing fair use.

¹⁶² It should be clear that the same principles which apply to data bases apply also to any copyrightable works embodied in a format for reproduction and use within a computer. See this chapter under Publication.

sequently made accessible to others, its creation would have to be properly authorized by the copyright proprietor. That only one copy is being made, or even that the owner of the computer system intends to exact no fee for providing access to the work, would no more insulate the copies from liability for copyright infringement than would similar circumstances insulate a public library which made unauthorized duplications of entire copyrighted works for its basic lending functions.¹⁶⁶

Under normal circumstances, the transfer by sale or lease of a copyrighted work in computer-readable form, such as a data base, would be a meaningless transaction unless implicit in the transfer was the authorization to place or reproduce a copy in the memory unit of the transferee's computer. Any limitations on the use to be made of the copy would be a matter to be negotiated between private parties, guided by applicable public policy considerations.¹⁶⁷ The proprietor of a work in computer-readable form would, under any foreseeable circumstances, be able to control by contract the future disposition of machine-readable copies of his proprietary work. The proprietor of copyright in such a work would always have a valid cause of action, arising either under copyright or contract, if a reproduction of the work were entered into a computer without the proprietor's authorization, or if a transferee authorized a third party to enter a copy into the memory unit of a computer in violation of the terms of a valid agreement with the proprietor. That copyright would not

provide the sole right and remedy for unauthorized use of a protected work neither is unique to the protection of proprietary interests in computer-readable works nor is it a situation to be considered undesirable.¹⁶⁸

Accordingly, the Commission believes that the application of principles already embodied in the language of the new copyright law achieves the desired substantive legal protection for copyrighted works which exist in machine-readable form. The introduction of a work into a computer memory would, consistent with the new law, be a reproduction of the work, one of the exclusive rights of the copyright proprietor. The unauthorized transfer of an existing machine-readable embodiment of a work could subject the violators to remedies for breach of contract. Principles of fair use would be applicable in limited instances to excuse an unauthorized input of a work into computer memory. Exemplifying such fair uses could be the creation of a copy in a computer memory to prepare a concordance of a work or to perform a syntactical analysis of a work, which but for the use of a computer would require a prohibitive amount of human time and effort. To satisfy the criteria of fair use, any copies created for such research purposes should be destroyed upon completion of the research project for which they were created. Should the individual or institution carrying on this research desire to retain the copy for archival purposes or future use, it should be required to obtain permission to do so from the copyright proprietor.

¹⁶⁶ The example of a copyrighted work placed in a computer memory solely to facilitate an individual's scholarly research has been cited as a possible fair use. The Commission agrees that such a use, restricted to individual research, should be considered fair. To prevent abuse of fair use principles, any copy created in a machine memory should be erased after completion of the particular research project for which it was made.

¹⁶⁷ Outright sale by a copyright proprietor of a copy of a protected work, rather than a lease under which the proprietor retains ownership of a copy which the lessee may use in accord with negotiated terms and conditions, normally results in a complete loss of control over the copy which has been sold. This reflects the unwillingness of courts to enforce restrictions on the alienation of property once a complete transfer of ownership interest in any item of property has been accomplished.

¹⁶⁸ Remedies for breach of contract, if the right being protected is not equivalent to copyright, would not be preempted under the provisions of section 301 of the new law, and would accordingly be available to one who, on the strength of a copyright interest, granted permission to another to make certain uses of the copyrighted work only to have the terms of the authorization violated. There continues to be some scope for state enforcement of proprietary rights in intellectual property under the new copyright law. See House Report, *supra* note 1, pp. 130-33. That state law rather than federal would be involved presents few real problems. The existence of parallel but not equal rights under state and federal law reflects advantages as well as disadvantages inherent in a federal polity, and generally both claims could be joined in the same federal cause of action under principles of pendent jurisdiction.

