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Creating a New Kind of Intellectual Property: Applying the Lessons of the Chip Law to Computer Programs

Pamela Samuelson*

INTRODUCTION

Whether semiconductor chip designs should be protected by amending existing copyright law or by creating a completely new form of legal protection is a controversy that understandably does not excite the popular imagination. Congress has resolved the issue in favor of a new, or *sui generis*, scheme.3

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1. Semiconductor chips, often referred to simply as “chips” or “integrated circuits,” are thin slices of semiconductive material (usually silicon) in which layers of electronic switches connected by thin wires have been laid. Each switch is functionally a transistor. Nowadays it is common for chips to contain several thousand switches. Chips are commonly manufactured by laying a stencil, often referred to as a “mask,” on top of a layer of semiconductive material, and then etching or imprinting the circuitry pattern on the layer through one of a number of different processes. See infra note 16.

Chips perform two different kinds of functions in modern computers. Some are memory units which store information (data or program instructions), either permanently (known as “read only memory” or “ROM” chips because the computer can only “read” the stored information, it cannot change or “write” new information into such a memory device) or temporarily (known as “random access memory” or “RAM” chips, capable of receiving and temporarily storing data, and allowing changes to be made in what is stored in the cell). Other kinds of chips serve as the central processing units of computers, that is, as hardware components that are responsible for execution of computer program instructions. See H.R. REP. No. 781, 98th Cong., 2d Sess. 11-13, reprinted in 1984 U.S. CODE CONG. & AD. NEWS 5750, 5760-62 [hereinafter cited as HOUSE REPORT] (All citations to the House Report are to the star print. United States Code Congressional and Administrative News contains the initial version of the House Report. The star print corrected typographical errors in the initial version and contains three additional pages.); Boraiko, The Chip, 162 NAT'L GEOGRAPHIC 421, 421 (1982); Toong & Gupta, Personal Computers, Sci. AM., Dec. 1982, at 87-94.

2. *Sui generis* is defined as: “Of its own kind of class; i.e., the only one of its own kind; peculiar.” BLACK’S LAW DICTIONARY 1286 (5th ed. 1979) (emphasis in original).

That resolution will not and should not stop scholars from pondering the wisdom of Congress's decision, particularly when, in the future, developers of other new technologies take their cases for *sui generis* protection to Washington.

The creation of a *sui generis* form of intellectual property law was a somewhat radical approach for Congress to take. In the past, Congress had virtually always incorporated new subject matters into either the patent or copyright laws rather than creating a new form of legal protection. The last time—


New kinds of intellectual property rights have also been created at common law, perhaps most notably, the right of publicity. See Zacchini v. Scripps-Howard Broadcasting Co., 433 U.S. 562 (1977) (holding that “human cannonball” performer had right to control broadcast of his act); see also International News Serv. v. Associated Press, 248 U.S. 215 (1918) (holding that a news organization had a quasi-property right in the news it gathered).

Another new kind of intellectual property right, created by Congress in 1984, concerned unauthorized reception and retransmission of cable television signals by persons with satellite dishes. See Cable Communication Policy Act of 1984, Pub. L. No. 98-549, § 6(a), 1984 U.S. CODE CONG. & AD. NEWS (98 Stat. 2779, 2804) 4655 (codified at 47 U.S.C.A. § 605 (West 1962 & Supp. 1985)). The copyright law was insufficient to deal with this problem for two reasons: reception and display of signals in a private home would not violate any of the exclusive rights of copyright, see 17 U.S.C. § 106 (1982); and cable companies could not sue for “theft” of their signals under the copyright laws unless they were themselves the copyright owners, see 17 U.S.C. § 501(b) (1982), which was unusual. The law as enacted makes lawful the reception of unencrypted cable signals by individual households in areas where there is no cable marketing system established even though retransmission of signals (as to units in an apartment building) is unlawful. See 47 U.S.C.A. § 605 (West 1962 & Supp 1985); see also R. BROWN & R. DENICOLA, CASES ON COPYRIGHT 422-23 (4th ed.}

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now nearly a century ago—\(^5\) that Congress tried to create a new category of federal intellectual property law, the Supreme Court struck it down.\(^6\) It would have been very difficult, however, for Congress to try to expand the copyright laws to protect semiconductor chip designs. One of the central tenets of copyright law is that a copyright will not protect "utilitarian works," that is, works that have a usefulness beyond merely the conveying of information or the display of an appearance.\(^7\) Since chips are clearly "utilitarian works,"\(^8\) to include them under copyright law would have required abandoning one of its fundamental tenets. Congress had never consciously decided to give a utilitarian subject matter copyright protection; on many

\(1985\). One might also characterize the Plant Variety Protection Act, 7 U.S.C. §§ 2321-2582 (1982), as a kind of intellectual property law.

5. See Piracy Ban Nears For Silicon Chips, N.Y. Times, Oct. 10, 1984, at 1, col. 4 (chip law would be first new federal intellectual property law in more than a century).

6. See Trademark Cases, 100 U.S. 82, 99 (1879). The Supreme Court struck down a federal trademark statute that Congress had passed in 1870, holding that trademarks had always been protected by state law and that Congress had to have specific authority in the Constitution to preempt state law in this area. Id. The current federal trademark statute was primarily aimed at giving federal recognition to what are essentially state-created trademark rights. See 15 U.S.C.A. §§ 1051-1127 (West 1976 & Supp. 1985); E. KITCH & H. PERLMAN, LEGAL REGULATION OF THE COMPETITIVE PROCESS 281-85 (2d ed. 1979). Congress was therefore concerned in 1984 about its power to enact a sui generis scheme for semiconductor designs. See Copyright Protection for Semiconductor Chips: Hearings on H.R. 1028 Before the Subcomm. on Courts, Civil Liberties, and the Administration of Justice of the House Comm. on the Judiciary, 98th Cong., 1st Sess. 171 (1983) (Representative Kastenmeier questioning the Copyright Office spokesperson about the constitutionality of protecting chip designs) [hereinafter cited as 1983 House Hearings]. Congress concluded, however, that it could do so under its commerce clause powers, if not under the patent/copyright clause. See S. REP. NO. 425, 98th Cong., 2d Sess. 14-15 (1984) [hereinafter cited as SENATE REPORT].

7. This principle has been incorporated into the copyright statute at 17 U.S.C. § 101 (1982) (definition of "useful article") and 17 U.S.C. § 113 (1982) (copyright in drawing does not extend to manufacture of article drawn). The principle has long been recognized in copyright law. In Baker v. Selden, 101 U.S. 99 (1879), the most famous application of this principle, the Supreme Court held that copyright protection for a book that explained a particular accounting system did not extend to the use of the system itself. See Oxman, INTELLECTUAL PROPERTY PROTECTION AND INTEGRATED CIRCUIT MASKS, 20 JURIMETRICS J. 405, 444-46 (1980) (citing Baker v. Selden as still good law); see also Samuelson, CONTU Revisited: The Case Against Copyright Protection for Computer Programs in Machine-Readable Form, 1984 DUKE L.J. 663, 727-49 (discussing utilitarian character of machine-readable computer programs); infra notes 59-67 and accompanying text.

8. For a description of the utilitarian function of computer chips, see supra note 1.
occasions, in fact, Congress had consciously decided not to do so.9

This changed in 1980,10 however, when Congress extended copyright protection to computer programs in machine-readable11 form.12 The report of the National Commission on New

9. Congress has repeatedly rejected bills to create copyright protection for designs of utilitarian works. See Register of Copyrights, Draft, Second Supplementary Report of the Register of Copyrights on the General Revision of the U.S. Copyright Law ch. VII (1975) (reporting that between 1914 and 1957 nearly 50 such bills were introduced in Congress).

10. See infra notes 186-191 and accompanying text regarding the utility of computer programs in machine-readable form; see also Samuelson, supra note 7, at 672-68, 741-49 (arguing that since all machine-readable computer programs have utility beyond just information conveyance and image display, they should not be copyrightable).

11. “Machine-readable” means the program is written in machine language; this generally represents the final stage in the development of a program. As noted in an earlier article:

There are often several phases in the development of an operable computer program. Each phase may be characterized by a different written work. The writings may include: a description of the task or tasks the program is intended to perform; a formulation—in either mathematical or nonmathematical terms—of the algorithm of the program, that is, the programmer's idea about how the task should be accomplished; a flow chart that schematically depicts the steps the programmer thinks will be necessary to carry out the algorithm; and the source code, which is a written statement of the precise set of instructions that when transformed into “machine language” will be capable of producing the desired result in the desired manner. . . .

The transformation of source code to machine code is accomplished within the computer by processing the source code through an operating system known as a “compiler.” In the transformation process, compiler programs often restructure the set of program instructions so that the hardware will be able to execute them.

Samuelson, supra note 7, at 685-86.

Machine code is simply ones and zeros that are translated into electrical pulses that direct the computer to perform specific functions; it is not readable by human beings. “In seeking to preserve a competitive advantage and protect proprietary rights in computer software, many software companies distribute only machine-readable object code copies of their software.” Grogan, Decompilation and Disassembly: Undoing Software Protection, 1 Computer Law., Feb. 1984, at 1. The source code is generally not provided, which means that a user cannot read the actual program instructions on the screen. Thus, it is generally the machine-readable version of the program that software pirates appropriate.

12. The law extending copyright protection to machine-readable programs was § 10 of the Act of Dec. 12, 1980, Pub. L. No. 96-517, 94 Stat. 3015, 3028 (copyright amendments codified at 17 U.S.C. § 101 (1982) and 17 U.S.C.A. § 117 (West Supp. 1985)). The copyright amendments can be found in the House bill's subsection IV, which dealt with miscellaneous items. The amendments were relatively minor, involving only the addition of a definition of “computer program” to § 101, the deletion of the interim § 117, and the substitution of a new § 117 that gave owners of copyrighted programs a limited right to make
Technological Uses of Copyrighted Works (CONTU), on which Congress relied in enacting that amendment, however, was seriously flawed. Congress was not advised of the utilitarian character of programs or warned of the serious changes that would result if a utilitarian subject matter was taken into the copyright fold.

This Article argues that Congress should reconsider its decision to protect machine-readable computer programs through copyright law. The decision to use copyright was based on a faulty conception of copyright. Congress rejected that conception of copyright when it enacted the sui generis chip protection law.

Although there is considerable legislative history concerning the patent and trademark issues of this Act, very little legislative history focused on the copyright issues. The House Report on the bill mentions that the bill embodies the CONTU recommendations, but does not discuss the copyrightability issues. See H.R. Rep. No. 1307, 96th Cong., 2d Sess. 23, reprinted in 1980 U.S. CODE CONG. & AD. NEWS 29890 (1980).

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14. In another article this author has criticized CONTU for the serious flaws in its analysis relating to, among other things, the utilitarian character of programs. See Samuelson, supra note 7. Of necessity, some points of that article's analysis will be repeated here. The aim of this article, however, is to particularize why sui generis legislation for machine-readable programs is desirable notwithstanding the fact that copyright is already in place for other types of computer programs and that there will be some resistance to adoption of a sui generis approach for software.

15. See Samuelson, supra note 7, at 727-49. The courts that thus far have upheld the copyrightability of computer programs in machine-readable form have not been willing to look beyond Congress's enactment of the CONTU recommendations. See, e.g., Apple Computer, Inc. v. Franklin Computer Corp., 545 F. Supp. 812, 824 (E.D. Pa. 1982) (finding utility problems with copyright for operating systems), rev'd, 714 F.2d 1240, 1253-54 (3d Cir. 1983) (relying on Congressional action), cert. dismissed, 464 U.S. 1033 (1984); see also The Semiconductor Chip Protection Act of 1983: Hearings on S. 1201 Before the Subcomm. on Patents, Copyrights & Trademarks of the Senate Comm. on the Judiciary, 98th Cong., 1st Sess. 27-33 (1983) (statement of Dorothy Schrader, Associate Register of Copyrights for Legal Affairs, Copyright Office) (discussing the utilitarian work cases) [Ms. Schrader's statement will be cited hereinafter as Schrader Statement, 1983 Senate Hearings and the Committee's hearing will be cited as 1983 Senate Hearings].
tion legislation. The Article first traces the congressional debate concerning chip protection, specifically whether a copyright or *sui generis* approach would best accomplish the goal of protecting semiconductor chip design. The Article then considers the larger implications of that debate, with a particular focus on the social bargains implicit in the systems of patent and copyright law, and a consideration of the ramifications of incorporating a nonutilitarian subject matter into the copyright framework. The Article then discusses a possible alternative conception of copyright law, one that would protect utilitarian subject matter. This conception seemed to underlie the arguments in favor of extending copyright protection to both machine-readable programs and semiconductor chips. Congress ultimately rejected this alternative conception of copyright law during the chip debate. If properly informed about the utilitarian character of machine-readable programs, Congress would likely have rejected this conception with regards to machine-readable programs also. Finally, the Article examines the need for *sui generis* protection for machine-readable computer programs, and concludes that the same reasons Congress had for adopting a *sui generis* approach to protection of chip designs support adopting a *sui generis* approach to protection of machine-readable computer programs.

I. THE CONGRESSIONAL DEBATE OVER CHIP PROTECTION: COPYRIGHT OR SUI GENERIS?

The semiconductor industry sought legal protection for chip designs for several years before the goal was finally achieved. In the late 1970's, an attempt was made to persuade the Register of Copyrights to recognize chip masks\(^\text{16}\) or the

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16. Semiconductor chip products are most frequently manufactured by a process known as "photolithography" or "masking." After the two and three dimensional features of shape and configuration of a chip have been determined, the layout (or "topography") of the chip can be fixed in pictorial form—a so-called "composite" drawing of the various layers of the chip, shown in different colors on a very large sheet of paper. The same information can be recorded in digital form, by storing all the relevant coordinates of points in the composite drawing in a computer tape known as a "data base tape."

This information is then used to generate a series of "masks," which are stencils used to manufacture chips. Chips are manufactured by etching material (or otherwise removing it) away from semiconductor wafers and depositing material (or otherwise placing it) on the wafers. The etching and depositing processes configure the chips to the patterns comprising the mask work protected by this Act. The masks are used to control the etching and depositing processes.
chips themselves as copyrightable subject matter. The Register was willing to accept technical drawings of chip design layouts for copyright registration, but refused to accept registration of the chips themselves, or of the masks used to make them, on the ground that the chips and the masks were utilitarian works ineligible for copyright protection. At least one semiconductor chip firm filed suit to compel the Register to accept their products for copyright registration, but the litigation avenue did not look promising and the lawsuit was withdrawn without prejudice.

A. THE EVOLUTION OF THE CHIP PROTECTION BILLS

In 1979, the semiconductor chip firms took their case to Congress. The House of Representatives held a hearing on a bill that would have amended the copyright law to include chip masks and products. The bill would have, in one sentence,

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19. As the House Report states, "the fundamental principle codified in 17 U.S.C. 113 has meant that any protection as a 'technical drawing' does not protect the copyright owner of the drawing with respect to unauthorized duplication of the finished useful article represented by the drawing." Id.; see also Schrader Statement, 1983 Senate Hearings, supra note 15, at 29-30 (discussing the historic refusal of the copyright office to register copyrights in design or "topology" of semiconductor chips); infra notes 92-93, and accompanying text.


22. See Copyright Protection for Imprinted Design Patterns on Semiconductor Chips, 1979: Hearings on H.R. 1007 Before the Subcomm. on Courts, Civil Liberties and the Administration of Justice of the House Comm. on the Judiciary, 96th Cong., 1st Sess. (1979) [hereinafter cited as 1979 House Hearings]. Apparently, CONTU had been consulted about whether, or to what ex-
exempted semiconductor masks from the utilitarian objection that had been standing in the way of copyright protection.\textsuperscript{23} The Copyright Office, however, raised a number of serious questions about protecting chip designs under the copyright scheme.\textsuperscript{24} Additionally, two of the four representatives of semiconductor industry firms who testified concerning the bill opposed it for a variety of reasons, including the utilitarian character of the subject matter and the potential for excessive and counterproductive protection.\textsuperscript{25} The 1979 House bill was not even reported out of Committee.\textsuperscript{26}

\paragraph*{23} The House bill would have added one sentence to the definition of "[p]ictorial, graphic, and sculptural works" in § 101 of the Copyright Act to indicate that this class of works would "also include the photographic masks used to imprint patterns on integrated circuit chips and include the imprinted patterns themselves even though they are used in connection with the manufacture of, or incorporated in a useful article." H.R. 1007, 96th Cong., 1st Sess. (1979). In other words, this additional sentence would have made mask works, and even chips, copyrightable works.

