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PROVING COPYRIGHT INFRINGEMENT OF COMPUTER SOFTWARE: AN ANALYTICAL FRAMEWORK*

I. INTRODUCTION

There can be little doubt that personal computers and the programs that operate them have become big business. Combined sales of computer hardware and software are projected to exceed eighty-one billion dollars in 1984;¹ software sales alone may top forty billion dollars by 1988.² The explosive growth in the computer field and its effect on modern society have been well chronicled in the popular press.³ But sadly, as in almost every other field of human endeavor, the growth of the computer field may also be gauged by the explosion in computer-related litigation over the past few years.⁴

Computer systems are generally viewed as consisting of two major components: the tangible computer machinery itself ("hardware") and

* A version of this Comment was awarded National Third Prize in the 1984 American Society of Composers, Authors and Publishers' (ASCAP) Nathan Burkan Memorial Competition, and will appear in ASCAP COPYRIGHT LAW SYMPOSIUM NUMBER THIRTY-FOUR.

That Comment was also awarded First Prize in the 1984 ASCAP Nathan Burkan Memorial Competition at Loyola Law School.

1. Taylor, *The Wizard Inside The Machines*, TIME, Apr. 16, 1984, at 56.

2. Future Computing Inc., *Personal Computer Industry Report*, COMPUTER RETAILING, Dec. 1983, at 55.

3. The personal computer was given the unprecedented accolade of being selected Time Magazine's first "Machine of the Year." See Friedrich, *The Computer Moves In*, TIME, Jan. 3, 1983, at 14. See also Taylor, *supra* note 1, at 56; Boraiko, *The Chip*, 162 NAT'L GEOGRAPHIC 421 (1982).

4. For opinions specifically addressing the copyrightability of computer software and video games, see generally *Apple Computer, Inc. v. Formula Int'l Inc.*, 725 F.2d 521 (9th Cir. 1984) (both operating system programs and computer application programs protected by Copyright Act); *Apple Computer, Inc. v. Franklin Computer Corp.*, 714 F.2d 1240 (3d Cir. 1983) (action for copyright infringement, patent infringement, unfair competition, and misappropriation; district court's denial of motion for preliminary injunction reversed), *cert. dismissed*, 104 S. Ct. 690 (1984); *Williams Elecs., Inc. v. Artic Int'l, Inc.*, 685 F.2d 870 (3d Cir. 1982) (copyrightability of video games); *Atari, Inc. v. North Am. Philips Consumer Elecs. Corp.*, 672 F.2d 607 (7th Cir.) (copyrightability of video games), *cert. denied*, 459 U.S. 880 (1982); *Stern Elecs., Inc. v. Kaufman*, 669 F.2d 852 (2d Cir. 1982) (copyrightability of audiovisual display of video game software upheld); *Midway Mfg. Co. v. Artic Int'l, Inc.*, 547 F. Supp. 999 (N.D. Ill. 1982) (copyrightability of video games), *aff'd*, 704 F.2d 1009 (7th Cir. 1983); *Tandy Corp. v. Personal Micro Computers, Inc.*, 524 F. Supp. 171 (N.D. Cal. 1981) (object code in read only memory chips proper subject matter for copyright protection); *Data Cash Sys., Inc. v. JS&A Group, Inc.*, 480 F. Supp. 1063 (N.D. Ill. 1979) (object code in ROM chips uncopyrightable subject matter), *aff'd on other grounds*, 628 F.2d 1038 (7th Cir. 1980).

the programmed instructions ("programs" or "software"). There is little dispute that legal protection of intellectual property interests in the design and manufacture of computer hardware is rooted in federal patent law,⁵ but where to base the corresponding legal protection of computer software has engendered much debate in recent years.⁶ Almost all suggested software protection schemes have been based in either patent, trade secret, trademark, unfair competition, or copyright theories.⁷ Most commentators agree that the federal copyright statutes⁸ offer the most attractive protection for computer programs,⁹ but until recently courts have been split on the threshold question of whether some forms of software could be copyrighted at all.¹⁰ The emerging weight of authority holds, and the better view seems to be, that all forms of computer software¹¹ are indeed copyrightable.¹² Assuming that copyright is to be the protection of choice, a new question is presented: given the unique and complex nature of computer software, what is an appropriate means of detecting its infringement? To answer that question, this Comment examines the nature of software in the context of existing methods for determining copyright infringement, and outlines an analytical frame-

5. A patent may be obtained to protect "any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof." 35 U.S.C. § 101 (1982).