SCOPE OF COPYRIGHT IN A DATA BASE

A computer-readable data base derives its value in large part from the ease with which a user may retrieve from it data conforming to certain specifications. That ease is the product of several factors: the organization of the data, the sophistication of the program which assists in the searching and retrieving, and the skill of the searcher in articulating the search criteria. The difference between a data base in hard copy and one in computer-readable form is that the use of the former is passive and the latter may be used interactively, in the language of the industry.¹⁶⁹ Thus, a student who searches the *Reader's Guide to Periodical Literature* (a copyrighted data base) must not only know what is sought but also painstakingly read much unsought material in numerous volumes and updates to obtain the desired information. If, however, an interactive bibliographic data base is used, only the topic(s) of interest need be expressed to receive citations to apparently pertinent literature and, frequently, abstracts of that literature to allow further evaluation of its utility. One important question for the Commission's purposes concerns what rights the proprietor of a computer-readable data base has in the information obtained pursuant to a user's request to or search of such a data base.

There is little doubt that one who obtained access to a copyrighted data base by normal commercial methods—paying the proprietor or the proprietor's authorized agent for the right to search the data base and retrieve from it information or data responsive to the search request—would infringe an existing copyright by retrieving the entire data base and marketing an exact duplicate in competition with the copyright proprietor. Such activity beyond question would be unauthorized copying in violation of a valid copyright. Purchasing access to information contained in a data base no more entitles one to make and employ copies for commercial purposes than would purchasing a copy of a copyrighted directory entitle one to produce and disseminate copies of the directory.

¹⁶⁹ An interactive data base is one with which a user, aided by a computer, can converse, i.e., the user frames questions to which the data base, controlled by a computer, provides responses.

Two complications arise in attempting to define the scope of protection in a computerized data base. First, such works are not static; rather, they are constantly being updated by the addition of current data and the deletion of data determined obsolete. Second, the question as to what rights a copyright proprietor has in extracts of information retrieved pursuant to an authorized search of the data base must be addressed. Provisions applicable to both issues are found in the text and legislative reports of the new law.

The dynamic process by which a data base changes need not affect the entitlement of the data base to copyright protection. This process raises two concerns: (1) that deposit of a new embodiment of the data base to reflect every modification of the data contained in it would be both extremely expensive for the proprietor and cumbersome for the Library of Congress; and (2) that a proprietor, by virtue of the constant updating of the data base, could claim copyright in the work in perpetuity, in disregard of the "limited times" provision of the Constitution and the statutory term of seventy-five years applicable to data bases under the new statute. Neither of these concerns need cause serious problems.

The deposit requirement should prove no bar to providing effective copyright protection for dynamic data bases. Deposit is not a precondition to copyright under the new law. Sections 407(c) and 408(c) of the new copyright law authorize the Register of Copyrights to exempt categories of material from the deposit requirements by regulation or to require alternative forms of deposit. Computer data bases seem well suited for this exemption, for the deposit of an identifying form would achieve the statutory purpose of "providing a satisfactory archival record of a work without imposing practical or financial hardships on the depositor. . . ." ¹⁷⁰ Nor would a dynamic data base necessarily obtain protection for a longer period than constitutionally or legislatively authorized, any more than would a telephone directory be given perpetual protection by virtue of its being updated annually. The proprietor of a data base would have to register for copyright each update of the work, just as the proprietor of a telephone di-

¹⁷⁰ 17 U.S.C. § 407(c).

rectory obtains copyright in new editions of a work.

Similar also to a telephone directory, copyright in a dynamic data base protects no individual datum, but only the systematized form in which the data are presented. The use of one item retrieved from such a work—be it an address, a chemical formula, or a citation to an article—would not under reasonable circumstances merit the attention of the copyright proprietor. Nor would it conceivably constitute infringement of copyright. The retrieval and reduplication of any substantial portion of a data base, whether or not the individual data are in the public domain, would likely constitute a duplication of the copyrighted element of a data base and would be an infringement. In any event, the issue of how much is enough to constitute a copyright violation would likely entail analysis on a case-by-case basis with considerations of fair use bearing on whether the unauthorized copying of a limited portion of a data base would be held noninfringing. Fair use should have very limited force when an unauthorized copy of a data base is made for primarily commercial use. Only if information of a substantial amount were extracted and duplicated for redistribution would serious problems exist, raising concerns about the enforcement of proprietary rights.