\paragraph*{24} See Schrader Statement, 1983 Senate Hearings, supra note 15, at 34; 1979 House Hearings, supra note 22, at 14-15. The Copyright Office's questions about the 1979 bill included: whether the layouts of chip designs were dictated by the nature of the chip functions or whether they represented merely a creative choice from a host of possibilities; what the relationship would be between the chip masks and products, on the one hand, and the programs stored in them, or used to generate them, on the other; and whether copyright protection for masks should be subject to the same or different terms of protection, scope of rights, and remedies as other copyrighted works. See 1979 House Hearings, supra note 22, at 14-15.

\paragraph*{25} See 1979 House Hearings, supra note 22, at 51-62; see also Schrader Statement, 1983 Senate Hearings, supra note 15, at 35-36. Dorothy Schrader stated:

\begin{quote}
Opponents of H.R. 1007 argued that protection would reduce the ability of U.S. firms to compete in the world market and would increase costs to U.S. consumers. They argued that chips, as utilitarian articles, cannot appropriately be protected by copyright; existing copyright protection for computer programs and patent protection for certain processes was adequate; industry practices of "second sourcing" or "reverse engineering" would be inhibited if not illegal; existing copyright remedies (especially the remedy allowing destruction of infringing articles) would work an undue hardship; protection was being sought for ideas; and copyright gives more protection than is necessary to encourage innovation in this field.
\end{quote}

\textit{Id.} (footnotes omitted).

Chip piracy,\textsuperscript{27} of course, remained a subject of intense concern to the semiconductor industry.\textsuperscript{28} In 1983 both the House and the Senate introduced bills to extend a modified form of copyright protection to semiconductor chip designs.\textsuperscript{29} The semiconductor industry, no longer as concerned as they were earlier about whether the law included all or only some of the features of copyright, supported these bills.\textsuperscript{30} Although there were some differences between these bills,\textsuperscript{31} they were similar in that they treated chips in a significantly different manner than other copyrighted works. For example, these bills reduced the term of protection to ten years\textsuperscript{32} and provided a dif-
ferent set of exclusive rights to chip designers than copyright law provided to copyright owners.\textsuperscript{33}

In 1984, both the House and the Senate substituted new bills\textsuperscript{34} for the 1983 versions. The bill the Senate reported out of Committee was described as a “copyright” bill and, like its predecessor, it proposed amendment of various internal provisions of existing copyright law to extend protection to chip masks, but at the same time, it treated mask works differently from other copyrighted works.\textsuperscript{35} The bill the House reported out of committee was described as a “\textit{sui generis}” bill and, for the first time, proposed a statute that was free standing but modeled partly on existing copyright law.\textsuperscript{36} The law eventually enacted was even more of a \textit{sui generis} law than this \textit{sui generis} House bill.\textsuperscript{37}

\textsuperscript{33} See infra notes 113-123 and accompanying text for a comparison of the sets of exclusive rights.


\textsuperscript{35} See S. 1201, 98th Cong., 2d Sess., 130 CONG. REC. S5837-38 (daily ed. May 16, 1984). The revised Senate bill would have amended six existing provisions of the copyright statute and would have added two new provisions to the statute. Among the amendatory provisions were: (1) the addition of three terms, “semiconductor chip product,” “mask,” and “chip mask,” to the § 101 copyright definition provisions, (2) a modification of the § 102 provision on the subject matter of copyright, to include “mask works,” (3) the creation of a set of exclusive rights applicable only to mask works within the exclusive rights provision of § 106, (4) the addition of a new subsection limiting the duration of protection of mask works to ten years, and (5) slight changes to two of the remedy provisions. The new provisions included: a provision creating a right to make copies of the chip design for reverse engineering purposes, and a provision protecting an “innocent purchaser of an infringing semiconductor chip product” from full liability. Id. at 35. Although the Senate called this a “copyright” bill, it was really a quasi-\textit{sui generis} approach, not just a few easily integrated special provisions for chips. See infra notes 113-116 and accompanying text.


\textsuperscript{37} Compare 17 U.S.C. §§ 901-914 (Supp. II 1984) (the current law) with H.R. 5525, 98th Cong., 2d Sess., 130 CONG. REC. H5489-91 (daily ed. June 11, 1984) (the \textit{sui generis} House bill). The law as enacted, for instance, does not refer to chip design owners as “authors,” define mask works in terms of intrinsic utilitarian character, or define the term “original.”
From the two congressional committee reports on the chip design bills, it is possible to get the impression that the primary difference between the Senate and House bills was a decision whether to call the law copyright or sui generis. Although this seems to be a minor matter, this controversy was a manifestation of a larger controversy concerning the essence of copyright. The underlying question was whether protection of chip designs could, in fact, be successfully integrated into the copyright law. The Senate Committee concluded that integration was possible, and the House Committee concluded that it was not.

B. THE SENATE COMMITTEE’S ARGUMENTS FOR A COPYRIGHT APPROACH

The Senate Judiciary Committee’s report on the chip design legislation pronounced that “the copyright system is not only adequate, but well suited to the task at hand. On balance, [the Committee] concludes that protection can best be provided within the framework of existing copyright law, rather than through the creation of a new and untried form of sui generis protection.” The Senate Report cited six reasons for this conclusion.

First, over the centuries copyright had been expanded many times to include new forms of expression. Although recognizing that the extension of copyright to chip designs would be a step beyond traditional boundaries, the Committee did not think it would be “a giant leap.” The Committee dismissed the argument that copyright protection should not be extended to utilitarian subject matter because “copyright today protects a vast range of works, some of which have value almost exclusively as utilitarian objects.” The Committee

39. See infra notes 131-161 and accompanying text.
40. Senate Report, supra note 6, at 12.
41. Id.
42. Id.
43. Id. The Committee on the Judiciary noted that such utilitarian things as “belt buckles [sic], telephone books, ashtrays, eyeshades, door knockers, pill boxes, and advertisements” had all been accepted as copyrightable, so they found no reason to not protect chip designs. Id. at 12-13 (quoting 1983 Senate Hearings, supra note 15 (statement of Arthur Miller, Professor of Law, Harvard University) (statement was inadvertently left out of printed hearing record, it is in subcommittee files)); see also 1983 Senate Hearings, supra note 15, at 89 (testimony of Arthur Miller, Professor of Law, Harvard University)
found support for its conclusion in two Supreme Court decisions. In *Mazer v. Stein*, the Court had "noted that the industrial use of an article is no bar to its protection under copyright law," and in *Goldstein v. California*, the Court had broadly interpreted the constitutional term "writings" to include "any physical rendering of the fruits of creative intellectual or aesthetic labor." Clearly, chip masks and products are physical renderings of intellectual labor, and thus seemed to be

[hereinafter cited as Miller Testimony, 1983 Senate Hearings]. As discussed *infra* note 182 and accompanying text, Miller's interpretation reflects a serious misunderstanding of the meaning of "utilitarian" in copyright doctrine.

44. 347 U.S. 201 (1954).

45. *SENATE REPORT*, supra note 6, at 13. This interpretation of *Mazer* that the Senate relied on confuses somewhat the relationship between copyright and industrial uses. The Senate misunderstood the Court's reasoning in *Mazer*. The issue in *Mazer* was whether a copyrighted statuette that was subsequently incorporated into a lamp base should be deprived of copyright protection because the plaintiff had always intended to use it as a lamp base. The Court did not say that any industrial product could be copyrighted, but rather that a properly copyrighted sculpture did not necessarily lose its protection because of its subsequent incorporation into an industrial article. *See Mazer*, 347 U.S. at 218 ("We find nothing in the copyright statute to support the argument that the intended use or use in industry of an article eligible for copyright bars or invalidates its registration."). Thus the Court in *Mazer* was not ruling that any useful article could be copyrighted.


47. The United States Constitution grants Congress the power "[t]o promote the progress of science and useful arts, by securing for limited times to authors and inventors the exclusive right to their respective writings and discoveries." U.S. CONST. art. I, § 8, cl. 8 (emphasis added).

48. *SENATE REPORT*, supra note 6, at 13 (quoting *Goldstein*, 412 U.S. at 561). This statement, however, may be dicta. The issue in *Goldstein* was whether sound recordings could be "writings" within the meaning of the Constitution. Given that sound recordings are simply a different medium for preserving music, words, and the like, and that the contents of the recording can be communicated with the aid of a machine, sound recordings may be sufficiently like other forms of copyright subject matter to be considered "writings." That does not necessarily mean the Court would hold any human-made thing to be a "writing." *See Samuelson*, supra note 7, at 732-36.

49. One of the issues that received only glancing attention in the legislative history of the semiconductor chip law was the role of computer programs in the design of chip circuit patterns. The House Hearings include as Appendix 3 an article by Michael Feuer which discusses the very substantial role that automation, "fueled" by computer programs, now plays in the process of designing very large scale integrated (VLSI) chips. *See 1983 House Hearings*, supra note 6, at 380-86 (setting out Michael Feuer, *VLSI Design Automation: An Introduction*, 71 PROCEEDINGS OF THE IEEE 5 (1983)). A few speakers did raise questions about how automation should affect the rights given to those who develop designs in this manner. *See, e.g.*, 1983 *House Hearings*, supra note 6, at 78 (testimony of Dorothy Schrader, Associate Register of Copyrights for Legal Affairs, Copyright Office) ("There is some uncertainty also about the scope of protection for designs developed with the assistance of a computer..."
within the constitutional sweep of the copyright laws.

The Senate's second argument in favor of copyright focused on the considerable similarity in form and function between mask works and such copyrightable works as maps and technical drawings. The Senate Committee relied on these similarities to support its conclusion that copyright doctrine would be only minimally distorted by protecting chip designs.

Third, the Senate Committee predicted that protecting chips through copyright would "encourage certainty and stability within the field of semiconductor chip design." Because the bounds of copyright had been explored extensively in the past, a chip protection law under the copyright scheme would give more guidance to members of the industry—be they innovators, reverse engineers, or copyists—than would a *sui generis* scheme. A chip protection statute containing new concepts and terms might "invite costly litigation to define the parameters of the new form of protection."

The fourth reason for preferring copyright was the uncertainty of obtaining international protection for chip designs if Congress adopted a *sui generis* scheme. Although acknowledging that the differences between mask works and traditional copyright subject matters would create some uncertainty about international recognition of a United States copyright for chip designs, the Senate Committee viewed a *sui generis* scheme as creating even more uncertainty.

A fifth reason was the "simplicity and economy" of a copyright approach. Since any *sui generis* form of protection for chip designs would have to borrow heavily from copyright concepts, it seemed easier to simply incorporate chip designs within copyright and make the few adjustments necessary to make the integration work.

Finally, the Senate Committee addressed the fears of some commentators that adopting a more limited form of copyright

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50. See *SENA! REPORT*, supra note 6, at 13.
51. See *id.*
52. *Id.*
53. *Id.*
54. *Id.*
55. See *id.*
56. *Id.* at 14.
for mask works would distort copyright, setting a dangerous precedent that might one day be used to erode the rights of other copyright owners. This fear had led some parties to prefer a *sui generis* form of protection. The Committee thought its bill made it sufficiently clear that there would be no such erosion.

C. THE HOUSE COMMITTEE’S ARGUMENTS FOR
   A SUI GENERIS APPROACH

The major argument in favor of *sui generis* protection for chip designs, as reflected in the House Report, was actually an anti-copyright argument. Mask works and chip products were not subject matters that historically had been regarded as copyrightable, and the House Committee believed there were sound reasons for refusing to extend copyright protection to include them. The Register of Copyrights had refused to register mask works and chip products because they were “utilitarian” in a copyright sense; that is, they had a function beyond merely portraying an appearance or conveying information. Utilitarian works are not copyrightable. The House Report explained:

The prohibition against copyright in useful articles is a fundamental principle of our copyright laws, adhered to for the nearly 200 years of their existence. In philosophical terms, the prohibition rests on the distinction between protection for expression and nonprotection for ideas under copyright, and on the differences in scope, standards, term, and purpose of the patent and copyright systems. In pragmatic terms, the nonprotection of useful articles that do not meet the patent standards of novelty and invention represents a societal judgment that the public benefits from relatively unhampered imitative copying of non-novel useful articles . . .

Although copyright sometimes had been extended to artistic

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58. See Senate Report, supra note 6, at 13.
60. See id. at 6, 1984 U.S. Code Cong. & Ad. News at 5755. See generally Samuelson, supra note 7, at 727-49 (distinguishing utilitarian works from copyrightable portrayals and expressions).
61. See 17 U.S.C. § 101 (1982) (definition of “useful article”); see also supra notes 7, 9. Similarly, utilitarian elements of works with both utilitarian and nonutilitarian features are not copyrightable. See infra note 63 and accompanying text.
features of utilitarian works, such features were only protected by copyright when they could be identified separately from and were capable of existing independently of the utilitarian aspects of the work. In the case of chips and chip masks, this “separate-identification-and-independent-existence” test could not be met. That is, a copyright for a chip product or chip mask would have to be a copyright on its functional features.

The House Committee recognized that mask works were in some respects similar to maps, technical drawings, photographs, and audiovisual works, all clearly copyrightable. The Committee described these similarities as “superficial,” however, and found mask works to be “in fact very dissimilar in function and nature of creativity” from these other items. Mask works were to be protected because of the technical and creative skill employed in laying out or designing electronic circuitry. Mask works have no intrinsic aesthetic purpose. Even if the layouts convey information, that is not their sole or main purpose: their primary purpose is to be used in the manufacture of a useful article—semiconductor chip products.

The House Committee regarded the rule against copyright protection for utilitarian works to be so fundamental that a sui generis approach was required to protect chip designs. The House Committee predicted that there would be “formidable philosophical, constitutional, legal and technical problems associated with any attempt to place protection for mask works or semiconductor chip designs under the copyright law . . . .” These formidable problems could be avoided by creating a sui generis form of protection, in some ways similar to copyright but ultimately freestanding. This new law would pertain only to semiconductor chip designs.

Responding to the Senate Committee’s argument that

64. See HOUSE REPORT, supra note 1, at 10, 1984 U.S. CODE CONG. & AD. NEWS at 5759.
65. Id.
66. Id.
67. Id. For a discussion of these obstacles, see infra note 92 and accompanying text. What the House Committee did not specifically say was that it preferred this sui generis approach because it would avoid conflict with the many copyright cases holding that copyrights on drawings did not extend to the use of the drawings to create useful articles. See supra notes 7, 15 and accompanying text; see also Samuelson, supra note 7, at 731 n.312 (citing cases that refused copyright protection to useful works depicted in copyrighted drawings).
greater certainty would result from a copyright approach because of the ability to draw on nearly two hundred years of copyright precedents, the House Committee asserted that it was not necessary to call the law "copyright" to be able to draw on pertinent copyright precedents. The House Committee stated that the new law "could draw by analogy on this statutory and case law framework to the extent clearly applicable to mask works and semiconductor chip protection, but should not be restricted by the limitations of existing copyright law."68

Moreover, in the House Committee’s view, the international aspects of a law intended to protect chip designs also weighed against the copyright approach. There were, to begin with, some substantial problems with fitting a copyright mask work protection scheme under the Universal Copyright Convention.69 No country besides the United States had considered protecting mask works under the Universal Copyright Convention, and there was no assurance that any would do so.70 Because of the “national treatment” provisions of the Universal Copyright Convention, a United States decision to protect mask works under copyright would require the United States to protect mask works by nationals of foreign countries, even though those foreign countries would have no reciprocal obligation to protect mask works by United States nationals.71 A sui generis approach, on the other hand, would allow the United States to only grant protection to foreign chip designs of those countries that granted equivalent protection to United States companies. Thus, the House Committee thought that a sui generis approach was a better solution to the international protection problem.72

II. REFLECTIONS ON THE COPYRIGHT/SUI GENERIS DEBATE

The previous section summarizes the copyright versus sui

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68. HOUSE REPORT, supra note 1, at 10-11, 1984 U.S. CODE CONG. & AD. NEWS at 5759-60.
69. Id. at 7, 1984 U.S. CODE CONG. & AD. NEWS at 5756.
70. Id.
71. Id. at 7-8, 1984 U.S. CODE CONG. & AD. NEWS at 5756-57.
72. See id. at 8, 1984 U.S. CODE CONG. & AD. NEWS at 5757. A sui generis approach was consistent with the General Agreement on Tariffs and Trade (GATT). Id. The Committee also noted that while the international dimensions were not insignificant, it regarded the establishment of a meaningful system of domestic protection as its paramount concern. Id. at 7, 1984 U.S. CODE CONG. & AD. NEWS at 5756.
"debate" as it was reflected in those portions of the Senate and House reports that were specifically devoted to discussion of that issue. Those portions actually depict only some of the many considerations that went into the decision-making process. A review of the committee reports as a whole and of the congressional hearings reveals a more complete set of reasons for the choice of a *sui generis* approach rather than a copyright approach. It is clear that Congress was somewhat slow in coming to the conclusion that *sui generis* protection for chip designs was preferable to copyright, partly because it was slow to realize the negative implications of protecting chip designs under copyright. Congress was also slow to appreciate the positive benefits that would flow from a freestanding statute specially molded to the unique characteristics of semiconductor chips.