6. See generally Boorstyn & Fliesler, *Copyrights, computers and confusion*, 56 CAL. ST. B.J. 148 (1981); Luccarelli, *The Supremacy of Federal Copyright Law Over State Trade Secret Law for Copyrightable Computer Programs Marked With a Copyright Notice*, 3 COMPUTER L.J. 19 (1981); Keplinger, *Computer Software—Its Nature and Its Protection*, 30 EMORY L.J. 483 (1981); Note, *Copyright Protection of Computer Object Code*, 96 HARV. L. REV. 1723 (1983); Note, *Copyright Protection for Computer Programs in Read Only Memory Chips*, 11 HOFSTRA L. REV. 329 (1982); Davidson, *Protecting Computer Software: A Comprehensive Analysis*, 23 JURIMETRICS J. 337 (1983).

7. Davidson, *supra* note 6, at 348, 360, 395, 411-18.

8. 17 U.S.C. §§ 101-810 (1982).

9. See articles cited *supra* note 6.

10. Compare *Apple Computer, Inc. v. Franklin Computer Corp.*, 714 F.2d 1240 (3d Cir. 1983) (all forms of computer software copyrightable), *cert. dismissed*, 104 S. Ct. 690 (1984) with *Data Cash Sys., Inc. v. JS&A Group, Inc.*, 480 F. Supp. 1063 (N.D. Ill. 1979) (computer software copyrightable in its flow chart, source code, and assembly phases, but not in its object code phase), *aff'd on other grounds*, 628 F.2d 1038 (7th Cir. 1980).

11. See *infra* text accompanying notes 14-18.

12. See, e.g., *Apple Computer, Inc. v. Formula Int'l Inc.*, 725 F.2d 521 (9th Cir. 1984) (both operating system programs and computer application programs copyrightable); *Apple Computer, Inc. v. Franklin Computer Corp.*, 714 F.2d 1240 (3d Cir. 1983) (both source code and object code computer programs copyrightable), *cert. dismissed*, 104 S. Ct. 690 (1984); *Williams Elecs., Inc. v. Artic Int'l, Inc.*, 685 F.2d 870 (3d Cir. 1982) (video game software copyrightable); *Stern Elecs., Inc. v. Kaufman*, 669 F.2d 852 (2d Cir. 1982) (audiovisual display of video game software copyrightable).

work for detecting software infringement in anticipation of what is likely to become a heavily litigated field.

II. THE NATURE OF SOFTWARE

A. Generally

Outlining the complex nature of software and the myriad of steps required for its creation is well beyond the scope of this Comment. However, a rudimentary knowledge of basic computer software concepts and terminology is essential to understanding the cases and commentary on computer software law. The computer and data processing industries are highly technical and heavily jargoned; consequently, the cases and literature are filled with exotic-sounding verbiage.¹³ To help unravel the cases and provide a common foundational understanding for the proposed copyright analysis, a brief overview of computers, software, and related industry terminology is necessary.

Section 101 of the Copyright Act defines a computer program as "a set of statements or instructions to be used directly or indirectly in a computer in order to bring about a certain result."¹⁴ For example, a set of instructions or computer program written in English to calculate the average of any two numbers would read as follows:

1. Get the first number.
2. Get the second number.
3. Add the two numbers together.
4. Divide this sum by two.
5. Print the result.
6. Go to line one and begin again.