It appears that adequate legal protection for proprietary rights in extracts from data bases exists under traditional copyright principles as expressed in the new law, supplemented by still-available relief under common-law principles of unfair competition. The unauthorized taking of substantial segments of a copyrighted data base should be considered infringing, consistent with the case law developed from infringement of copyright in various forms of directories.¹⁷¹ In addition, common-law principles of misappropriation which, according to the legislative reports accompanying the new law, are not preempted with regard to computer data bases are

available to enforce proprietary rights in these works.¹⁷²

PUBLICATION

In section 101 of the new law, publication is defined as:

the distribution of copies or phonorecords of a work to the public by sale or other transfer of ownership, or by rental, lease, or lending. The offering to distribute copies or phonorecords to a group of persons for purposes of further distribution, public performance, or public display, constitutes publication. A public performance or display of a work does not of itself constitute publication.

According to sections 401 and 407 of the new law, after publication the copyright owner is required to place copyright notice upon all publicly distributed copies of a work and to deposit two copies of the work for the Library of Congress. If a proprietor wishes also to register the work in accordance with section 408, the deposit required by section 407 must be accompanied by the prescribed registration application and fee. Although the failure to deposit copies will not result in forfeiture of copyright, the failure to place notice on published copies may.¹⁷³ Accordingly, it is of considerable importance to know what acts constitute publication of any copyrighted work. Computerized data bases are no exception.

The definition cited above, and further discussed in the legislative reports accompanying

¹⁷² House Report, *supra* note 1, p. 132, discussing the preemption provisions of section 301.

¹⁷³ Under the new law, the most significant effect of the act of publication is the requirement that copyright notice be affixed to all copies of the work distributed thereafter. Omission of notice may result, in accord with the provisions contained in section 405, in the forfeiture of copyright. Section 405 of the Act of 1976 provides that omission of notice will not invalidate copyright if notice is omitted from a relatively small number of publicly distributed copies, if the work is registered within five years of publication and reasonable efforts are made to add notice to publicly distributed copies, or if omission of notice violates terms set by the proprietor for authorizing public distribution of copies of the work. Section 406 deals with errors in contents of the notice with like flexibility. The failure to include notice may, at least temporarily, deny the proprietor his full rights in a copyrighted work, i.e., to prevent and collect damages for unauthorized copying.

¹⁷¹ See *Leon v. Pacific Tel. & Tel. Co.*, 91 F.2d 484 (9th Cir. 1937); *Jeweler's Circular Pub. Co. v. Keystone Pub. Co.*, 281 F. 83 (2d Cir. 1922), *cert. denied*, 279 U.S. 581 (1922), *aff'g* 274 F. 932 (S.D.N.Y. 1921); *New York Times Co. v. Roxbury Data Interface, Inc.*, 434 F.Supp. 217, 194 U.S.P.Q. 371 (D.N.J. 1977).

the new law, provides a reasonably clear benchmark for determining when a data base used in conjunction with an automated storage and retrieval system—a computer—is published for the purposes of the copyright law. The House Committee report thoroughly discusses the concept of publication in the context of considering the duration of copyright under the new law:

Under the definition in section 101, a work is "published" if one or more copies or phonorecords embodying it are distributed to the public—that is, generally to persons under no explicit or implicit restrictions with respect to disclosure of its contents—without regard to the manner in which the copies or phonorecords changed hands. The definition . . . makes plain that any form of dissemination in which a material object does not change hands—performance or displays on television, for example—is not a publication no matter how many people are exposed to the work. On the other hand, the definition also makes clear that, when copies or phonorecords are offered to a group of wholesalers, broadcasters, motion picture theaters, etc., publication takes place if the purpose is "further distribution, public performance, or public display."¹⁷⁴

Accordingly, a data base proprietor, by display alone, could make the data base available to users, without having published the data base. The same would be true where the proprietor leased a tape containing the data base directly to a user and placed that user under explicit restrictions prohibiting disclosure or transfer. Under these circumstances, the failure to place copyright notice on the data base or to register with the Copyright Office would jeopardize no rights the proprietor might have. If, however, the proprietor authorized transferees to distribute copies or make available displays of the data base, publication would be accomplished and the notice and registration requirements of the law would take effect. Many data bases are marketed in exactly this way, with the proprietor authorizing the broker to distribute or display extracts from the data base.