A. COPYRIGHT AS THE LEAST INAPPROPRIATE OF EXISTING OPTIONS

The utilitarian objection to copyright protection of chip designs was apparent from the first time the proposal surfaced. What lingered as an appealing feature of copyright law was that, of the existing forms of intellectual property protection in the United States, it was the least inappropriate. The literature concerning chip design protection and the legislative history of the chip design bills extensively reviewed the reasons that chip designs either "fit" or did not "fit" within existing intellectual property forms. All commentators who engaged in such review considered trade secret, patent, and copyright; some also added unfair competition to the cast of possibilities. It was certainly true that, if the choice was limited to the preexisting forms of protection, copyright did seem the least inappropriate. Nevertheless, that did not mean that copyright was, or could be made, appropriate.

Trade secret protection was clearly insufficient. Although the designs and masks for a chip might well be considered important trade secrets of a company while the chip was under

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73. See supra note 19 and accompanying text.
74. See, e.g., 1983 Senate Hearings, supra note 15, at 147 (letter from James Dykes, Vice President and General Manager, General Electric) ("No other form of intellectual property protection is as appropriate to semiconductor designs as copyright. . .").
75. See, e.g., Oxman, supra note 7, at 411-51.
76. See, e.g., Miller Testimony, 1983 Senate Hearings, supra note 43, at 90.
77. See Oxman, supra note 7, at 411-15.
development, once sold on the market, the chip would reveal the "secret" of its design. Any trade secret protection of the design would then evaporate.\textsuperscript{78}

Patent law protection was also insufficient. Patent law is the law that normally provides legal protection against unauthorized copies of utilitarian works.\textsuperscript{79} Thus, initially, it appears to be the most appropriate form of legal protection for improvements in the design of semiconductor chips. After all, chips serve as the central processing elements and memories of most computers,\textsuperscript{80} and the aim in redesigning chips is to improve their efficiency and economy, not to improve their aesthetic appeal.\textsuperscript{81} In fact, the first chip was patented, and other patents have issued on improvements in chip design.\textsuperscript{82}

The House Report, however, concisely describes the major drawback of patent law as applied to protection of chip designs:

Patent law can protect the basic electronic circuitry for new microprocessors or other new such products. But patent law does not protect the particular layouts and design work performed by the different chip manufacturers in adapting those electronic circuits for a particular industrial purpose, because the creativity involved does not rise to the inventive level required by the patent laws. Yet, it is those layouts and design works that consume the resources of the innovating firms and that are copied by free riders.\textsuperscript{83}

In other words, the patent standard of invention\textsuperscript{84} would have to be abandoned in order for patent law to protect all the new chip designs that the industry wanted to have protected. Invention is the core tenet of patent law. Furthermore, it appears that Congress is constitutionally prohibited from granting patents to improvements in the industrial arts that do not meet

\textsuperscript{78} See id. at 418-19.
\textsuperscript{80} See supra note 1.
\textsuperscript{81} See, e.g., Comment, supra note 21, at 819.
\textsuperscript{82} See D. Hanson, The New Alchemists 96-98 (1982).
\textsuperscript{83} House Report, supra note 1, at 3, 1984 U.S. Code Cong. & Ad. News at 5752 (footnote omitted).
\textsuperscript{84} This standard of invention is set out in § 103:

A patent may not be obtained . . . if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.

the patent standard of invention. So Congress, even if it had wanted to, could not have amended patent law to provide protection for the majority of improvements in chip design.

State unfair competition law can also be used to protect against certain unauthorized copies of products. There are two varieties of the common law of unfair competition. One protects against the “passing off” of the defendant company’s product as if it had been made by the plaintiff. The other protects against the defendant’s misappropriation of a commercially valuable aspect of the plaintiff’s product to the detriment of the plaintiff. Because chip manufacturers were not complaining of “passing off,” this aspect of unfair competition law was not useful to manufacturers searching for meaningful protection. Furthermore, although the misappropriation type of unfair competition would seem to apply to chip design piracy, serious questions about the continuing validity of the misappropriation doctrine have been raised by cases and commentators. So unfair competition law was not the solution to the chip design protection problem.

Copyright, by comparison, looked like a haven. After all, copyright law had long protected against direct copies of designs, and it incorporated a relatively low standard of originality that the chip manufacturers could easily meet. In fact, because the technical drawings of chip designs were already copyrightable, it initially seemed a small step to extend protection to the masks and the chips themselves.

A Copyright Office spokesperson, however, testified before

86. See Oxman, supra note 7, at 411.
88. See Oxman, supra note 7, at 414.
89. The case of International News Serv. v. Associated Press, 248 U.S. 215 (1918), is said to enjoy an uncertain status in the aftermath of Erie R.R. v. Tompkins, 304 U.S. 64 (1938). See D. CHISUM, INTELLECTUAL PROPERTY § 16.04, at 16-40 to 16-42 (1980). State misappropriation law may also be at least partially preempted by federal copyright or patent law or both. See, e.g., R. BROWN & R. DENICOLA, CASES ON COPYRIGHT 487-93 (4th ed. 1985). Misappropriation, if recognized at all, has the further disadvantage of being a state common law tort, the elements of which might well vary from place to place.
90. See, e.g., Peter Pan Fabrics, Inc. v. Martin Weiner Corp., 274 F.2d 487, 489 (2d Cir. 1960) (copyright protection given to fabric designs).
91. See, e.g., Alfred Bell & Co. v. Catalda Fine Arts, Inc., 191 F.2d 99, 102-03 (2d Cir. 1951) (“All that is needed to satisfy both the Constitution and the statute is that the author contributed something more than a trivial variation, something recognizably ‘his own.’ ”).
the House and Senate Committees that copyright protection for semiconductor chip designs would violate four fundamental principles of copyright: (1) copyright does not protect useful articles per se; (2) copyright protects a design only to the extent that artistic features are capable of being separately identified and capable of existing independently of the utilitarian aspects; (3) a copyright in a drawing of a useful thing does not protect against unauthorized duplications of the useful thing itself; and (4) copyright protects only the expression of ideas, not the ideas, processes, plans, etc. that might be embodied therein.\textsuperscript{92} Abandoning these four fundamental principles of copyright law would likely, as the House Report eventually concluded, present "formidable philosophical, constitutional, legal and technical problems" in administering the law.\textsuperscript{93} So it appeared from the review of these forms of protection that there was a "gap" between patent and copyright law into which chip designs fell. Congress had to decide whether to fill that gap, and, if so, how.

B. Why Protect Something in the "Gap" Between Copyright and Patent?

There have always been "gaps" between copyright and patent law. Neither copyright\textsuperscript{94} nor patent law\textsuperscript{95} grant exclusive rights to the discoverers of new ideas or principles of nature, nor to the creators of new mathematical formulae or business methods, no matter how original and creative these discoveries of creations are. Even significant improvements in the design of machinery or other utilitarian works will not be protected if a knowledgeable artisan might have thought of them.\textsuperscript{96} Society

\textsuperscript{92} See 1983 House Hearings, supra note 6, at 77 (testimony of Dorothy Schrader, Associate Register of Copyrights for Legal Affairs, Copyright Office); see also Schrader Statement, 1983 Senate Hearings, supra note 15, at 27-28.

\textsuperscript{93} HOUSE REPORT, supra note 1, at 10, 1984 U.S. CODE CONG. & AD. NEWS at 5759; see supra note 67 and accompanying text.


\textsuperscript{96} E.g., Graham v. John Deere Co., 383 U.S. 1, 11 (1966). The Court observed:

Unless more ingenuity and skill . . . were required . . . than were possessed by an ordinary mechanic acquainted with the business,
has long tolerated this state of affairs. In other words, just because there is a "gap" between copyright and patent law does not mean it must be filled. As the House Report on the chip design legislation indicates, Congress generally allows utilitarian works to be freely copied if they do not meet the patent standards of novelty and invention. For chip designs, however, Congress made an exception. The House Committee perceived the chip to be "at the vortex" of the new information society. "More than perhaps any other invention, the semiconductor chip has brought us into the information age." Laying out the pattern of circuits so that hundreds of thousands or even a million transistors can be fit efficiently and economically onto the surface of a chip is "a fine art and also a costly one." The period of time from the initial layout of the design to the successful manufacture of the first chip can "take the innovating chip firm years, consume thousands of hours of engineer and technician time, and cost millions of dollars. The development costs for a single new chip can reach $100 million." By comparison, copying a chip's design is very cheap. In several months, for a cost of less than $50,000, a pirate firm can duplicate the mask work of an innovator. The House Report highlights the effect that this dramatic difference between development and reproduction costs has on the incentive to innovate:

Because the copyist firm does not have the enormous costs borne by the innovator, such a firm can undersell the innovating firm and flood the market with cheap copies of the semiconductor chip. In an industry in which innovation is absolutely essential, such appropriation of creativity is a devastating disincentive to innovating research and development. . . . Moreover, the disincentive effect reaches other firms who learn a lesson from the misfortune of others.

there was an absence of that degree of skill and ingenuity which constitute essential elements of every invention. In other words, the improvement is the work of the skillful mechanic, not that of an inventor.

Id. (quoting Hotchkiss v. Greenwood, 52 U.S. (11 How.) 248, 267 (1851)).
97. See supra text accompanying note 62.
98. HOUSE REPORT, supra note 1, at 2, 1984 U.S. CODE CONG. & AD. NEWS at 5751.
99. Id.
100. Boraiko, supra note 1, at 421.
101. HOUSE REPORT, supra note 1, at 2, 1984 U.S. CODE CONG. & AD. NEWS at 5751.
102. Id.
103. Id.
104. Id. at 2-3, 1984 U.S. CODE CONG. & AD. NEWS at 5751-52.
This piracy was perceived to be a clear threat, not only to the health of the U.S. semiconductor industry, but to the growth of American information industries.\textsuperscript{105}

What seems clear from the House Report is that it was not just because there was a "gap" between copyright and patent law that Congress created a new form of legal protection, but because there was a special kind of gap. The centrality of the chip industry to the continued growth of the American economy and the dramatic disparity between development costs and the costs of copying were the reasons Congress filled the gap in this particular instance. In fact, everyone who participated in the discussion agreed that some sort of legislation was necessary to protect chip designs.\textsuperscript{106}

C. A SHORTER DURATION OF PROTECTION

There was also unanimity about creating a much shorter duration of protection for chip designs than for ordinary copyrighted works.\textsuperscript{107} Even the commentator who argued for protection of chip designs under the Copyright Act of 1976 indicated that the full copyright term for chip designs would be excessive.\textsuperscript{108}

The most frequently cited reason for creating a shorter term of protection for chip designs was that the commercial life of any specific chip layout was likely to be relatively short: roughly two to five years in the normal case.\textsuperscript{109} Ten years would clearly provide an adequate time to recoup the investment made in the design of a particular product. Since it was the inability to recoup research and development costs that gave rise to the charges of piracy in the first place, it made sense to grant a period of protection adequate to recoup costs, but no longer.

\textsuperscript{105} Id. at 3, 1984 U.S. CODE CONG. & AD. NEWS at 5752.

\textsuperscript{106} See, e.g., 129 CONG. REC. S5922 (daily ed. May 4, 1983) (statement of Sen. Mathias) ("Chip piracy reduces the incentive for our innovative semiconductor industry to invest in the development of new chips."); see also Schrader Statement, 1983 Senate Hearings, supra note 15, at 40.


\textsuperscript{108} See Comment, supra note 21, at 849-50; see also Oxman, supra note 7, at 459.

\textsuperscript{109} See Comment, supra note 21, at 850.
There were other reasons for keeping the duration short. One of the important purposes of the federal intellectual property laws has always been the enrichment of the public domain once the innovator has been given an opportunity to obtain enough reward for his creative efforts to provide an incentive to create. The House Report on the chip legislation reflects this concern:

Copyright is an amalgam of property law principles bent to the service of a rather simple bargain. A limited term of protection against copying is granted to an author's original expression in exchange for the dedication of that expression to the public domain at the end of the term. The public ordinarily benefits at least twice from this bargain: once, when the original expression is first created, and then again when the expression is added to the public domain from which anyone may borrow freely to fashion new works. Although a copyright belongs to an author during its term, the ultimate purpose of this bargain is not to protect authors but rather to enrich the public domain. The cardinal principle in copyright law, then, is that any decision to extend the law or to recognize new interests ought to be based on a realistic expectation that one day the public domain will bear new fruit.\(^\text{110}\)

The House Report stated that the chip law should also be grounded in this expectation,\(^\text{111}\) and the shorter duration of chip protection was an important aspect of this enrichment.

The House did not explain how it decided upon ten years as an appropriate term of protection. One reason for such a brief term may have been a desire to keep the chip protection law roughly proportional to copyright and patent law. It would have been grossly disproportionate to provide protection of chip designs for, say, thirty years. If most chip designs could not be patented because, although categorically eligible for patent protection, they would not meet the patent standard of invention, it would not make sense to provide a greater duration of protection\(^\text{112}\) than would be available if the chip design had, in fact, been nonobvious and patentable. The chip bill satisfied propor-

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\(^\text{111}\) See House Report, supra note 1, at 5, 1984 U.S. Code Cong. & Ad. News at 5754. Whether the public domain will be enriched if the copyrighted work is outmoded by the time the exclusive rights expire and the public has the right to copy the work, is an interesting question. In the future, the commercial life of chips may be longer than it has been in the recent past, in which case something valuable will have been committed to the public domain.

\(^\text{112}\) Patent law provides only 17 years of protection for inventions. See 35
tionality concerns by providing ten years of protection for new chip designs.

D. A DIFFERENT SET OF EXCLUSIVE RIGHTS

One reason the Senate eventually yielded to the House’s sui generis approach is that even the Senate bill created a kind of sui generis scheme for chips. The Senate’s “copyright” bill, while physically included as part of copyright law, granted an entirely different set of exclusive rights to mask work owners than those exclusive rights granted to owners of all other copyrighted material.\textsuperscript{113}

The Senate’s 1984 version of the bill set out five exclusive rights for mask works.\textsuperscript{114} Not only were these five new rights completely distinct from the exclusive rights granted to all other copyright owners,\textsuperscript{115} all five contradicted the longstanding copyright rule that the manufacture of a utilitarian object depicted in a copyrighted drawing does not infringe the copyright.\textsuperscript{116} The original version of the Senate bill also included an exclusive right to use chip products embodying the design of a protected mask work.\textsuperscript{117} That provision would, if enacted, have meant that every person or company who purchased a computer that, unbeknownst to them, included one or more pirated chips, would have been liable for copyright infringement. This

\begin{footnotes}
\footnotetext[114]{See S. 1201, 98th Cong., 1st Sess., 129 CONG. REC. S5992-93 (daily ed. May 4, 1983); see also SENATE REPORT, supra note 6, at 33-34.}
\footnotetext[115]{See S. 1201, 98th Cong., 2d Sess., 130 CONG. REC. S5837-38 (daily ed. May 16, 1984). These five exclusive rights included the right:}
\footnotetext[116]{(A) to embody the mask work in a mask;}
\footnotetext[117]{(B) to distribute a mask embodying the mask work;}
\footnotetext[118]{(C) to embody an image of the mask work in a semiconductor chip product;}
\footnotetext[119]{(D) in the manufacture of a semiconductor chip product, substantially to reproduce, by optical, electronic, or other means, an image of the mask work on material intended to be part of the semiconductor chip product; and}
\footnotetext[120]{(E) to distribute a semiconductor chip product made as described in subparagraph (C) or (D) of this paragraph.}
\end{footnotes}
was a highly significant change, because copyright law normally does not control uses of copyrighted works and leaves the purchaser of a "bootleg" copy of a copyrighted work free from liability.\(^{118}\) To temper the effect on innocent purchasers, the Senate bill required the firm owning the protected design to grant a compulsory license to users, and protected innocent infringers by requiring them to pay only a reasonable royalty for the privilege of being able to continue to use the pirated chip.\(^{119}\) This innocent infringer provision, like the use right, was unparalleled in copyright law.\(^{120}\)

The chip law that was eventually passed gave chip owners the exclusive right to make, import, and distribute chip products embodying the mask work designs.\(^{121}\) These rights were distinct from the set of exclusive rights given to copyright owners. The need to create a set of exclusive rights of substantially different character than those traditionally available for copyright owners was an indication that copyright was not a suitable vehicle for chip protection and that a \textit{sui generis} approach was preferable.\(^{122}\)

E. REVERSE ENGINEERING

It is interesting to note that neither the chip law eventually

\footnotesize{118. See Schrader Statement, 1983 Senate Hearings, supra note 15, at 46 ("[T]he 'use' right proposed here seems unrelated to anything known to any copyright system, past or present, here or abroad.").}

\footnotesize{119. See S. 1201, 98th Cong., 1st Sess., 129 CONG. REC. S5992-93 (daily ed. May 4, 1983); see also Miller Testimony, 1983 Senate Hearings, supra note 43, at 92-93. Professor Miller testified:

I think one would have to rely for a justification of this use concept on a combination of the fact that these mask works are unique; they move rapidly. Many of them come in from abroad. Many of them are produced by fly-by-night organizations that are unavailable when you are trying to seek legal redress and you have a very serious pragmatic problem in getting at them.