The same set of problem solving instructions expressed in the BASIC computer language¹⁵ might read as follows:

```
10 INPUT "Enter the first number ? ";X
```

13. One district court, after struggling with industry expert witnesses and jargon, had a good deal to say about computer industry terminology:

After hearing the evidence in this case the first finding the court is constrained to make is that, in the computer age, lawyers and courts need no longer feel ashamed or even sensitive about the charge, often made, that they confuse the issue by resort to legal "jargon," law Latin or Normal French. By comparison, the misnomers and industrial shorthand of the computer world make the most esoteric legal writing seem as clear and lucid as the Ten Commandments or the Gettysburg Address; and to add to this Babel, the experts in the computer field, while using exactly the same words, uniformly disagree as to precisely what they mean.

Honeywell, Inc. v. Lithonia Lighting, Inc., 317 F. Supp. 406, 408 (N.D. Ga. 1970).

14. 17 U.S.C. § 101 (1982).

15. BASIC, or *Beginner's All-purpose Symbolic Instruction Code*, is a popular and easy to learn computer programming language found on nearly every personal computer today.

```
20 INPUT "Enter the second number ? ";Y
30 LET SUM = X + Y
40 LET AVERAGE = SUM / 2
50 PRINT "The average is ";AVERAGE
60 GOTO 10
99 END
```

Thus, a computer program represents an expression of each step required to bring about a particular result. The end result may be as banal as calculating the average of a pair of numbers, as complex as tracking passengers on an airline reservation system, or as fanciful as creating computer graphics for a video arcade game. Although at least one commentator has drawn a distinction between computer programs and computer software,¹⁶ in this Comment and most of the literature and cases the terms "software" and "computer program" are used interchangeably.

B. Source Code

A working computer program of any complexity is the result of many hours of creative thought and energy. Programs are initially conceived in the abstract sense when a problem capable of computer resolution is identified. Once so identified, the next step in a program's creation is to articulate a step-by-step solution to the problem (the "algorithm") which then may be implemented on a computer. This algorithm forms the basis of the computer program. Many times a programmer will create a "flow chart" illustrating the logical progression of the various steps of the algorithm required to solve the problem. Once the solution has been defined, a competent programmer is able to translate the algorithm into statements of a computer language. These statements are called the "source code" of a program. Source code statements may be initially written on paper, but are eventually typed into a computer and stored there.

In addition to actual computer language statements, source code usually contains a general description of the program and detailed annotations of the computer instructions used to enable others to quickly comprehend a program's purpose and its application and use of particular computer statements. These comments may also contain other information such as the programmer's name, when the program was

16. "Software . . . refer[s] to all materials encompassing or describing computer programs. *Computer programs* are the ordered set of instructions which can operate a computer." Davidson, *supra* note 6, at 340-41 (emphasis in original).

originally created, when it was last modified, and in the best of all possible worlds, perhaps even a formal copyright notice. The source code of a program thus represents a programmer's unique expression of a computer solution to a particular problem.

C. *Object Code*

Even though source code statements are ostensibly written in a "computer language," each individual instruction must be further "translated" into a binary form—computer "machine language"—before a computer can actually execute it. Machine language consists only of ones and zeros (*binary digits* or "bits") and is unintelligible even to highly skilled programmers and computer engineers. The actual translation from source code to machine language is ordinarily performed by a separate computer program which is distinct from the program to be translated. Depending on the computer language initially used, source code statements may be translated en masse into machine language by programs called "compilers" or "assemblers." Assemblers and compilers create completely new and separate programs which contain the machine language essence of each original source code statement. These new modules are called "object code." Comments and annotations in the original program are not included in the object code. The computer does not execute or run the original program during the compilation stage; the compiler or assembler operates only on the source code statements of the program being translated. A compiler or assembler converts each statement to machine language and then aggregates the newly translated instructions into a separate executable object code module. Once compiled or assembled, this object code module may be executed by a computer without any reference to the original program source code. Because object code is far less intelligible than source code, software publishers prefer to distribute programs in compiled or assembled object code versions, thereby preserving the secrecy of the original source code.