Certain consequences flow from the publication of any work. Publication of a work activates the requirement of deposit under section 407, and a proprietor might choose not to publish

and, thereby, avoid the need to affix notice to all copies and deposit two copies for the Library of Congress. The doctrine of fair use may be applied more narrowly to unpublished than to published works. The Senate report accompanying the new law indicates that "[t]he applicability of the fair use doctrine to unpublished works is narrowly limited since, although the work is unavailable, this is the result of a deliberate choice on the part of the copyright owner."¹⁷⁵ Accordingly, the proprietor of a work may have somewhat greater rights in unpublished as opposed to published works.

Certain remedies for infringements may be made available to one who publishes and registers a work which would be denied to the proprietor of an unpublished, unregistered work under the provisions of section 412 of the Act of 1976. One who successfully prosecutes a copyright infringement action may be entitled, under section 504 of the new law, to an award of statutory damages in spite of an inability to prove actual damages. The proprietor may also be entitled to an award of attorney's fees under the provisions of section 505. Section 412 provides that the proprietor of copyright in a work neither published nor registered at the time of the infringement is not entitled to these remedies; the proprietor of a published work, however, may register the work within three months after publication without forfeiting these remedies for infringing acts occurring after publication. While the key factor in determining the availability of these remedies is registration, there exists the three-month grace period after publication for registering copyright, during which period the lack of registration will not preclude availability of statutory damages and attorney's fees for infringements then occurring. No such grace period exists for registering works which are unpublished. Consistent with this thrust of the new law, proprietors of data bases are encouraged to publish and register their works and create a public record of the information available through their proprietary works.

New Works

The Commission was specifically assigned the

¹⁷⁴ House Report, *supra* note 1, p. 138; Senate Report, *supra* note 1, p. 121.

¹⁷⁵ Senate Report, *supra* note 1, p. 64.

responsibility to study and compile data on the creation of new works by the application or intervention of computers, to recommend any changes in copyright law or procedure necessary to preserve public access to such works, and to recognize the rights of copyright owners.¹⁷⁶ This matter appears to have been included within the Commission's mandate because of questions raised in the mid-sixties during early debates and hearings leading to the new law. For instance, in the 1965 report of the Register of Copyrights it was stated:

The crucial question appears to be whether the "work" is basically one of human authorship, with the computer merely being an assisting instrument, or whether the traditional element of authorship in the work (literary, artistic or musical expression or elements of selection, arrangements, etc.) were actually conceived and executed not by man but by a machine.¹⁷⁷

This discussion may have stemmed from a concern that computers either had or were likely to soon achieve powers that would enable them independently to create works that, although similar to other copyrightable works, would not or should not be copyrightable because they had no human author. The development of this capacity for "artificial intelligence" has not yet come to pass, and, indeed, it has been suggested to this Commission that such a development is too speculative to consider at this time.¹⁷⁸ On the basis of its investigations and society's experience with the computer, the Commission believes that there is no reasonable basis for considering that a computer in any way contributes authorship to a work produced through its use. The computer, like a camera or a typewriter, is an inert instrument, capable of functioning only when activated either directly or indirectly by a human. When so activated it is capable of doing only what it is directed to do in the way it is directed to perform.

Computers may be employed in a variety of ways in creating works that may be protected by copyright. Works of graphic art may consist of designs, lines, intensities of color, and the

like selected and organized with the assistance of a computer.¹⁷⁹ A computer may be used to assist an artist in filling in numerous frames in an animation sequence, thus reducing the amount of time and effort otherwise needed to prepare an animated work.¹⁸⁰

In the case of computer music, a program may be designed to select a series of notes and arrange them into a musical composition, employing various tonal qualities and rhythmic patterns. The computer may also be used to simulate musical instruments and perform the music so composed.¹⁸¹

In other instances, a computer may be used to manipulate statistical information to produce an analysis of that information. The resulting work may bear little similarity to the original form or arrangement of the work being analyzed, as in the case of an economic forecast produced by the manipulation of raw economic data. A computer may, on the other hand, be employed to extract and reproduce portions of a work.¹⁸² In every case, the work produced will result from the contents of the data base, the instructions indirectly provided in the program, and the direct discretionary intervention of a human involved in the process.