\textit{Id.}

\footnotesize{120. See Schrader Statement, 1983 Senate Hearings, supra note 15, at 44 ("[T]he innocent infringer provision would insulate unconscious infringers from copyright liability (traditional copyright law protects against both conscious and unconscious infringement).") (footnote omitted). The law eventually enacted does not include a use right, although it does contain an innocent infringement provision that allows those who unwittingly import or distribute pirated chips to be relieved of liability for more than a reasonable royalty. See 17 U.S.C. § 907 (Supp. II 1984).}

\footnotesize{121. See 17 U.S.C. § 905 (Supp. II 1984). In addition, the owner was given the exclusive right "to induce or knowingly to cause another person" to make, import, or distribute chip products embodying the mask work. \textit{Id.} § 905(3).}

\footnotesize{122. For a discussion of the need for a different set of exclusive rights for computer programs than copyright provides, see \textit{infra} notes 228-247.}
enacted nor any of its predecessor bills contained a provision giving the chip designer an exclusive right to prepare derivative works based on the protected chip design.\footnote{123} In fact, the Act\footnote{124} and its legislative history\footnote{125} make it abundantly clear that persons who "reverse engineer" the layout of a particular chip—that is, persons who use the protected design as a basis for their own chip design—will be shielded from liability so long as they do not copy the chip exactly or make only insignificant changes. This is so despite the fact that the reverse engineer may be taking a partial "free ride" on the research and development investment of a more innovative firm.\footnote{126} 

There was strong support for a clear statutory recognition of a right to reverse engineer. Although some witnesses believed that the copyright "fair use"\footnote{127} doctrine would suffice to allow legitimate reverse engineering,\footnote{128} others felt that there was a need for a clear statement in case the fair use doctrine was construed more narrowly than this.\footnote{129} Without the reverse engineering provision, the chip act might not have had the substantial industry support that it did.\footnote{130} 

\begin{itemize}
\item All copyright owners have exclusive rights to prepare derivative works. 17 U.S.C. § 106(2) (1982). Derivative works are defined in the copyright statute as:
\begin{itemize}
\item work[s] based upon one or more preexisting works, such as a translation, musical arrangement, dramatization, fictionalization, motion picture version, sound recording, art reproduction, abridgement, condensation, or any other form in which a work may be recast, transformed, or adapted. A work consisting of editorial revisions, annotations, elaborations, or other modifications which, as a whole, represent an original work of authorship, is a "derivative work".
\end{itemize}
\item See HOUSE REPORT, supra note 1, at 21-23, 1984 U.S. CODE CONG. & AD. NEWS at 5770-72.
\item See 1983 House Hearings, supra note 6, at 34 (testimony of F. Thomas Dunlap, Jr., Corporate Counsel and Secretary, Intel Corp.).
\item The fair use doctrine is often defined as "a privilege in others than the owner of the copyright to use the copyrighted material in a reasonable manner without his consent, notwithstanding the monopoly granted to the owner by the copyright." Rosemont Enters. v. Random House, Inc., 366 F.2d 303, 306 (2d Cir. 1966) (quoting H. BALL, THE LAW OF COPYRIGHT AND LITERARY PROPERTY 260 (1944)), cert. denied, 385 U.S. 1009 (1967). For the factors to be considered in fair use determinations, see 17 U.S.C. § 107 (1982).
\item See, e.g., 1983 House Hearings, supra note 6, at 34 (testimony of F. Thomas Dunlap, Jr., Corporate Counsel and Secretary, Intel Corp.); see also Comment, supra note 21, at 848.
\item See, e.g., 1983 Senate Hearings, supra note 15, at 103-04 (testimony of Jon Baumgarten, Copyright Counsel, Association of American Publishers); id. at 114-15 (statement of NEC Electronics U.S.A., Inc.).
\item See 1983 Senate Hearings, supra note 15, at 100-01 (statement of a
Utilitarian works have intentionally not been included in the copyright statute, so there has never been occasion to create a copyright reverse engineering rule. If the copyright law had been extended to include utilitarian works, it would probably have been necessary to explicitly recognize a right to reverse engineer.

F. FEATURES OF THE CHIP LAW UNLIKE COPYRIGHT

The main reason the House Committee rejected copyright as a form of legal protection for chip designs was that chip designs did not comport with copyright's long tradition of not protecting utilitarian works. This subsection focuses on why it was a good idea not to call the new chip act a "copyright law."

The main reason not to call the new law protecting chip designs a "copyright" law is that it really was not a "copyright" law. There are, of course, some respects in which the new chip protection scheme resembles copyright. But there are many features of the law that more closely resemble patent law, and many that can be found in neither copyright nor patent law. Unless one is prepared to confound the definition of "copyright," it would be better to call something this different by a new name.

There are a number of ways in which the chip design law resembles copyright. Perhaps the clearest resemblance is that the chip design law protects the particularities of "original" designs. The concept of "originality" was intended to have a copyright-like meaning. The chip law also states that "[i]n no case does protection . . . for a mask work extend to any

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1 See 17 U.S.C. § 902(b)(2) (Supp. II 1984). This provision suggests that the chip law standard of originality will be higher than the copyright standard. Under copyright law, "[o]riginality means only that the work owes its origin to the author, i.e., it is independently created, and not copied from other works." 1 M. NIMMER, NIMMER ON COPYRIGHT § 2.01[A], at 2-8 (1985) (footnote omitted).


132. See HOUSE REPORT, supra note 1, at 19, 1984 U.S. CODE CONG. & AD. NEWS at 5768. There is one respect in which the chip law is different from copyright law concerning the requirement of originality. The chip law excludes from protection "designs that are staple, commonplace, or familiar in the semiconductor industry, or variations of such designs, combined in a way that, considered as a whole, is not original." 17 U.S.C. § 902(b)(2) (Supp. II 1984).
idea, procedure, process, system, method of operation, concept, principle, or discovery, regardless of the form in which it is described, explained, illustrated, or embodied in such work ... 

This provision parallels copyright law. The chip law allows the owner of a mask work to register for protection by applying to the Copyright Office, and the examination procedure to be followed by the Office in determining whether to issue a certificate of registration will be of the same minimal sort as for copyrighted works. There are indications in the legislative history that a copyright-like "substantial similarity" test might be used to judge infringements of the chip law, although there are other indications that a new test might be developed. Some commentators anticipated that problems might arise when applying the copyright substantial similarity test to a subject matter where utilitarian considerations were involved in the design process. Finally, the generous remedy provisions of copyright, including recovery of the defendant's profits or, in the alternative, statutory damages, have been adopted in the chip law.

The chip law has other similarities to copyright that are actually features common to both patent and copyright law. For example, there is a provision allowing the owner to affix to the product a notice of his claim of protection under the federal

137. See, e.g., Senate Report, supra note 6, at 16.
139. See, e.g., 1983 Senate Hearings, supra note 15, at 117-19 (statement of Patent Task Force of the Institute for Electrical and Electronics Engineers (IEEE)). The Task Force expressed many concerns about the potential for mistaken judgments about copying due to the significantly different nature of chips as compared with novels. Id. They pointed out that "[t]he laws of physics do not allow the wide open possibilities as those in writing a novel." Id. at 118. The Task Force also pointed out that even very subtle changes in chip designs may represent significantly different designs and that juries may be misled by relying on visual perceptions of the designs. Id. at 119. For a discussion of similar problems in applying the copyright infringement test to software, see infra notes 255-255.
chip statute. The notice is to consist of an "*M*" and the name of the owner of the work. This notice is similar to that for copyrighted works and patented works. There are several other features common to all three forms.

The chip law also has a number of similarities to patent law. As with patents, affixing a notice of chip protection is discretionary. The chip law also resembles patent law by protecting against the unauthorized manufacture of mask

143. Id. The letter "M" in circle is also permitted. Id.
144. The copyright notice consists of three elements: (1) an indication of a claim of right through the use of the symbol "©", or the abbreviation "Copr.", or the word "Copyright"; (2) the year of first publication; and (3) the name of the copyright owner. 17 U.S.C. § 401(b) (1982). This notice must be displayed in such a manner and location as to give reasonable notice of the claim. 17 U.S.C. § 401(c) (1982).
145. Patentees may affix "pat." or "patent" and the patent's number to the goods or packaging for the patented item. See 35 U.S.C. § 287 (1982).
148. See 17 U.S.C. § 909 (Supp. II 1984) (owner of mask work may affix notice) (emphasis added); cf. 17 U.S.C. § 401(a) (1982) (copyright statute provides that whenever a work protectable under the law is published, a copyright notice shall be attached to it). Although the Copyright Act of 1976, as compared to the 1909 Act, is more generous toward those who inadvertently omit copyright notices on some copies, compare 17 U.S.C. § 405(a)(1) (1982) (copyright not invalidated when notice has been omitted from "a relatively small number of copies") with Act of Mar. 4, 1909, Pub. L. No. 349, § 20, 35 Stat. 1075, 1080 (copyright not invalidated when notice omitted from "a particular copy or copies") (repealed 1976), it is still true that a failure to attach a copyright notice can result in a determination that the work has been dedicated to the public domain. See 2 M. Nimmer, NIMMER ON COPYRIGHT, § 7.14[A][1], at 7-102 (1985). By contrast, failure to affix a patent notice will only preclude damage recoveries unless the infringer had actual notice of the patent. See 35 U.S.C. § 287 (1982).
works or the semiconductor chip products embodying the mask design.\textsuperscript{149} Overall, the chip designer's exclusive rights under the chip law more closely resemble the exclusive rights of patent law than copyright law.\textsuperscript{150} Additionally, it is not an infringement of the mask work to make a copy for teaching or evaluative purposes,\textsuperscript{151} just as it is not an infringement to make a copy of a patented device for experimental purposes.\textsuperscript{152} The duration of chip design protection more nearly resembles patent than copyright law: ten years as compared with seventeen years for patent and at least fifty years for copyright.\textsuperscript{153} Furthermore, there is a requirement that the owner of a mask work register the design within two years of its first commercial exploitation or be barred from any protection under the federal law.\textsuperscript{154} This again more closely resembles patent than copyright law.\textsuperscript{155}

There are also many unique provisions in the new chip law.

\textsuperscript{149} Recall that the copyright on a drawing does not extend to making the thing depicted therein if it is a useful thing. \textit{See supra} note 19.

\textsuperscript{150} \textit{Compare} 17 U.S.C. § 905(1)-(2) (Supp. II 1984) (owner has exclusive right to reproduce, import, and distribute chips embodying the mask work design) \textit{with} 35 U.S.C. § 154 (1982) (owner has exclusive right to make, use, and sell invention) \textit{and} 17 U.S.C. § 106 (1982) (owner has exclusive right to make copies, prepare derivative works, distribute, and where applicable, give public performances or make public display of works). Given the manufacturing orientation of both the patent and the chip laws, the rejection of the derivative work right for chips, and the inapplicability of public performance and display rights, it is fair to conclude that the chip law's exclusive rights are more patent-like than copyright-like.

\textsuperscript{151} \textit{See} 17 U.S.C. § 906(a) (Supp. II 1984).

\textsuperscript{152} 4 D. CHISUM, PATENTS § 16.03[1] (1985).


\textsuperscript{154} \textit{See} 17 U.S.C. § 908(a) (Supp. II 1984).

\textsuperscript{155} \textit{See} 35 U.S.C. § 102(b) (1982) (inventors may not “publicly use” their inventions for more than one year before filing for a patent application). Commercial exploitation of the invention is one of the “public uses” that can give rise to a statutory bar to a patent application. \textit{See, e.g.,} Cali v. Eastern Airlines, Inc., 442 F.2d 65, 68 (1971); 2 D. CHISUM, PATENTS § 6.02[5] (1985). Copyright has no comparable rule.
In addition to the new definitional provisions,\textsuperscript{156} new features of the law include the President's power to proclaim United States protection for foreign nationals' products when the foreign nations provide comparable protection,\textsuperscript{157} the ten year term of protection,\textsuperscript{158} the importation provisions,\textsuperscript{159} and the provisions on innocent infringement,\textsuperscript{160} among others.\textsuperscript{161} Given these many differences from traditional copyright law, it is not surprising that Congress in the end decided that the form of protection appropriate for chips was so different from "copyright" that to call the new law "copyright" would have distorted the meaning of the word.

III. AN ALTERNATIVE CONCEPTION OF THE COPYRIGHT SYSTEM

There is something to be said for having two, and only two, primary forms of federal intellectual property law: copyright and patent.\textsuperscript{162} To develop a \textit{sui generis} form of protection for

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\textsuperscript{157} See 17 U.S.C. § 902(a)(2) (Supp. II 1984). Copyright has a provision that entitles foreign authors to protection under American copyright law if they are nationals of a country with which the United States has a copyright treaty or nationals of a country that is a party to the Universal Copyright Convention. See 17 U.S.C. § 104(b) (1982). Additionally, the President may issue a proclamation entitling foreign nationals to this protection. Id.


\textsuperscript{159} See 17 U.S.C. §§ 905(2), 910(c) (Supp. II 1984). The chip law is unique in that the right to control imports is an integral part of the set of exclusive rights. Id. Copyright law has separate provisions concerning imports. See 17 U.S.C. §§ 601-603 (1982).

\textsuperscript{160} See 17 U.S.C. § 907 (Supp. II 1984). The only copyright provision that remotely resembles the chip law innocent infringement provision is the statutory damages provision, see 17 U.S.C. § 504(c) (1982), which permits the court to reduce statutory damages if the defendant had no reason to believe her acts were infringing. Librarians and public broadcast companies are eligible for a complete remittance if the infringement was innocent. See id.

\textsuperscript{161} See, e.g., 17 U.S.C. §§ 913-914 (Supp. II 1984) (transitional provisions); id. § 904(c) (reliance on calendar years to determine duration); id. § 912 (the chip law's relation to other laws).

\textsuperscript{162} Trademark and trade secret law are sometimes spoken of as types of intellectual property law, but these laws are, to a large extent, state laws and they have a different orientation than patent and copyright law which protect intellectual innovations. Trademark law protects source significance; trade secret law protects confidential relationships and the right to be free from industrial espionage and other tortious conduct. In view of these differences, it is fair to call patent and copyright law the primary forms of federal intellectual property law, at least before the passage of the chip law. See also supra note 4.
each new innovation would create an extremely complicated body of law, which in turn would give rise to difficulties in administration and enforcement. To strike a new social bargain for each innovation would be foolhardy and unworkable. All prior innovations seem to have been adequately protected by simply expanding the boundaries of copyright or patent law. It would be foolish to embark on an expedition for the perfect *sui generis* protection each time something new comes along to challenge preexisting legal boundaries.

In order to have an intellectual property system in which there was only copyright and patent law, and in which there would never be a need to create a *sui generis* scheme for any new subject matter, it would be necessary to reconceptualize copyright and patent in ways that would free the systems from the historical subject matters to which they have been applied. It would be necessary to rethink the legal forms, pare them down to a more essential base, and adjust their rules accordingly. It would be necessary to reconceive the social bargain they now reflect.

As far as copyright is concerned, the rule against protecting utilitarian things would have to be abandoned. Copyright law might be reconceived as a system which protects as “works of

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163. The Doge of Venice in the sixteenth century apparently administered an intellectual property system in which he and his council made case by case determinations of the duration of protection to be accorded each new book or invention, based on their assessment of its benefit to the public. *See*, e.g., *Outline of the History of the United States Patent Office*, 18 J. PAT. OFF. SOC’Y 21-24 (1936) (discussing the Venetian intellectual property system and Galileo’s petition to the Doge for exclusive rights to an invention). Such a system is not feasible today. Nowadays, one cannot administer an intellectual property system by such an ad hoc process, giving a set of rock lyrics protection for two years but giving a great symphony one hundred years of protection. The system we have gives a new type of bottle cap the same length of protection as the first microprocessor chip. That may be absurd, in the sense that the social benefit from the bottle cap and from the microprocessor may be quite different, but it is the price we pay for simplicity in administration.