Alternatively, each source code instruction may be translated individually, one by one, and submitted to the computer for immediate execution by a program called an "interpreter." Since each source code instruction must be translated anew each time the program is executed, an interpreter requires the original source code to be present every time a program is run. Because source code is easily understood, easily copied, and may contain routines and algorithms which required a great deal of development, a program's source code is considered to be quite valuable and software publishers are understandably reluctant to provide it to users. In addition, because each instruction must be re-translated each

time a program is run, interpretative computer languages execute far more slowly than compiled or assembled languages. Although interpretative computer languages may speed development of a program because the results of programming changes may be seen immediately without the need for an intermediary compilation step, interpreters are not favored for the commercial dissemination of computer software. Thus, the existing cases and literature focus on the problems of works which have already been reduced to unintelligible object code by an assembler or compiler.

D. Operating Systems and Application Programs

In addition to the distinction between source and object code, the cases and the literature have drawn another distinction between different types of software. Although in terms of detecting copyright infringement it may well be a distinction without a difference,¹⁷ some cases have distinguished between "operating system programs" and "application programs." A computer uses operating system programs (or simply "operating systems") internally to help execute application programs. Operating systems coordinate and control the flow of information among various parts of the computer, such as the keyboard, screen, printer, and mass storage device. Computer languages (compilers, assemblers, and interpreters) are also considered to be operating system programs. Operating systems are ordinarily and hopefully transparent to a computer user—that is, a user should have only a minimum of direct interaction with an operating system while using a machine. Operating systems are typically given such cryptic names as CP/M[®] (Control Program for Microprocessors, a product of Digital Research, Inc.) and MS-DOS[™] (Microsoft Disk Operating System, a product of Microsoft Corporation).

On the other hand, programs which interact and actually perform a task for a user are considered to be application programs. Airline passenger reservation systems or programs which maintain lists of names and addresses in zip code order for mailing labels are examples of application programs.

Armed with this rudimentary knowledge of computers and software, we turn now to an examination of how the question of the copyrightability of software has been treated in the courts. Although still debated elsewhere,¹⁸ the copyrightability of software appears to have been resolved by several recent decisions. Thus, only a brief discussion of

17. See *infra* note 70 and accompanying text.

18. See articles cited *supra* note 6.

the nature of copyright itself and the evolution of software's copyrightability is presented below.

III. COPYRIGHTABILITY OF COMPUTER SOFTWARE

A. *The Nature of Copyright*

Article I of the Constitution empowers Congress to "promote the Progress of Science and useful Arts, by securing for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries."¹⁹ To this end, Congress passed laws establishing copyrights (for "Authors" and their "Writings") and patents (for "Inventors" and their "Discoveries") and has kept the statutes current through periodic revisions.²⁰

In order for a work to qualify for federal copyright protection, the 1976 Copyright Act requires a work to be an "original [work] of authorship"²¹ fixed in a "tangible medium of expression."²² The Copyright Act

19. U.S. CONST. art. I, § 8, cl. 8.

20. The first copyright statutes were promulgated by the first Congress in 1790 shortly after the adoption of the Constitution and were completely revised in 1831, 1870, and 1909. The latest revision of the Copyright Act was enacted in 1976 and became effective on January 1, 1978. An Act For the General Revision of the Copyright Law, Pub. L. No. 94-553, § 102, 90 Stat. 2541, 2598 (1976) (codified at 17 U.S.C. §§ 101-810 (1982)). In 1980, Congress passed legislation which amended the 1976 Act to address the issue of computer software. *See infra* note 29.