To be entitled to copyright, a work must be an original work of authorship. It must be a writing within the meaning of that term as used

¹⁷⁹ Computer graphics and other pictorial art forms have also drawn much attention. See FRANKE, COMPUTER GRAPHICS—COMPUTER ART (1971); Davis, *The Artist and the Computer*, 78 NEWSWEEK (September 13, 1971). Recently appearing in the *New York Times* was an article describing the possible future impact of computer and related technology on the creation and dissemination of works, such as musical compositions, dance, and the dramatic arts, that are potentially protectible by copyright. Greene, *The Coming Impact of Technology on the Arts—Computer Violins and the Electronic Palette*, NEW YORK TIMES (February 26, 1978).

¹⁸⁰ For examples of such applications, see Transcript, CONTU Meeting No. 18, pp. 2-10.

¹⁸¹ See the following works on computer music: HOWE, ELECTRONIC MUSIC SYNTHESIS (1975); MATHEWS, THE TECHNOLOGY OF COMPUTER MUSIC (1969); HILLER and ISAACSON, EXPERIMENTAL MUSIC (1959). See also Keziah, *Copyright Registration for Aleatory and Indeterminate Musical Compositions*, 17 BULL. COP. SOC. 311 (1970).

¹⁸² For a discussion of the copyright status of directories produced by computer use, see Oberman, *Copyright Protection for Computer Produced Directories*, 22 ASCAP COPYRIGHT L. SYMP. 1 (1977).

¹⁷⁶ P.L. 93-573 (1974).

¹⁷⁷ COPYRIGHT OFFICE, SIXTY-EIGHTH ANNUAL REPORT OF THE REGISTER OF COPYRIGHTS 5 (1965).

¹⁷⁸ Letter to the Commission, February 1978, from John McCarthy, director of Stanford University Artificial Intelligence Laboratory.

in the Copyright Clause of the Constitution.¹⁸³ The Supreme Court has interpreted this requirement to include "any physical rendering of the fruits of creative intellectual or aesthetic labor."¹⁸⁴ The history of the development of the concept of originality shows that only a modicum of effort is required. In *Alfred Bell & Co. Ltd. v. Catalda Fine Arts, Inc.*, a federal court of appeals, speaking through Judge Frank, observed:

All that is needed to satisfy both the Constitution and the statute is that the "author" contributed something more than a "merely trivial" variation, something recognizably "his own." . . . No matter how poor artistically the "author's" addition, it is enough if it be his own.¹⁸⁵

Thus, it may be seen that although the quantum of originality needed to support a claim of authorship in a work is small, it must nevertheless be present.¹⁸⁶ If a work created through application of computer technology meets this minimal test of originality, it is copyrightable. The eligibility of any work for protection by copyright depends not upon the device or devices used in its creation, but rather upon the presence of at least minimal human creative effort at the time the work is produced.

Computers are enormously complex and powerful instruments which vastly extend human powers to calculate, select, rearrange, display, design, and do other things involved in the creation of works. However, it is a human power they extend. The computer may be analogized to or equated with, for example, a camera, and the computer affects the copyright status of a resultant work no more than the employment of a still or motion-picture camera, a tape recorder, or a typewriter. Hence, it seems clear that the copyright problems with respect to the authorship of new works produced with the assistance of a computer are not unlike those posed by the creation of more traditional works.

¹⁸³ U.S. Const., Article I, § 8, cl. 8.

¹⁸⁴ *Goldstein v. California*, 412 U.S. 546, 561 (1973).

¹⁸⁵ 191 F.2d 99, 102-3 (2d Cir. 1951); but cf. *Batlin v. Snyder*, 536 F.2d 486 (2d Cir. 1976).

¹⁸⁶ For example, arranging the layout of an answer sheet within the rigid confines imposed by its use in an optical reading device for computer input has been held to constitute sufficient originality. *Harcourt Brace & World, Inc. v. Graphic Controls Corp.*, 329 F.Supp. 517 (S.D.N.Y. 1971).