164. It is readily apparent that copyright law is weighed down with concepts that pertain to its earliest subject matter, namely books. The clearest example of this is the notion of “publication” as a significant copyright event. *See* 17 U.S.C. §§ 101, 401(a) (1982). Books get published. It is somewhat silly to talk about “publishing” a sculpture or a pantomime, let alone a chip mask or a machine. Similarly, patent law is weighed down with machine-oriented imagery. *See*, e.g., *In re Meyer*, 688 F.2d 789, 796 n.5 (C.C.P.A. 1982) (expert system program denied patentability because it did not transform matter) (citing Gottschalk v. Benson, 409 U.S. 63, 70 (1972)).

165. For a discussion of the social bargains that copyright and patent law now embody, see *infra* notes 195-208 and accompanying text.
authorship" any physical rendering of intellectual labor so long as it had the minimal degree of "originality" that copyright has historically required, and was "fixed" in some tangible medium of expression. Under this new system, not only would the words of a play be copyrightable, but also the design of a building, whether in plans or in the final constructed form, the shape of a chair or an airplane wing, and the configuration of a machine and its inner working parts.

Patent law would similarly need to be reconceived to protect nonobvious ideas regardless of the kind of works to which they might pertain. If someone came up with a nonobvious idea for processing information, a nonobvious mathematic formula or solution to a well-known problem, or a nonobvious design for a filing system, lamp, or sculpture, it would be patentable.

This reconception of the two systems would, of course, mean that a tremendous number of previously unpatentable nonobvious ideas and previously uncopyrightable designs would receive federal monopoly rights. The "gaps" between copyright and patent would be filled, and all new subject matters would fall somewhere within the dual system. It would be possible to get a patent for the nonobvious ideas embodied in either a book or a machine, and a copyright on the particularities of the expression or implementation of those ideas. Upon the expiration of the patent, the particularities of the book's expression or the machine's configuration could still be protected by copyright, although the nonobvious ideas would now be open to imitation so long as they were implemented in a different way. In this reconceived system, most semiconductor chip designs would get only copyright protection because most chip designs, while clearly products of substantial intellectual labor, would be obvious to people skilled in the art of chip design.

166. See supra note 48 and accompanying text.
167. See 17 U.S.C. § 102(a) (1982) (originality requirement); see also supra note 91 and accompanying text for the meaning of "originality" in copyright.
168. See 17 U.S.C. § 102(a) (1982) (requiring that a work of authorship be "fixed" in a tangible medium of expression to qualify for copyright protection); see also 17 U.S.C. § 101 (1982) (A work is "fixed" in a tangible medium of expression "when its embodiment in a copy or phonorecord . . . is sufficiently permanent or stable to permit it to be perceived, reproduced, or otherwise communicated for a period of more than transitory duration.").
169. Similarly, the vast majority of computer programs would be protected only under copyright because no more than a small fraction contain nonobvious ideas. See, e.g., CONTU FINAL REPORT, supra note 4, at 17 (noting that it was not clear if any programs were patentable, but even if they were, few could satisfy the standards). Genetically engineered products would likewise be eligible for copyright protection. See, e.g., Kayton, Copyright in Living Ge-
Some of those who testified in favor of including chip designs under copyright law seem to have been operating on the assumption that such a reconception was desirable or had already occurred. At one of the Congressional hearings conducted in 1983 on protection of chip designs, Professor Arthur Miller, who had chaired the CONTU subcommittee, which was responsible for studying the copyrightability of computer programs, testified that the decision to make chips copyrightable was a logical extension of Congress's earlier decision to make machine-readable computer programs copyrightable. In fact, the argument Miller used in his testimony closely paralleled the argument CONTU had used to support its conclusion that machine-readable computer programs could be copyrighted. As in the CONTU Report, Miller mentioned the broad and dynamic meaning of the constitutional term "writing." To show that this new technology was "writing," Miller analogized


170. See, e.g., Miller Testimony, 1983 Senate Hearings, supra note 43, at 87-99; 1983 Senate Hearings, supra note 15, at 137-39 (letter from Jocelyn West Brittin and James E. Ballowe, Jr., law offices of Boothe, Prichard & Dudley). But see 1983 House Hearings, supra note 6, at 51-63 (testimony of L. Ray Patterson, Professor of Law, Emory University School of Law) (arguing that a sound conceptual basis for copyright would be undermined if semiconductor chips were protected under copyright law).

171. See CONTU FINAL REPORT, supra note 4, at 6. The subcommittee of the commission that dealt with the copyrightability of machine-readable programs consisted of Professor Arthur Miller, E. Gabriel Perle of Time, Inc., and retired New York Court of Appeals Judge Stanley Fuld. Id.

172. Miller Testimony, 1983 Senate Hearings, supra note 43, at 97 ("I just simply cannot see conceptually how you can negate the copyrightability of mask works and accept computer programs and accept code books, which are just collections of unintelligible gibberish designed to produce a utilitarian function.").

173. Compare Miller Testimony, 1983 Senate Hearings, supra note 43, at 87-98 with CONTU FINAL REPORT, supra note 4, at 14-26. There is some difference in the ordering of the elements of the argument, and there are some new elements in the chip argument, but nevertheless there are substantial and important similarities in the two arguments. It is also important to note that CONTU was not unanimous in its recommendation of copyright protection for software. The novelist John Hersey and consumer lawyer Rhoda Karpatkin dissented, and the well-known copyright scholar Melville Nimmer concurred with some serious reservations about the advisability of extending copyright protection to software. See id. at 26-38.

174. See CONTU FINAL REPORT, supra note 4, at 14.

175. See Miller Testimony, 1983 Senate Hearings, supra note 43, at 88, 97.
it to objects already clearly recognized as "writings" and within the bounds of copyright. He reviewed the inadequacies of other existing forms of protection, and, once again, suggested that copyright was appropriate because it was the least inappropri-177 Miller curtly dismissed the utilitarian objection to the copyrightability of chip designs, and implied that anyone who was caught up in it was elevating form over substance. Miller also dismissed the argument that by protecting chip designs, copyright would be granting patent-like protection of ideas and not just expression. Miller noted that CONTU overcame similar objections in extending copyright protection to machine-readable computer programs, and urged that the Senate Committee have the courage to surmount similar fears concerning chip protection. So long as it was possible to design a chip another way than by copying, or possible to write different programs to implement the same function, Miller felt there would be no idea/expression problem.

176. See Miller Testimony, 1983 Senate Hearings, supra note 43, at 88-89 (likening chip designs to scrimshaw, works by Jackson Pollock, Mondrian, and Christo, and various other objects); see also CONTU FINAL REPORT, supra note 4, at 15 (likening programs to novels, poems, and plays.).

177. See Miller Testimony, 1983 Senate Hearings, supra note 43, at 90 (after eliminating patent and trade secret, copyright is left); see also CONTU FINAL REPORT, supra note 4, at 16-19. The report stated that "of the various potential modes of protection, copyright has the smallest negative impact." Id. at 18.

178. See Miller Testimony, 1983 Senate Hearings, supra note 43, at 89 ("Surely it is not that mask works are useful that disenables them from copyright protection."); see also CONTU FINAL REPORT, supra note 4, at 21 (copyright has not been denied to things on account of their utilitarian aspects).

Professor Miller made the following remarks at the 1983 Senate hearings:

A nation that awards a 75 year copyright monopoly to an E.T. piggy bank or an E.T. cushion or an E.T. lunch pail, and then gets itself bol-lixed up in a conceptual debate as to whether a mask work is too utili-
tarian, has got its priorities fouled up.

... [T]o worry about [the chip law's] placement in title 17 versus title XX is worrying about a shell game.

Miller Testimony, 1983 Senate Hearings, supra note 43, at 89-90. Professor Miller also said: "It just seems to me that there is no rational way of distin-
guishing that blown-up photograph of a chip from Jackson Pollock or Mond-
rian or Albers." Id. at 97.

179. See Miller Testimony, 1983 Senate Hearings, supra note 43, at 89 (dismissing this argument by noting that nothing in proposed legislation gives an owner a monopoly in a chip or would keep anyone else from producing them).

180. Id. ("That was an issue that [CONTU] faced in the late seventies. It is an old chestnut. It is a conceptual problem which, when you scratch at it it tends to disappear.").

181. Id. at 89-90; see also CONTU FINAL REPORT, supra note 4, at 20.
Given how calmly Congress reacted to the inclusion of computer programs in the copyright realm, it was somewhat surprising that Congress balked at a continuation of this expansive trend and took a step back toward the more traditional, if confining, views of copyright and patent. It was logical to make chips copyrightable after having made machine-readable computer programs copyrightable. Miller's argument in favor of copyright protection for chip designs was essentially identical to the argument CONTU made in favor of copyright protection for machine-readable computer programs. The rejection of Professor Miller's conception of copyright for chip protection demonstrates a congressional judgment that he misunderstood the nature of the utilitarian objection and its position at the core of copyright law. That same misconception pervades the CONTU Report on the copyrightability of computer

182. In Miller's view copyright has long protected "useful works," which is why he regarded the utility of computer chips and computer programs to be insignificant. But an examination of the examples he gives of "useful works" protected by copyright—newspapers, dictionaries, and "E.T." lunch pails, see Miller Testimony, 1983 Senate Hearings, supra note 43, at 89—reveals that Professor Miller does not fully comprehend the special meaning of "utility" as it is used in copyright parlance.

Newspapers and dictionaries are "useful" in the ordinary sense of the word, but not in the copyright sense of the word. Copyright has traditionally treated as "nonutilitarian," and hence copyrightable, those works whose only uses, and whose value, lay in the conveyance of information or the display of an appearance. See supra note 7 and accompanying text; see also Samuelson, supra note 7, at 732-36. Copyright regards those works that have additional functions beyond these two and whose value is in large measure attributable to those other functions as utilitarian. Newspapers and dictionaries convey information. This is what they are intended to do. What value they have is derived from this utility. Therefore, they are not "useful" in the sense that would bar them from receiving copyright protection. "E.T." lunch pails would at first blush seem to be uncopyrightable on account of their "usefulness," but a closer look reveals that a copyright would not protect the useful aspect of the lunch pail. Copyright will only protect the "E.T." lunch pail to the extent that the "E.T." pictorial design can be identified separately from the lunch pail and can exist independently from it. See 17 U.S.C. § 101 (1982). The "E.T." picture displays an appearance, is valuable for that reason, and is therefore copyrightable. That does not mean, however, that the lunch pail qua lunch pail has utility beyond the conveyance of information and the display of an appearance, which is why it traditionally has been regarded as beyond the scope of copyright law. Anyone can make a lunch pail in the same shape, and indeed they have. It is only if a manufacturer wants to put an "E.T." picture on the pail that the manufacturer needs permission from the owner of the "E.T." copyright. Miller's use of these items—newspapers, the dictionary, and the "E.T." lunch pail—as examples of "useful works" protected by copyright shows that he misunderstood the copyright definition of utility.
SUI GENERIS PROTECTION

IV. APPLYING THE LESSONS OF THE CHIP ACT TO SOFTWARE: THE NEED FOR SUI GENERIS PROTECTION

Congress's decision to reject copyright law as the mechanism for protecting computer chip designs was wise, and reaffirms the principle that copyright protection should not be extended to utilitarian subject matters. Congress should now reassess its earlier decision to extend copyright protection to machine-readable computer programs, another utilitarian subject matter. The same fundamental concerns about the duration of protection and the rights created by copyright which led to passage of the chip law, suggest that copyright law is not the proper vehicle for protection of computer programs, and that a sui generis approach is needed.

183. See Samuelson, supra note 7 at 727-49; see also CONTU FINAL REPORT, supra note 4, at 28-30 (dissent of Commissioner John Hersey). In his thoughtful concurrence to the majority report, CONTU Commissioner Nimmer expressed dismay at the majority's 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 a patent arena, and indeed, also in other areas which neither copyright nor patent law has previously extended.

CONTU FINAL REPORT, supra note 4, at 26 (emphasis in the original).

184. This author is not the only person to have called for a sui generis scheme for software. Richard Stern, a noted copyright lawyer, has stated: "Software is clearly different enough and important enough to justify its own system of legislative protection." Stern, The Case of the Purloined Object Code: Can It Be Solved? Part 2, BYTE, Oct. 1982, at 210, 222. See also Galbi, Proposal for New Legislation to Protect Computer Programming, 17 BULL. COPYRIGHT SOC'Y 280 (1970); Goldberg, Legal Protection for EDP Software, 18 DATAMATION 66, 70 (1972); Karjala, Lessons from the Computer Software Debate in Japan, 1984 AIZ. ST. L.J. 53, 61-81; Comment, Softright: A Legislative Solution to the Problem of Users' and Producers' Rights in Computer Software, 44 LA. L. REV. 1413, 1448-55 (1984); cf. Davidson, Protecting Computer Software: A Comprehensive Analysis, 1983 ARIZ. ST. L.J. 611, 760-84 (discussing various proposals for sui generis protection of software); Note, Semiconductor Chip Protection: Changing Roles for Copyright and Competition, 71 VA. L. REV. 249, 252 (1985) (arguing for sui generis protection for new technologies such as semiconductor chips because legal distinctions between writings and machines which have pervaded copyright and patent tradition should not be ignored in attempting to protect new technologies).

185. There are, of course, a number of arguments in favor of retaining copyright protection for computer programs. One is inertia. It would take a...
A. THE UTILITARIAN NATURE OF MACHINE-READABLE COMPUTER PROGRAMS

Machine-readable computer programs are "utilitarian" in a copyright sense. Because in the developmental stages pro-

major effort to design a new law that would be an improvement over copy-
right, and perhaps an even greater effort to amass the political consensus needed to get a new scheme passed. See, e.g., Davidson, supra note 184, at 760-
67 (discussing problems with previously proposed sui generis proposals for software). Another argument is that however often the software industry complains about copyright's inadequacies, it has already started adjusting to copyright law, and has found copyright useful enough to resist calls for a sui generis scheme. Yet another argument is that many other countries have now adopted copyright as a form of protection for software. See, e.g., M. KEPLINGER, LEGAL PROTECTION FOR COMPUTER PROGRAMS: A SURVEY AND ANALYSIS OF NATIONAL LEGISLATION AND CASE LAW (1984) (study sponsored by the World Intellectual Property Organization of how twelve countries have decided to treat software). For the United States to abandon copyright and create a new form of legal protection for programs, especially after the pressure it has brought to bear on other nations to accept the copyright regime, see, e.g., U.S. Opposes Japanese Proposal for Limited Software Protection, 27 PAT. TRADEMARK & COPYRIGHT J. (BNA) No. 669, 424 (March 1, 1984); S. 339, 99th Cong., 1st Sess., 131 CONG. REc. S908 (daily ed. Jan. 31, 1985) (bill would condition protection under U.S. copyright law for foreign nationals' software on whether their countries granted equivalent protection to U.S. nationals' software), would certainly be embarrassing and might create substantial international problems. Moreover, there are some features of copyright law which are very attractive to the software industry and which are unquestionably appropriate for programs. As strong as these reasons may seem, however, there are stronger reasons for creating a sui generis protection for machine-readable programs. If the international dimension of the problem were the only substantial reason to retain copyright protection for software, and if a more appropriate system were devised, it would seem wiser to adopt the better system than to continue with copyright out of respect for its short (and unsatisfactory) history of protecting software.

186. There is one very simple but important difference between a book which contains a set of instructions about how to do a particular task and a computer program in machine-readable form which contains a similar, if considerably more elaborate, set of instructions on the same subject: The former informs a human being about how the task might be done; the latter does the task. Computer programs now operate traffic light systems, update inventories, post sales, regulate pacemakers, tune radios, pump gas, and control car engines, among other tasks.

Programs dictate what kind of machine a computer will be. To the extent the program causes the machine to be something other than a book or an audiovisual work and to the extent it makes the computer a dishwashing machine or a gas pump, the traditional rules against copyright protection for utilitarian works and for machine parts ought to be enforced. This is particularly appropriate because the same kind of machine, if not a computer, would be disqualified from copyright protection under these rules. It is absurd to deny copyright protection to the shape of a television set on account of its
grammers are said to "write" programs, \(^{187}\) a process that re-
quires the preparation of a "source code" setting forth the se-
quence of hardware instructions necessary for a computer to
perform a desired function, it has been easy to focus on this
source code as a basis for asserting the copyrightability of its
machine-readable counterpart. \(^{188}\) The process of transforming
source code into machine-readable form is shrouded in mystery
to the uninitiated. This, and the fact that programs may be
stored on media such as cassette tapes, seems to have obscured
recognition of the utilitarian character of these machine-reada-
ble programs.