21. 17 U.S.C. § 102(a) (1982). While Congress provided no interpretation or definition of the word "original" in the Copyright Act itself, courts have long interpreted that originality requires that the work "owes its origin" to its author, *Burrow-Giles Lithographic Co. v. Sarony*, 111 U.S. 53, 58 (1884) (quoting Worcester), and that the work was not copied from another, *Alfred Bell & Co. v. Catalda Fine Arts, Inc.*, 191 F.2d 99, 102-03 (2d Cir. 1951). Thus, distinct and valid copyrights may exist simultaneously in two (or more) separate but identical works so long as each was independently created. *Id.* at 103.

Contemplating this possibility, Judge Learned Hand once mused that "if by some magic a man who had never known it were to compose anew Keats's Ode on a Grecian Urn, he would be an 'author,' and, if he copyrighted it, others might not copy that poem, though they might of course copy Keats's." *Sheldon v. Metro-Goldwyn Pictures Corp.*, 81 F.2d 49, 54 (2d Cir.), *cert. denied*, 298 U.S. 669 (1936).

This seeming incongruity forms one of the basic functional differences between copyright and patent protection. A patent holder has the right to "exclude others from making, using, or selling the invention," 35 U.S.C. § 154 (1982), but a copyright owner has only limited and enumerated rights. *See infra* note 27. One who independently duplicates a patented invention or device is prohibited from exploiting the fruits of their ingenuity, but one who independently reproduces a copyrighted work does not infringe. *Alfred Bell & Co.*, 191 F.2d at 103.

The practical significance of this copyright feature is easily seen when applied to computer software. If a program has truly been independently created, or a copyright defendant can convince a trier of fact that a program in suit was independently created, a copyright infringement action based on that work will fail even though the program may be substantially similar or even identical to plaintiff's protected work. *Id.*

22. 17 U.S.C. § 102(a) (1982).

also specifies several categories of works which clearly qualify for copyright protection.²³ Computer software appears to fit nicely in the "literary works" category—"works, other than audiovisual works, [which are] expressed in words, numbers, or other verbal or numerical symbols or indicia, regardless of the [media] . . . in which they are embodied."²⁴ However, it has been argued successfully that a computer program has more than "literary value"—that a program also produces visual and sometimes audio material which can sustain a separate copyright under the "audiovisual works" category.²⁵ Computer programs may simultaneously be protected by more than one copyright in different statutory categories.²⁶

Once the statutory prerequisites are satisfied, the Copyright Act grants five specific, exclusive rights to the copyright owner.²⁷ Three are of paramount importance with respect to computer software: the exclusive rights of reproduction, adaptation, and distribution.²⁸ However, Congress has seen fit to impose strict limitations on both the reproduction and adaptation rights of the computer software copyright owner.²⁹

23. Section 102(a) sets forth seven different categories of works of authorship: (1) literary works; (2) musical works; (3) dramatic works; (4) pantomimes and choreographic works; (5) pictorial, graphic, and sculptural works; (6) motion pictures and other audiovisual works; and (7) sound recordings. *Id.* § 102(a)(1)-(7).

24. *Id.* § 101.

25. *See Stern Elecs., Inc. v. Kaufman*, 669 F.2d 852, 857 (2d Cir. 1982). Audiovisual works "consist of a series of related images which are intrinsically intended to be shown by the use of machines, or devices . . . together with accompanying sounds, if any, regardless of the [media] . . . in which the works are embodied." 17 U.S.C. § 101 (1982).

26. A copyright may be obtained on the audiovisual displays produced by a computer program, while a separate copyright would protect the underlying computer program itself. *See Midway Mfg. Co. v. Strohon*, 564 F. Supp. 741, 749 (N.D. Ill. 1983) (express recognition that "computer program copyright connected with a video game is protectible [sic] separately from the audiovisual copyright."). *See also Williams Elecs., Inc. v. Artic Int'l, Inc.*, 685 F.2d 870, 875 (3d Cir. 1982); *Atari, Inc. v. Amusement World, Inc.*, 547 F. Supp. 222, 226 (D. Md. 1981); *Midway Mfg. Co. v. Bandai-America, Inc.*, 546 F. Supp. 125, 139 (D.N.J. 1982); *Stern Elecs. Inc. v. Kaufman*, 523 F. Supp. 635, 639 (E.D.N.Y. 1981), *aff'd*, 669 F.2d 852 (2d Cir. 1982).