Needless to say, computers, like typewriters and other instruments, may be used to produce writings that lack the degree of originality held necessary to copyright. The statement " $2 + 2 = 4$ " is, of course, not copyrightable, whether generated by a computer or written with a pencil. But the criteria that determine if a work is sufficiently original to qualify for copyright are already well established, and the intervention of the computer should not affect them.

Finally, we confront the question of who is the author of a work produced through the use of a computer. The obvious answer is that the author is one who employs the computer. The simplicity of this response may obscure some problems, though essentially they are the same sort of problems encountered in connection with works produced in other ways.

One such problem is that often a number of persons have a hand in the use of a computer to prepare, for example, a complex statistical table. They may have varying degrees and kinds of responsibility for the creation of the work. However, they are typically employees of a common employer, engaged in creating a work-for-hire, and the employer is the author. When the authors work together as a voluntary team and not as employees of a common employer, the copyright law with respect to works of joint authorship is as applicable here as to works created in more conventional ways, and the team itself may define by agreement the relative rights of the individuals involved.

To be used in the creation of a work, a computer must be controlled by a program and must ordinarily utilize data input from other sources. Both the program and the data may be copyrighted works or parts of copyrighted works. The question has been raised whether authorship or proprietorship of the program or data base establishes or may establish a claim of authorship of the final work. It appears to the Commission that authorship of the program or of the input data is entirely separate from authorship of the final work, just as authorship of a translation of a book is distinct from authorship of the original work. It is, of course, incumbent on the creator of the final work to obtain appropriate permission from any other person who is the proprietor of a program or data base used in the creation of the ultimate

work. The unlawful use of a program or data base might limit or negate the author's claim of copyright in the ultimate work, just as the failure of a translator to obtain a license from the proprietor of the translated work might prevent securing copyright in and making use of the translation.¹⁸⁷ But this is not a question of authorship itself, and the author of the original work does not become the author of a translation merely because it is made from the original book without permission. Here, too, the situation with respect to works produced by the use of a computer does not appear to differ from that with respect to works otherwise created.

This approach is followed by the Copyright Office today in conducting examinations for determining registrability for copyright of works created with the assistance of computers.¹⁸⁸ It comports with the rather summary conclusions reached by the Whitford Committee's investigation of copyright problems in the United Kingdom.¹⁸⁹ It is supported by the comment of experts in the fields of computer art and music and computer science with whom the Commission has consulted.¹⁹⁰

¹⁸⁷ See 17 U.S.C. § 103(b).

¹⁸⁸ The Performing Arts Section of the Examining Division, for example, requests specific information about the authorship of a musical composition submitted for registration when the composition has been created with a computer. The work will be registered only when it is shown that the applicant exercised sufficient control over the production of the work to be considered its author.

¹⁸⁹ COPYRIGHT AND DESIGNS LAW: REPORT OF THE COMMITTEE TO CONSIDER THE LAW ON COPYRIGHT AND DESIGNS 132-33 (1977).

¹⁹⁰ These include Milton Babbitt, professor of music at Princeton University; Kenneth Knowlton, a

However, the Commission recognizes that the dynamics of computer science promise changes in the creation and use of authors' writings that cannot be predicted with any certainty. The effects of these changes should have the attention of Congress and its appropriate agencies to ensure that those who are the responsible policy makers maintain an awareness of the changing impact of computer technology on both the needs of authors and the role of authors in the information age. To that end, the Commission recommends that Congress, through the appropriate committees, and the Copyright Office, in the course of its administration of copyright registrations and other activities, continuously monitor the impact of computer applications on the creation of works of authorship. The subject should be considered by Congress as part of any hearings held on the general topic of the role of the computer in society. And the Copyright Office, in the course of its regular activities, should report to Congress if the impact of computers is found to raise questions of copyright law or policy requiring legislative attention.

The Commission, therefore, concludes that no special problem exists with respect to the "creation of new works by the application or intervention of such automatic systems or machine reproduction"; that existing statute and case law adequately cover any questions involved; and that no action by Congress is necessary at this time.

computer scientist and computer artist at Bell Laboratories; Joseph Weizenbaum, professor of computer science at Massachusetts Institute of Technology; and John McCarthy, professor of computer science at the Artificial Intelligence Laboratory at Stanford University.