The utility of machine-readable programs, however, is un-
deniable. It is commonly recognized in the computer science
community that a customized piece of hardware can be built to
do any task that might otherwise be performed by running a
program on a general purpose computer. \(^{189}\) In other words,

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partially utilitarian character while allowing full copyright protection
to the operative mechanism controlling the tuning of the television
picture if that mechanism is run by a computer program. Copyright
law would not have protected the tuning device before it was computer-
ized. Congress could not have intended such an inconsistent result.
Having been so firm about limiting copyright protection to nonu-
tilitarian works, Congress could not have understood its decision to
extend copyright protection to computer programs to be a decision to
extend such protection regardless of the program's utility.

Samuelson, supra note 7, at 727, 748-49 (footnotes omitted).

Before computer programs, there may not have been any "literary works"
that were directly capable of operating a machine, although there are a few
cases in which things that could be within the definition of "literary works"
have been denied copyright protection because of their utility. See, e.g., Taylor
Instrument Co. v. Fawley-Brost Co., 139 F.2d 98, 100-01 (7th Cir. 1943) (circular
chart used in conjunction with temperature recording device not copyright-
able because of utilitarian character), cert. denied, 321 U.S. 785 (1944).

187. See supra note 11.

188. See, e.g., CONTU FINAL REPORT, supra note 4, at 9-10, 15 (emphasiz-
ing the characterization of computer programs as "writings" and analogizing
programs to other written works such as novels and plays); Iskrant, The Im-
 pact of Multiple Forms of Computer Programs on Their Adequate Protection
by Copyright, 18 COPYRIGHT L. SYMP. (ASCAP) 92, 107-19 (1970) (concluding
that computer programs are "writings" and analogous to phonograph records).

189. See, e.g., T. PRATT, PROGRAMMING LANGUAGES: DESIGN AND IMPLE-
MENTATION 19 (2d ed. 1984). Mr. Pratt stated:

Given a precise definition of a computer, it is always possible to real-
ize the computer in hardware, that is, to construct a hardware device
whose machine language is precisely that of the defined com-
puter. . . . In suggesting this possibility we are appealing to the im-
portant basic principle behind computer design: Any precisely
defined algorithm or data structure may be realized in hardware. Be-
cause a computer is simply a collection of algorithms and data struc-
tures, we may assume that its hardware realization is a possibility,
software is simply a substitute for certain hardware parts that would otherwise have to be constructed to make a single purpose machine capable of doing precisely the same task that the software could do. Computer programs in machine-readable form make it possible for one machine—a computer—to be many machines. Programs, in effect, tell the computer what kind of machine to be. That is why computer scientists refer to modern computers as "universal machines."

Nonutility is a fundamental principle of copyright law. Congress acknowledged that fact when it enacted sui generis protection for semiconductor chips. Machine-readable computer programs are utilitarian, and including them in the subject matter of copyright was a mistake that threatens to distort the fabric of copyright law. Like semiconductor chips, machine-readable programs fall into the "gap" between traditional patent and copyright subject matters. The chip protection debate suggests that sui generis protection should not be provided to these "gap" subject matters unless the subject matter is one of substantial importance to our economic future and there is a dramatic disparity between the costs of development and the costs of piracy. Software satisfies these two criteria regardless of the complexity of the computer or its associated machine language.

Id.

190. To be precise, we must realize that it is not the application program alone that performs the task we ask the computer to do. Nor is it the hardware alone. Rather, it is the complex hierarchy of programs and hardware that, while interacting with one another, works as a unit to perform a particular application task. . . . For functional purposes, the programs in a computer are part of the machine; programs are only substitutes for hardware. . . .

Computer programs make it possible for one machine to perform the functions of many machines. When a word processing program is operating in a computer, the computer is a word processor. When a videogame program is operating in a computer, the computer is a videogame machine. When a digital watch program is operating in a computer, the computer is a digital watch. With each new program, the computer is a new machine. . . . The program determines what kind of machine the computer will be.

Samuelson, supra note 7, at 680.

191. See, e.g., A. Hodges, Alan Turing: The Enigma 293-95, 318-21 (1983). Hodges quotes the mathematician and early computer scientist Alan Turing: "We do not need to have an infinity of different machines doing different jobs. A single one will suffice. The engineering problem of producing various machines for various jobs is replaced by the office work of 'programming' the universal machine to do these jobs." Id. at 293.

192. See supra notes 59-67 and accompanying text.

193. See supra notes 94-105 and accompanying text.
in the same way that chips do.\textsuperscript{194} Thus a \textit{sui generis} form of protection should be developed to give software producers the protection they require without distorting copyright law.

B. THE NEED FOR A DIFFERENT SOCIAL BARGAIN THAN COPYRIGHT PROVIDES

Looking at federal intellectual property law macroscopically, society makes a social contract or bargain with authors, inventors, and other creative people, whereby society gives them certain rights in exchange for which they give certain things to the public.\textsuperscript{195} Under copyright law, society grants authors certain exclusive rights, primarily control over the copying and distribution of copies for at least fifty years,\textsuperscript{196} in exchange for the public benefits derived from widespread dissemination of the works' ideas and expression upon publication.\textsuperscript{197} Although copyright law has been solicitous of an author's desire not to publish at all,\textsuperscript{198} it has traditionally assumed that if an author does decide to reap commercial rewards, the social bargain will be carried out.\textsuperscript{199}

The social bargain of copyright limits the author's rights to his or her "expression." The "ideas" in the work can be used

\textsuperscript{194} See Samuelson, \textit{supra} note 7, at 687-92.

\textsuperscript{195} It is common to see copyright and patent law described as a kind of social contract or bargain. See, e.g., Fried, Krupp Aktien-Gesellschaft v. Midvale Steel Co., 191 F. 588, 594 (3d Cir. 1911) (patent described as a "contract between an inventor and the government"); White, \textit{Why A Seventeen Year Patent?}, 38 J. PAT. OFF. SOC'Y 839, 839-40 (1956) (patent described as "an exchange of a bundle of temporary exclusive rights from the state for an inventor's immediate disclosure and the later unlimited use of his invention.").

\textsuperscript{196} See \textit{supra} notes 32, 115 (discussing the exclusive rights and duration of copyright).

\textsuperscript{197} R. SALTMAN, COPYRIGHT IN COMPUTER-READABLE WORKS: POLICY IM-PACTS OF TECHNOLOGICAL CHANGE 52 (1977) (disclosure of ideas and expres-sion is the quid pro quo for granting exclusive rights to copyright owners).

\textsuperscript{198} There is no requirement that copyright owners publish their works to receive copyright protection. See 17 U.S.C. § 302(a) (1982) (duration of copyright protection not dependent on publication); 17 U.S.C. § 408(a) (1982) (copyright protection is not conditioned on copyright registration); see also infra notes 221-223 (discussing copyrights in unpublished works).

\textsuperscript{199} Underlying the copyright system is a basic assumption that authors will "publish" their works when seeking to reap the commercial rewards for them. Publication would, by its nature, disclose the contents of the work. Neither publication nor disclosure of the work is required, however, because it was assumed that reaping commercial rewards would not be possible without publishing and disclosing. Machine-readable computer programs are the first category of copyrightable work for which it is possible both to reap the commercial rewards of one's creativity and keep the work secret. See \textit{supra} note 11.
by anyone, even to write a book which will compete with the original author's book.\textsuperscript{200} In fact, one of the reasons copyright grants such a long period of protection is that the author's rights are limited by this idea/expression dichotomy.\textsuperscript{201} If copyright granted an author a set of exclusive rights in his or her ideas, as well as in the book's expression, the period of protection would undoubtedly be shorter. An additional reason for granting a long period of protection has been the nonutilitarian character of the works copyright has protected.\textsuperscript{202} It is one thing to grant a lengthy term of protection to songs, poems, and paintings, and quite another to do so for airplane wings, pumps, and clothes dryers.

Similarly, the social bargain inherent in patent law also involves an exchange. Society grants the inventor\textsuperscript{203} a certain set of exclusive rights, primarily a seventeen-year term of control over the making and distribution of the invention, in return for disclosure of the elements of the invention and the eventual right of the public to practice freely the art the patent teaches. Meaningful and extensive disclosure is required by statute in order to get a patent.\textsuperscript{204} Disclosure is required in large part because, unlike published works protected by copyright, the knowledge to be derived from a patented work often will not be apparent from examination of the patented item. The knowledge that can be derived from the patent application is considered to be in the public domain as soon as the patent

\textsuperscript{200} See, e.g., Baker v. Selden, 101 U.S. 99, 103 (1879) (no right to control use of ideas or knowledge through copyright); see also 17 U.S.C. § 102(b) (1982) (no copyright protection for ideas, methods, discoveries, processes, and the like).

\textsuperscript{201} See 1 M. Nimmer, Nimmer on Copyright § 1.10[B][2] (1985).

\textsuperscript{202} See supra note 7, at 732-36.

\textsuperscript{203} Patent law does not give exclusive rights to everyone who improves upon the prior art, but only to true inventors. See supra notes 84-85 and accompanying text.

\textsuperscript{204} The patent statute requires that the patent applicant provide a written description of the invention and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same, and shall set forth the best mode contemplated by the inventor of carrying out his invention. 35 U.S.C. § 112 (1982). Applications for a patent are confidential pending issuance of the patent. 35 U.S.C. § 122 (1982). Once the patent issues, the specification is annexed to the patent and is no longer treated as confidential subject matter. See 35 U.S.C. § 154 (1982).
issues.\textsuperscript{205}

Patent law gives the inventor a monopoly on the invention for seventeen years.\textsuperscript{206} The duration of the patent monopoly is shorter than copyright, in part because patent rights extend to practicing the "art" the patent discloses,\textsuperscript{207} and in part because it is socially desirable for the monopoly on utilitarian items to be shorter than the monopoly on nonutilitarian items.\textsuperscript{208}

Giving copyright protection to machine-readable computer programs completely upsets the traditional intellectual property bargain.\textsuperscript{209} Despite the fact that programs are a utilitarian subject matter, they are protected for at least fifty years. This runs counter to the congressional judgment, embodied in the patent and chip laws, that utilitarian works should be subject to shorter terms of protection than works that only convey information or display appearances. Furthermore, when other types

\textsuperscript{205} E.g., Kewanee Oil Co. v. Bicron Corp., 416 U.S. 470, 481 (1974). The Court stated:

When a patent is granted and the information contained in it is circulated to the general public and those especially skilled in the trade, such additions to the general store of knowledge are of such importance to the public weal that the Federal Government is willing to pay the high price of 17 years of exclusive use for its disclosure, which disclosure, it is assumed, will stimulate ideas and the eventual development of further significant advances in the art.

\textit{Id.} (emphasis added).


\textsuperscript{208} See, e.g., Denicola, \textit{Applied Art and Industrial Design: A Suggested Approach to Copyright in Useful Articles}, 67 MINN. L. REV. 707, 726 (1983) (suggesting that artistic works are more susceptible to appropriation than industrial designs and therefore in need of greater protection); Samuelson, \textit{supra} note 7, at 736; White, \textit{supra} note 195, at 842-45. See \textit{supra} notes 107-112 and accompanying text for a discussion of the proportionality of patent, copyright, and chip law durations.

\textsuperscript{209} As pointed out above, \textit{supra} note 11, programs in machine-readable form cannot be read as books can be read; in other words, they do not disclose their contents, which means that the knowledge they contain is kept secret. Moreover, as pointed out in \textit{infra} note 252 and accompanying text, some software producers are trying to prevent reverse engineering of programs through coordinate copyright/trade secret protection. Although it is true that a copyright in a program will eventually expire, the commercial life of programs is, as pointed out in \textit{infra} note 213, much shorter than the copyright duration, see 17 U.S.C. § 302 (1982). Furthermore, a frequent commercial practice in the software publishing field is to bring out updated (and newly copyrighted) versions of commercially valuable programs. The updates will incorporate portions of code from the prior versions, and it will be difficult, if not impossible, for a user to be able to know what part of the code is, say, a year (or whatever) closer to being in the public domain and what has just been added. Practically, this will mean unlimited duration copyrights in programs.
of copyrightable works are commercially exploited, the knowledge they embody is disclosed to society in return for copyright protection.

The Semiconductor Chip Protection Act of 1984 demonstrates that when inclusion of a new technology into patent or copyright law would upset the intellectual property bargain, a *sui generis* approach is necessary. The chip law strikes an appropriate balance between the needs of society and the needs of the industry. For example, in exchange for granting semiconductor chips ten years of protection, the law requires registration within two years of the first commercial use of the design and explicitly permits reverse engineering. As a practical matter, computer programs in machine-readable form do not belong in copyright any more than computer chips did. Because of the utilitarian character of programs and because of the generally short commercial life of software, a shorter term than copyright provides would seem appropriate. Congress has been slower to warm to the idea of a *sui generis* form of protection for machine-readable programs. The social bargain of copyright, however, has been upset by the inclusion of computer programs and it is now Congress's responsibility to set things right.

C. Multiple Forms of Protection as a Sign of Copyright's Inadequacies

If copyright were adequate to meet the needs of the software industry, the software industry would not have to engage in a frantic search for multiple layers of protection. Presently, however, there is widespread use of multiple and seemingly inconsistent forms of legal protection, such as patent coupled with copyright, trade secret coupled with copyright, or

210. See supra note 32 and accompanying text.
211. See supra note 155 and accompanying text.
212. See supra note 124 and accompanying text.
a combination of all three. Furthermore, software producers frequently use licensing agreements to create a more palatable set of exclusive rights and limitations than copyright, on its own, provides. This widespread use of multiple forms of pro-

215. An example will help illustrate how these multiple forms might currently be used to protect software, and how radical the results would be as compared with what the law previously allowed. Suppose someone discovers how to make a new kind of fuel injection device for automobile engines. If the idea is implemented in hardware form, it is clear that the design of the hardware cannot be copyrighted because of the utilitarian character of the device. It can not be patented unless it is nonobvious and otherwise meets patent standards. If it is patented, the inventor will have to disclose the details of the invention, which will make it impossible to claim the device as a trade secret. Even if the device is unpatented, it cannot long be protected as a trade secret because once a car embodying the system is sold, it will be readily possible to “reverse engineer” the device, see supra note 78 and accompanying text, and there will no longer be a “secret” that can be protected.

If, however, the same fuel injection system is implemented in software, the program that dictates how much fuel to inject into the engine at any given time will, as some interpret the law now, be copyrightable. See Apple Computer, Inc. v. Franklin Computer Corp., 714 F. 2d 1240, 1251 (3d Cir. 1983) (operating system programs held copyrightable despite being part of the machine), cert. dismissed, 464 U.S. 1033 (1984); 17 U.S.C. § 101 (1982) (definition of “computer program”). If the designer of this device seeks a patent on it, or on the process the program carries out, it may not be necessary to disclose the contents of the program because the Patent Office has not been requiring this kind of disclosure on computer program patent applications. Cf. White Consol. Indus. v. Vega-Servo-Control, Inc., 713 F. 2d 788, 788-89, 792 (Fed. Cir. 1983) (patent office had issued a patent on a numerical control system without requiring disclosure of the computer program implementing it; patent was invalidated, however); Note, Patenting Inventions That Embody Computer Programs Held As Trade Secrets, 59 WASH. L. REV. 601 (1984) (discussing White). The creator of this new computerized system might also try to maintain it as a trade secret. The sale of the device installed in a car might not dispel the secret, as it normally would with hardware, because it might infringe the copyright to copy the program for study. See, e.g., Hubco Data Prods. Corp. v. Management Assistance, Inc., 1983-84 Copyright L. Decisions (CCH) ¶ 25,529 (D. Idaho 1983); see also infra note 252 and accompanying text. If there is no lawful reverse engineering of the trade secret, the secret remains intact. Thus the inventor who implements her fuel injection system in software could theoretically have at least three layers of intellectual property protection in the same thing, including two types of protection, copyright and trade secret, that would be unavailable if the same device were implemented in hardware.

216. For instance, many firms try to limit the right to use software to one user and/or one machine. See, e.g., FIFTH ANNUAL COMPUTER LAW INSTITUTE 507 (1984) (MicroPro licensing agreement limits use to one machine). Without an agreement, copyright owners cannot control uses of their works, for use is not among the five exclusive rights of the copyright owner, see 17 U.S.C. § 106 (1982). Other firms attempt to limit or eliminate a right to make “back-up” copies of the software. See FIFTH ANNUAL COMPUTER LAW INSTITUTE 507 (1984) (MicroPro license agreement provides that a user can only make a copy of MicroPro products when authorized to do so in writing by MicroPro). Some
tection is evidence that copyright provides inadequate protection for programs.

In the past, joint copyright and patent protection for the same subject matter has been impossible. The two schemes were mutually exclusive, because patent law traditionally re-

firms also attempt to prevent buyers or lessees from making adaptations of the software, even for personal use. Id. at 514 (The Visicorp Customer License Agreement states: "Neither the program nor its documentation may be modified or translated without . . . written permission from VISICORP."). Some firms even purport to restrict the user's rights to the "outputs" generated through use of the program. The author has been informed by Computer Science Department faculty at Carnegie-Mellon University that the owner of one widely-used operating system claimed the right to block the sale of a commercially valuable word processing program written by a CMU student and developed with the assistance of the owner's operating system when the student sought to sell it to a competitor company. The owner probably regarded the student's word processing program as a "derivative work" within the meaning of the copyright statute. See 17 U.S.C. § 101 (1982), see also infra notes 235-245 and accompanying text.