27. They are: (1) the reproduction right; (2) the right to prepare derivative works; (3) the distribution right; and (4) the public performance and (5) public display rights of certain classes of works. 17 U.S.C. § 106(1)-(5) (1982).

28. The fourth and fifth rights, the public performance right and the public display right, have little relevance to a computer software copyright owner.

29. Although the Copyright Act was revised in its entirety in 1976, Congress recognized at that time that major strides in the development of computer and information technology needed to be addressed in new copyright legislation. Instead of delaying the new Act, Congress enacted a "status quo" provision in the revised Act and created the National Commission on New Technological Uses of Copyrighted Works (CONTU) to study the problem and make a recommendation as to the inclusion of computers in the Copyright Act. CONTU released its final report on July 31, 1978. *See NATIONAL COMM'N ON NEW TECHNOLOGICAL*

1. The reproduction right

The reproduction right conveys the exclusive right to make reproductions in material objects.³⁰ In terms of computer software, the reproduction right is simply the exclusive right to make copies of a copyrighted program, regardless of whether they are actual machine readable physical copies of the computer storage medium (diskettes, magnetic tapes, punch cards, etc.) or merely human readable printouts of the source or object code.³¹

2. The adaptation right

The second benefit is the exclusive right "to prepare derivative works based on the copyrighted work."³² A derivative work is defined in section 101 of the Copyright Act as a new work that is based on one or more preexisting works, such as a translation, condensation, adaptation,

USES OF COPYRIGHTED WORKS, FINAL REPORT (1978) [hereinafter cited as CONTU REPORT]. In 1980, Congress followed, almost to the letter, the recommendations of CONTU, repealing the status quo section and replacing it with the current section 117. An Act to Amend the Patent and Trademark Laws, Pub. L. No. 96-517, § 10(b), 94 Stat. 3015, 3028 (1980) (codified at 17 U.S.C. §§ 101, 117 (1982)). See also *infra* notes 31 & 34.

30. 17 U.S.C. § 106(1) (1982).

31. Section 101 of the Copyright Act defines "copies" as "material objects, other than phonorecords, in which a work is fixed by any method now known or later developed, and from which the work can be perceived, reproduced, or otherwise communicated, either directly or with the aid of a machine or device." *Id.* § 101. Congress realized that with this definition of a "copy," the very act of reading a computer program from its storage medium into the memory of the computer for use would constitute making a copy, an act prohibited by the reproduction right. (Programs must exist in the memory of a computer before they may be used. Because the memory of a computer is "dynamic" or "volatile," programs or information stored in memory are ordinarily lost when different programs or other information are stored there. Thus, a program must be loaded afresh each time it is to be used.)

In order to shield lawful users of computer programs from copyright liability for merely using the program, in 1980 Congress amended the Copyright Act specifically for computer software. See *supra* note 29. Section 117 of the Copyright Act was amended to provide that such a copy was allowed so long as it "is created as an essential step in the utilization of the computer program . . . and . . . is used in no other manner." 17 U.S.C. § 117(1) (1982). Although a lawful owner of a program may now make as many copies as required for the use of a program, other copies or reproductions are still proscribed by the reproduction right.