The standard licensing agreements often included in packaged software many times contain other provisions restricting the user's rights. The MicroPro End User Program License Agreement Article 3 states:

The MicroPro logo, product names, software, manuals, documentation, and other support materials are either patented, copyrighted, trademarked, or owned by MicroPro as trade secrets and/or proprietary information. End User agrees not to remove any product identification or notices of such proprietary restrictions from MicroPro Products. MicroPro retains exclusive ownership of the MicroPro software, of MicroPro printed materials and of the MicroPro trademarks . . . . All techniques, algorithms, and processes contained in MicroPro's products or any modification or extraction thereof constitute trade secrets and/or proprietary information of MicroPro and will be protected by End User.

FIFTH ANNUAL COMPUTER LAW INSTITUTE 507 (1984). Many of them inform the prospective purchaser that he will not really be the "owner" of a copy of software but rather a "licensee," and that the license is not transferable. Id. at 511. The validity of many of these restrictions is highly questionable. See, e.g., F.E.L. Publications, Ltd. v. Catholic Bishop of Chicago, 506 F. Supp. 1127, 1134 (N.D. Ill. 1981) (copyright owner may not unlawfully extend scope of copyright monopoly through license restrictions), rev'd on other grounds, 214 U.S.P.Q. (BNA) 409 (7th Cir. 1982); Rice, Trade Secret Clauses in Shrink-Wrap Licenses, 2 COMPUTER LAW., Feb. 1985, at 17; Software Sales are Not Sales, Publishers Say, Legal Times, April 15, 1985, at 1, col. 1 (describing controversy over whether over-the-counter sales of software can be licenses).

217. Ornamental designs for articles of manufacture, if nonobvious and original, may be eligible for design patent protection. See 35 U.S.C. § 171 (1982). If these designs meet the nonutilitarian standard of copyright, see supra note 63 and accompanying text, then they may be protected instead through the copyright laws. This is the only respect in which there has been some subject matter overlap between copyright and patent law.

218. See Taylor Instrument Co. v. Fawley-Brost Co., 139 F.2d 98, 99 (7th Cir. 1943) (discussing the exclusivity of patent and copyright), cert. denied, 321 U.S. 785 (1944); Note, supra note 184, at 292 ("When copyrights intrude into
quired that a thing have utility to be patentable and copyright traditionally required that a thing not have utility to be copyrightable. Once copyright is extended to protect the design of a utilitarian thing, very serious and difficult questions arise concerning the legal effect of a copyright and patent in the same object.

Similarly, joint trade secret and copyright protection has been impossible because the basic assumptions of the two bodies of law are incompatible. Federal copyright law has always been focused on published works, which by their very nature were incapable of being held as "trade secrets." Although the 1976 revision of the Copyright Act was clearly intended to pre-empt state common law copyright for unpublished works, it the province of patents, however, the public purpose in patents is badly compromised.

219. Utility is required for patentability under 35 U.S.C. § 101 (1982). As indicated supra notes 59-63 and accompanying text, utilitarian works are excluded from the copyright realm unless they have nonutilitarian aspects which can be identified separately from and can exist independently of the utilitarian aspects, and then only the nonutilitarian part can receive copyright protection.

220. For example, when the patent expires, what if anything enters the public domain? Might not the incentive to seek a patent, which requires disclosure of the valuable idea, be undermined if one can get a longer period of protection without disclosure under copyright? See Note, supra note 184, at 292 (discussing the potential for deterioration of the patent system if copyright moves into the protection of utilitarian works).

221. The primary focus of the Copyright Act of 1909 was on published works. See Act of Mar. 4, 1909, Pub. L. No. 349, § 9, 35 Stat. 1075, 1077 (superseded 1976) (permitting authors to obtain federal copyright protection through publication of the work with proper notice of the copyright claim). Section 2 of the 1909 Act, however, provided that nothing in that Act would prevent authors of unpublished works from preventing copying, publication, or use of those unpublished works at common law or in equity. See Act of Mar. 4, 1909, Pub. L. No. 349, § 2, 35 Stat. 1075, 1076 (superseded 1976). State common law copyright had previously been the primary mode of protection against the appropriation of unpublished works without the consent of the author. See, e.g., Bobbs Merrill Co. v. Straus, 210 U.S. 339, 346 (1908) ("At common law an author had a property in his manuscript and might have redress against anyone who undertook to realize a profit from its publication without the authority of the author."); Gorman, An Overview of the Copyright Act of 1976, 126 U. PA. L. REV. 856, 857-59 (1978) (common law regulated exploitation of unpublished works). State common law copyright was often called "the right of first publication." See 1 M. NIMMER, NIMMER ON COPYRIGHT § 4.01[B] (1985).

The Copyright Act of 1976 provides that copyright now attaches from a work's creation. See 17 U.S.C. § 302(a) (1982). The primary focus of the law remains on published works, however, as can be seen from a review of copyright cases since the 1976 Copyright Act took effect, virtually all of which involve disputes over published works.

222. In 1976, the copyright law was revised, and federal copyright protection attached from the instant the work was fixed on paper or in some other
does not appear that Congress intended to turn federal copyright law into a federal trade secret protection statute.\textsuperscript{223}

Software producers, who have long relied primarily on trade secret law, now insist they must have both copyright and trade secret protection, and bristle at the suggestion that they be required to elect only one form of protection.\textsuperscript{224} They feel that disclosure of the contents of their commercially valuable programs, which copyright law would require, would destroy their business.\textsuperscript{225} In effect, they want to transform copyright

\textsuperscript{223}In 1976, when copyright protection was extended to include the period before the work was published, there was no clear expression of congressional intent to turn the federal copyright laws into a federal trade secret protection statute. The legislative history of the preemption provision of the Copyright Act of 1976, indicates that the availability of relief under state trade secret law would be unaffected by the new federal copyright law so long as the state cause of action retained elements different in kind from copyright infringement (such as a breach of trust). See H.R. REP. No. 1476, 94th Cong., 2d Sess. 132, reprinted in 1976 U.S. CODE CONG. & AD. NEWS 5659, 5747-48.


\textsuperscript{225}According to software industry lawyers, the commercial advantage of a software firm may be dependent on the secrecy of the algorithm that the firm has developed to perform a particular task. If the firm is forced to disclose that algorithm, other firms would be able to develop competitive programs without having to expend the heavy research and development costs incurred by this innovator. The algorithm for a program is probably an "idea" or "procedure" so it would not be protected by copyright law, \textit{see} 17 U.S.C. § 102(b) (1982). The innovator, therefore, could not control the commercial exploitation of the competitive programs. This argument resembles the argument made by the semiconductor industry concerning "free rides." \textit{See supra} notes 101-105 and accompanying text.
law into a federal trade secret statute, which would give protection without the quid pro quo of disclosure. Whether it is wise or consistent with the constitutional purpose of copyright to have copyright become a federal trade secret statute is highly questionable. As important as computer programs are to our economic future, it is not clear that they are so important as to require these kinds of distortions of traditional copyright principles, especially since these distortions are likely to affect other subject matter besides programs. At a minimum, the case for special relief from the burdens of disclosure should be made openly to Congress; it should not be allowed to arise by default because of prior misunderstandings about what was at stake.

If Congress is concerned about preserving the traditional boundaries of intellectual property law, and the balance in the law which arises from those boundaries, a sui generis system of protection for software will have to be devised. If it is, software producers will no longer have to stack up layers of protection in order for their interests to be adequately protected, and courts will be spared the problems associated with sorting out the rights created by overlapping forms of legal protection for software.

D. THE NEED FOR A DIFFERENT SET OF EXCLUSIVE RIGHTS

Through "licensing agreements" and multiple layers of legal protection, many software producers are currently trying to obtain a different set of exclusive rights than copyright offers. By adopting sui generis protection for computer pro-

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226. See Samuelson, supra note 7, at 717-19 (discussing why there may be a trend toward enforcement of trade secrets through copyright).

227. The concern is that the public welfare will not be served. See, e.g., Register of Copyrights, Copyright Law Revision: Report of the Register of Copyrights on the General Revision of the United States Copyright Laws 5 (1961) ("As reflected in the Constitution, the ultimate purpose of copyright legislation is to foster the growth of learning and culture for the public welfare, and the grant of exclusive rights to authors for a limited time is a means to that end."); see also Twentieth Century Music Corp. v. Aiken, 422 U.S. 151, 156 (1975) (the immediate aim of copyright to compensate authors for their creations "must ultimately serve the cause of promoting broad public availability" of those works); Note, supra note 184, at 281 (noting that the Apple Computer case "seems to undermine the constitutional purpose of copyright, which is to promote knowledge by granting the author an exclusive right in his creation"); N.Y. Times, July 5, 1983, at D5, col. 3 ("The notion of secret copyrights is abominable.") (quoting Professor Ralph Brown of Yale University).

228. Some groups, such as the American Bar Association's Science and
grams, Congress can specify a different set of exclusive rights that are more appropriate for the subject matter and that strike a more equitable balance between the rights of software producers, software users, and the public at large.

In devising a legal scheme applicable only to programs, Congress would surely want to give software developers exclusive rights to make and distribute copies of the protected program. These are two of the exclusive rights of copyright owners, but the same two exclusive rights are found in patent law and the new chip law as well. As with semiconductor chips, there does not seem to be a need to give program owners the exclusive rights of public display or public performance of the programs. Under current copyright law, however, program owners are granted these exclusive rights.

Technology Section, have been trying to draft model software licensing agreements. See ABA, SECTION OF SCIENCE AND TECHNOLOGY, COMMITTEE ON CONTRACTING FOR COMPUTERS, MODEL SOFTWARE LICENSING AGREEMENT (draft June 8, 1984). This same ABA Section has put together a collection of sample licensing agreements for software. See ABA, SECTION OF SCIENCE & TECHNOLOGY, COMPUTER LAW DIVISION, SOFTWARE LICENSING PRACTICES COMMITTEE, SOFTWARE CONTRACT FORMS (Jan. 1984). It is easy to imagine how difficult it must be for users to keep track of which restrictions apply to which programs. Many agreements contain provisions that terminate the license agreement upon breach of any of the terms of the license. See, e.g., FIFTH ANNUAL COMPUTER LAW INSTITUTE 507 (1984) (MicroPro licensing agreement termination provision). Termination of the agreement will render any use after that time a copyright infringement as well as a breach of contract. The confusion that may arise when a user tries to figure out which software licensing restrictions apply to which software can lead even a well-meaning and reasonably diligent user into trouble, often without there being any real injury to the economic interest of the software copyright owner.


232. To protect the commercial interests of playwrights and sculptors, it makes sense to give them rights to control public performances of their plays and public displays of their sculptures. On the other hand, public performance and display rights would not seem to be necessary for computer program owners, because of the utilitarian character of programs and because the commercial interests of software producers can be protected in other ways. For those few programs, such as videogames, that might produce a kind of "performance" that should be protected, a copyright could still issue to protect the audiovisual display, because as noted infra note 255, videogames were originally given copyright protection as audiovisual works.

This may result in a technical infringement, but an infringement in which it would be inappropriate to attach liability.\textsuperscript{234}

Whether there should be a derivative work right for machine-readable programs is likely to be a hotly contested issue. Copyright law gives copyright owners the exclusive right to prepare "derivative works," in order to protect against such things as unauthorized translations of an author's novels.\textsuperscript{235} Copyright defines "derivative work" very broadly.\textsuperscript{236} Such a broad definition, however, may not be appropriate with respect to computer software. Even whether to give the developer of a program the right to control translations of the program from, for example, Fortran to Pascal is problematic given that different languages require different structures and that the program "expression" is basically functional in nature. Even assuming translations should be protected, the copyright derivative works right is so broad that it may include a wide range of things that were not intended to be, and should not be, controlled by the program owner.\textsuperscript{237}

Before discussing what those things are, it is worth empha-

\textsuperscript{234} For example, at many universities there is a computer facility with many terminals, all in the same room, available for students to use. The term "publicly," for the purposes of assessing performances and displays is defined in the statute to mean "to perform or display it at a place open to the public or at any place where a substantial number of persons outside of a normal circle of a family and its social acquaintances is gathered." 17 U.S.C. § 101 (1982). The computer facility or users at the facility, therefore, could be said to infringe these exclusive rights every time they use a program in the common room when other students are milling about or busy at their own work. The same type of situation may arise in many businesses. This is not the kind of situation Congress contemplated as an infringement.

\textsuperscript{235} Under the Copyright Act of 1909, there was no "derivative works" right as such. Rather, the statute listed various specific examples of an author's exclusive rights. See Act of Mar. 4, 1909, Pub. L. No. 349, § 1, 35 Stat. 1075, 1075 (superseded 1976). Section 1, for example, provided in subsection (b) that authors had the exclusive right to make or authorize translations of their works, to dramatize the works if nondramatic, to transform them to novel form if dramatic works, and so forth. See id. § 1(b), 35 Stat. at 1075. The Copyright Act of 1976 simplifies things by giving copyright owners an exclusive right to prepare derivative works, see 17 U.S.C. § 106(2) (1982), and defining derivative works rather broadly, see id. § 101.

\textsuperscript{236} See supra note 123 for the full definition. The key words of the definition of "derivative work" under § 101 are: "work based upon one or more preexisting works . . . ." 17 U.S.C. § 101 (1982) (emphasis added).

sizing that neither patent law nor the new chip law provides an exclusive right to prepare derivative works. It does not infringe a patent right for a consumer to buy a patented item and make adaptations to it, or to sell the adapted item to a third person. The same is true for semiconductor chips.

It may be appropriate to apply this same rule to machine-readable programs because, like the subjects protected under patent and semiconductor chip law, they are also utilitarian in nature. At present, the copyright law gives owners of copies of programs the right to adapt the programs if the adaptations are essential steps in utilizing the programs or if the adaptation is for archival purposes only. One court has construed this provision to mean that users have a right to adapt a machine-readable program only if the program cannot be executed in unadapted form. This adaptation right is much too narrow.

See 35 U.S.C. § 154 (1982). One of the early patent cases in which a patentee sought a “derivative works” right under patent law was O'Reilly v. Morse, 56 U.S. (15 How.) 62 (1854). In that case, the inventor of the telegraph claimed patent rights to all devices, not just the one he developed, that employed electric current to communicate intelligible marks over long distances. The Supreme Court ruled that this claim was illegal and void. Id. at 120. The rule in patent cases since then has been that the inventor only has rights to that which he has actually invented and its equivalents.


See 17 U.S.C.A. § 117 (West Supp. 1985). This section provides:

(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.

See Midway Mfg. Co. v. Strohon, 564 F. Supp. 741, 749 (N.D. Ill. 1983) (finding that enhancement kit for videogame constituted infringement of “lit-
The whole point of buying rights to a program is to get the program to do what it was purchased to do.\textsuperscript{243} The derivative works right is most questionable when applied to works generated through use of the program.\textsuperscript{244} Programs that provide substantial creative input into the development of new works, such as music, pictures, or chemical formulas are already available in the marketplace.\textsuperscript{245} More will be available in the future. Software producers, under the derivative works provision of the copyright law, could conceivably claim ownership rights in everything generated through use of their programs. Because no other kind of copyrighted work is utilitarian and capable on its own of generating other works, the issue raised by this application of the derivative works right has not been addressed before. The reasons that support giving novelists protection from unauthorized translations, however, do not support giving software producers ownership rights in everything generated through use of their programs.

There may, however, be good reasons to give program owners an exclusive right to control use of their work, just as patent law gives the patentee the exclusive right to use the

\begin{quote}
\textsuperscript{243} One consequence of Congress's decision not to let rightful possessors of programs make even "essential step" modifications is that virtually all software available in the market place is "licensed," not "sold." (The validity of many of these "licenses" is questionable. See supra note 216.) This practice means that the industry has stymied any legal recognition of user modification rights. That, of course, will not necessarily stop users from modifying the software to suit their purposes anyway (as, for example, to correct a "bug" in the program), but it does put them in a precarious position if and when a legal dispute arises.

\textsuperscript{244} See supra note 123 (full copyright definition of "derivative work"). Arguably, because of the breadth of the definition, a computer-generated work is "based upon" or "derived from" the program that generated it. It would thus be a "derivative work" within the meaning of the statute.

\textsuperscript{245} When CONTU was studying new technology issues, it recognized that computer programs were involved in creating new works of this sort. See CONTU FINAL REPORT, supra note 4, at 43-44. CONTU, however, glossed over the authorship problems computer-generated works could create by assuming that the user would always be the author and that computers could not make any meaningful contribution to authorship. Id. at 44-46. CONTU said nothing about the critical question of whether machine-generated works would or would not be derivative works within the meaning of 17 U.S.C. §§ 101, 106(2) (1982).
\end{quote}
patented invention. Given the utilitarian character of machine-readable programs, the fact that what has been implemented in software could instead have been implemented in patentable hardware, and the fact that the software industry already collects much of its income based on use, an alignment of software law with patent law in this respect would make sense. It might also reduce the software industry's penchant for using multiple forms of protection and "licensing agreements" to get what copyright law will not provide.

E. THE NEED FOR A DIFFERENT SET OF LIMITATIONS ON EXCLUSIVE RIGHTS

The utilitarian character of programs makes it appropriate to impose limitations that are more akin to those of patent law than copyright on the exclusive rights of program owners. Two patent-like limitations on exclusive rights have already been discussed: allowing the protected work to be used as a tool to create other works, and allowing the work to be modified if necessary to fulfill its intended purpose. A broader first sale rule, similar to the one available in the chip law and patent law, might also be appropriate for machine-readable computer programs.

Program users should also have the right to reverse engineer a program and to make a copy of the program for reverse engineering purposes. This feature of the chip law should be

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246. See supra note 189 and accompanying text.
247. See supra notes 215-216 and accompanying text; see also Lawlor, A Proposal for Strong Protection of Computer Programs Under the Copyright Law, 20 JURIMETRICS J. 18, 25-28 (1979) (strongly urging that software copyright owners should have right to control use of their programs).
248. The copyright "first sale" rule limits the copyright owner's right to enforcement of two of the five exclusive rights he may have, namely the right to control distribution and public displays of certain works. Those exclusive rights are exhausted after a "first sale" of the work to the public. That is, the copyright owner is entitled to a share on the first sale to the public, but not thereafter. See 17 U.S.C. §§ 109, 106(3),(5) (1982). Additionally, the "first sale" right is given only to "owners" of copies of copyrighted works. 17 U.S.C. § 109(c) (1982). As mentioned supra note 243, it is virtually impossible to "buy" a piece of software outright, for the software industry claims only to "license" use, so possessors of software have virtually no "first sale" rights whatsoever.
249. The chip law's "first sale" rule is broader. See 17 U.S.C. § 906(b) (Supp. II 1984). It grants the owner of the mask work a continuing exclusive right to control reproductions of the work following the "first sale." Id.
250. The patent rule is similar to the chip law's rule. See 4 D. CHISUM, CHISUM ON PATENTS § 16.03(2) (1985).
251. See supra notes 124-130 and accompanying text.
incorporated in a *sui generis* scheme for programs. At present, software firms are attempting to use a hybrid of copyright and trade secret law to make reverse engineering unlawful.\textsuperscript{252} This is at odds with traditional intellectual property principles, but, unless the law is amended, software producers can be expected to press their claims in this direction.

**F. A DIFFERENT TEST FOR INFRINGEMENT**

Another reason for preferring a *sui generis* approach to copyright is that the test traditionally used to determine whether there has been a copyright infringement cannot be meaningfully applied to programs. Although copyright is certainly adequate to protect against exact duplicates of the protected work, many infringement disputes do not involve identical copies but rather "new" works that are substantially similar to the copyrighted work. Although expert testimony on the general similarity of the works is admissible in evidence,\textsuperscript{253} the traditional test of copyright infringement has always been whether "a lay observer" comparing the copyrighted and the allegedly infringing work would regard the two as being so substantially similar as to conclude that the latter had unlawfully appropriated the expression of the former.\textsuperscript{254} The "lay observer" test, however, requires subject matter that is amenable to visual or audible presentation, either directly or with the aid of a machine or device, so that a comparison of the two works can be made. Some machine-readable computer programs cause an audio or visual display.\textsuperscript{255} This has prevented most

\textsuperscript{252} See, e.g., Hubco Data Prods. Corp. v. Management Assistance, Inc., 1983-84 COPYRIGHT L. DECISIONS (CCH) \$ 25,529 (D. Idaho 1983) (acknowledging right to reverse engineer under trade secret law, but finding copyright infringement based on core dump of program in order to study its contents); Grogan, *supra* note 11, at 8-10 (study of protection afforded by distributing software only in object code form).

\textsuperscript{253} See 3 M. Nimmer, NIMMER ON COPYRIGHT \$ 13.03[E][3] (1985).

\textsuperscript{254} Id. \$ 13.03[E], at 13-46 to 13-47 n.92. One often-quoted formulation of similarity is Judge Learned Hand's statement from Peter Pan Fabrics, Inc. v. Martin Weiner Corp., 274 F.2d 487, 489 (2d Cir. 1960): "[Whether] the ordinary observer, unless he set out to detect the disparities, would be disposed to overlook them, and regard their aesthetic appeal as the same."

\textsuperscript{255} Videogames are an example of computer programs that create vivid audiovisual displays. The audiovisual aspects of these games are separately copyrightable as audiovisual works. Most of the published cases involving videogame copyrights have involved only audiovisual copyrights. See, e.g., Stern Elecs., Inc. v. Kaufman, 669 F.2d 852 (2d Cir. 1982); Midway Mfg. Co. v. Dirkschneider, 543 F. Supp. 466 (D. Neb. 1981). A few have involved both audiovisual and program copyrights, see, e.g., Williams Elecs., Inc. v. Artic Int'l,
people from realizing that these programs themselves cannot intelligibly be seen or heard, either directly or with the aid of a machine or device.\textsuperscript{256}

The fact that these programs cause displays confuses the issue. Entirely different programs may produce the same display, while an identical program which has been supplemented may produce a very different display.\textsuperscript{257} Using the copyright

Inc., 685 F.2d 870 (3d Cir. 1982), and have relied heavily on the audiovisual cases. It is certainly much easier to apply the traditional test of copyright infringement to videogame cases. See Comment, \textit{Substantial Similarity Between Video Games: An Old Copyright Problem in a New Medium}, 36 VAND. L. REV. 1277, 1280-85 (1983). But how does one make a comparison between two microchips for toasters, or gas pumps, or heart pacemakers?

\textsuperscript{256} It is important to realize that when computer scientists talk about "reading" machine-readable programs, they mean something different than the ordinary person would suppose. See, e.g., C. SIPPL, \textit{COMPUTER DICTIONARY} 259 (1966) (five definitions of "read" in technical sense). When one realizes that "load" or "retrieve" are synonyms for "read" in the computer science sense, one can grasp the significance of the difference in intelligibility. One may "load" a mousetrap or "retrieve" a book from the library, but these are very different things from "reading" a mousetrap or "reading" a book in the ordinary meaning of the term. As Commissioner Hersey stated: "[I]f 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." CONTU \textit{FINAL REPORT, supra} note 4, at 30 (dissent of Commissioner John Hersey); see also D. HOFSTADTER, \textit{GODEL, ESCHER, BACH: AN ETERNAL GOLDEN BRAID} 290 (1980) (likening the readability of machine code to organization of DNA molecules).

\textsuperscript{257} See, e.g., Stern Elecs., Inc. v. Kaufman, 669 F.2d 852, 855 (2d Cir. 1982) (videogame case recognizing that two different programs may produce the same audiovisual display); Midway Mfg. Co. v. Strohon, 564 F. Supp. 741, 747 (N.D. Ill. 1983) (no infringement of audiovisual copyright in videogame, although program copyright infringed); see also Note, \textit{Copyright Infringement of Computer Programs: A Modification of the Substantial Similarity Test}, 68 MINN. L. REV. 1264, 1285-88 (1984). Articles such as Russo & Derwin, \textit{Copyright in the "Look and Feel" of Software}, 2 COMPUTER LAW, Feb. 1985, at 1, that advocate granting copyright protection for the "look and feel" of software because that is where the commercial value may lie, are particularly distressing. Where traditional copyright law differs in approach from the misappropriation theory on which these authors rely is in its historical willingness to allow copying of commercially valuable ideas so long as particular expressions of the ideas were not stolen. See \textit{supra} notes 200-201 and accompanying text. The decisions in which software infringement has been found partly based on structural similarities in software are also questionable. See, e.g., Whelan Assocs., Inc. v. Jaslow Dental Labs, Inc., 609 F. Supp. 1307, 1321-22 (E.D. Pa. 1985) (finding infringement of dental laboratory software copyright partly because of structural similarities). The logical structure of a person's program, however, seems to be awfully close to the kind of "idea, procedure, process system, method of operation, concept, principle, or discovery" which the copyright statute says is not within the scope of the copyright. See 17 U.S.C. § 102(b) (1982).
“lay observer” test as to the programs in these two situations, a lay observer would probably find an infringement in the first case where there was none, and not find an infringement in the second case where there was one. Furthermore, many programs do not produce any display at all, but only do such things as control the operations of pacemakers, traffic systems, and catalytic converters. In these contexts, the “lay observer” test is useless. Indeed, it would lead to economically undesirable results since a program that functions in a way substantially similar to the copyrighted program would be an infringement. Neither the software industry nor society as a whole would be benefited by such a standard for program infringements.

G. RECOGNIZING THAT A CHANGE IN HOW PROGRAMS ARE “WRITTEN” MAY AFFECT THE LAW

The current copyright system is premised on a creative model of an individual programmer sitting at a computer terminal writing words on paper or typing source code into a computer. That model is, for the present, fairly accurate. This method of computer programming, however, is in the process of changing, and is expected to change radically in the foreseeable future. Programs are now being developed that can create other programs by taking modules of code from their own data base and composing them into the desired program. A user need only specify, in a general way, what the requirements are, how the data should flow, and what the results should be, and a program will automatically be produced. In the near future, software “reuse” of this sort and other kinds are expected to be the primary way in which programs will be created.

It is not clear whether copyright can yet answer the question of who will own rights in a program generated through such a process,


259. See generally, *Special Issue on Software Reusability*, SE-10 IEEE TRANSACTIONS ON SOFTWARE ENGINEERING 473-609 (1984). One author in this issue stated: “A tentative conclusion is that of all the code written in 1983, probably less than 15% is unique, novel, and specific to individual applications. The remaining 85% appears to be common, generic, and concerned with putting applications onto computers.” Jones, *Reusability in Programming: A Survey of the State of the Art*, SE-10 IEEE TRANSACTIONS ON SOFTWARE ENGINEERING 488, 488 (1984). Since much of computer programming is generic, giving exclusive rights to the first person to design the most efficient generic design of an input/output routine, for example, may not be socially desirable—at least not if the protection lasts as long as copyright protection lasts.
especially if modules of code are taken from different parent programs and assembled into a new program.\textsuperscript{260}

To further complicate matters, robots are currently being “programmed” by being physically taken through a series of steps that the robot can then repeat by executing the program thus created.\textsuperscript{261} A human instructed to do the same set of steps could not in any way be subject to copyright.\textsuperscript{262} Moreover, some believe that it is only a matter of time before people will be able to “write” programs by orally specifying what they want a program to do.\textsuperscript{263} As the method of program creation moves substantially away from the model copyright has assumed, a reassessment of how the law should deal with allocation of rights will be necessary.\textsuperscript{264}

\textsuperscript{260} On the one hand, one might argue that a program composed of modules of another program might be a “derivative work” within the meaning of 17 U.S.C. §§ 101, 106(2) (1982), and therefore it might infringe the parent program’s copyright. On the other hand, since it is the very purpose of the parent program to produce programs—perhaps even an essential step in the utilization of the program in conjunction with the machine—this might make the production of another program a fair use, see 17 U.S.C. § 107 (1982), or privileged, see 17 U.S.C.A. § 117 (West Supp. 1985).


\textsuperscript{262} A human instructed to do the same thing would be practicing the “art” the copyrighted book detailing the steps in the process “taught.” Under the venerable case of Baker v. Selden, 101 U.S. 99 (1879) and 17 U.S.C. § 102(b) (1982) this would not be protected by the copyright. For a discussion of the “practical use” doctrine, see Oxman, supra note 7, at 444-46.


\textsuperscript{264} It is necessary to have a legal system that facilitates rather than impedes the development of and dissemination of software without endless litigation over unclear issues. If the law gives all rights in things produced through use of a program to the original programmer, users will feel cheated and will feel justified in “ripping off” the producer. If one gives joint ownership rights to users and programmers, one will have to confront complex questions which the usual joint ownership situation does not pose. The usual situation assumes more cooperation and coincidence of interests than may be present in the software context where such “joint authors” would not have been jointly involved in the initial production of the software. There are also interesting questions about the patentability of computer-generated inventions. See, e.g., Blick, \textit{Computer-Assisted Chemical Synthesis Packages: Is This a New Problem in Patentability?}, 1 J. OF INFORMATION SCI. 227, 229 (1979) (suggesting that availability of computer-assisted organic synthesis packages must have an effect on the patentability of synthetic routes in organic chemistry).
CONCLUSION

It would clearly be preferable for the sake of simplicity to have only two primary forms of intellectual property law—copyright and patent—and to accommodate new subject matters within them. Continuing scientific and technological developments have created categories of subject matter that were wholly unforeseen by the original drafters of the patent and copyright laws. These laws have, over the years, been expanded to incorporate much of the new subject matter. Semiconductor chips, however, created somewhat unique problems. There was clearly a need to protect semiconductor chip designs, but to use either patent or copyright to accomplish that goal would have required abandoning the fundamental principles underlying each. Congress wisely recognized this problem, and ultimately decided to adopt a *sui generis* approach to chip design protection.

What was most admirable about how Congress handled the semiconductor chip design protection problem was that it paid close attention to the particular qualities of the subject matter under consideration and to the specific kind of protection the industry needed in order to prosper, while also considering competing interests such as the concerns of innocent infringers and reverse engineers.265 It is true, as the Senate Report initially stated, that semiconductor chip masks and the chips themselves *are like* maps and technical scientific drawings,266 but as the House Report pointed out, they are *not just like* maps and technical drawings.267 Congress ultimately decided chips were not enough like these clearly copyrightable works because of the chip's functionality and because of the different kind of creativity that produced the chip design.268 Representative Robert Kastenmeier, in his statement in favor of the *sui generis* bill, stated:

> The appropriate solution to the problem of protection for semiconductor chips is the creation of a *sui generis* proprietary right, separate and distinct from the author's copyright.

> Stated somewhat differently, a mask work is not a book. The proposed legislation does not engage in the legal fiction of treating

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265. *See supra* notes 118-130 and accompanying text.
266. *See supra* note 50 and accompanying text.
267. *See supra* notes 64-66 and accompanying text.
268. The enactment of the *sui generis* approach rather than the copyright approach to protection of semiconductor chip designs is strong evidence that the views expressed in the *HOUSE REPORT*, *supra* note 1, reflect the final intent of Congress.
books and mask works similarly. In the long run, we will reap great benefits by not proceeding from false analogies.269

Machine-readable computer programs are also not books.270 They resemble books in the same superficial way that chips resemble drawings of semiconductor designs. It is a legal fiction to say that machine-readable programs are, in the copyright sense, enough like books that the same legal rules should be applied to them.

Machine-readable computer programs are utilitarian works. They do more than simply convey information or display appearances. They control the operations of millions of machines; they make computers capable of being millions of different machines. The rules of law that are needed to deal with this kind of subject matter should be shaped to the particular nature of the subject matter itself as well as to the needs of the software industry and users. Just as Congress would not regulate the broadcasting industry exactly the same way as it would regulate the hydroelectric power industry, Congress should not make the mistake of treating unlike things alike in the intellectual property field.

In recommending that machine-readable computer programs be protected under copyright law, CONTU was not concerned with finding the most appropriate way to protect software, given its unique characteristics, but instead focused on whether machine-readable programs could be fit within the copyright scheme in any fashion.271 It is apparent that the non-utility principle underlying copyright must be abandoned if programs are going to be included. The legislative history of the chip law, however, provides clear evidence that Congress wishes to retain the nonutility principle of copyright.272 Congress should now reconsider its earlier and misguided decision to include machine-readable computer programs in the copyright realm, and adopt a sui generis approach to the protection of machine-readable programs. Although the software industry initially may be hesitant to acknowledge it, it too would be


270. See supra notes 186-191 and accompanying text.

271. See CONTU FINAL REPORT, supra note 4, at 16-19. Dissenting CONTU Commissioner Hersey apparently drafted a Computer Software Protection Act as an alternative to the copyright approach preferred by the CONTU Majority, see Davidson, supra note 184, at 766-67, but there was no mention of the possibility of a sui generis solution in the Final Report of CONTU.

272. See supra notes 59-72, 92-93 and accompanying text.
better off with something more certain, and more carefully crafted to address its needs, than the uncertain hodgepodge of protection currently available.