Alas, some confusion still remains. Though section 117 is written in terms of the lawful owner of a copy, *id.* § 117, most commercial software is *licensed* and not sold. No court has yet addressed the question of whether section 117 protects licensees as well as lawful owners. The legislative history of the word "owner" in section 117 is equally unclear. The CONTU Final Report recommended the phrase "rightful possessor" be used, thus ostensibly including licensees, but Congress, without official comment, substituted the word "owner" in the final draft. Davidson, *supra* note 6, at 363. Curiously, Mr. Davidson reports one possible explanation for the change was that "Congress was worried that otherwise Section 117 would not allow licensing of software." *Id.*

32. 17 U.S.C. § 106(2) (1982).

or abridgement.³³ Software infringement actions in which defendant's work is not an exact copy of plaintiff's would stem from a violation of this right. For example, an unauthorized translation of a copyrighted computer program from one computer language to another would clearly be proscribed by the adaptation right.³⁴

3. The distribution right

The exclusive right "to distribute copies . . . of the copyrighted work to the public by sale or other transfer of ownership, or by rental, lease, or lending" is conferred by section 106(3).³⁵ This is perhaps the most important of all of the rights granted to a copyright holder—the right to sell copies of the copyrighted work or derivations thereof. Although 1980 amendments to the Copyright Act³⁶ allowed the rightful owner of a copy of a computer program to make or authorize reproductions or adaptations of that copy, the 1980 legislation did not sanction the subsequent resale of any copies of the adaptations so made. *Any* unauthorized sale of the protected work would constitute an infringement even after the 1980 amendments.³⁷

B. *The Copyrightability of Computer Object Code*

There seems to be no doubt that program source code is copyrightable.³⁸ What has been questioned, however, is whether computer object code³⁹ is a proper subject matter for copyright. Software infringers have heretofore admitted copying software either in whole or in part but have

33. *Id.* § 101.

34. A "translation may not come lawfully into being without the consent of the copyright owner of the work to be translated." 2 M. NIMMER, NIMMER ON COPYRIGHT § 8.09[B], at 8-110.5 (1984).

The 1980 amendment to section 117 addressed the adaptation right as well as the reproduction right, granting the lawful owner of a program the right to adapt such work as is required for its use in the particular computer installation. The CONTU Final Report stated that even translations from one computer language to another (by the lawful owner) should be exempted: "The conversion of a program from one higher-level language to another to facilitate use would fall within this [limitation on the adaptation] right, as would the right to add features to the program that were not present at the time of rightful acquisition." CONTU FINAL REPORT, *supra* note 29, at 32.

35. 17 U.S.C. § 106(3) (1982).

36. *See supra* note 29.

37. 17 U.S.C. § 117 (1982).

38. Even *Data Cash*, the strongest judicial statement to date against the copyrightability of computer object code, stated that "the court believes that the 1976 [Copyright] Act applies to computer programs in their flow chart, *source* and assembly phases." *Data Cash*, 480 F. Supp. at 1066-67 n.4 (emphasis added).

39. *See supra* textual discussion of computer source and object code following note 16.

argued noncopyrightability of the subject matter as a complete legal defense to infringement.⁴⁰ Almost all of the cases and current literature on software copyright law have focused on this threshold question.⁴¹

1. The genesis of the problem

The origin of the problem lies in the 1908 case of *White-Smith Music Publishing Co. v. Apollo Co.*,⁴² a copyright infringement action brought by a music publisher against the manufacturer of player piano rolls. The Supreme Court held a player piano roll was not a "copy" of the music it embodied but instead was merely a part of the player piano mechanism, reasoning that because both the roll and the music encoded therein were imperceptible without the mechanism, the roll by itself was not meant for human communication, and therefore did not constitute a "copy" under the then existing copyright statute.⁴³ The Copyright Act of 1909, enacted shortly after the Court's *White-Smith* decision, did not include a definition of a copy or otherwise speak to this issue, but subsequent cases interpreting the 1909 Act held that it embodied the *White-Smith* definition.⁴⁴

2. *Data Cash Systems, Inc. v. JS&A Group, Inc.*

The first case to address the issue in the context of computer software was *Data Cash Systems, Inc. v. JS&A Group, Inc.*⁴⁵ In *Data Cash*, a federal district court, relying on *White-Smith* and ruling under the 1909 Act, held that computer programs are copyrightable in their source code and flowchart phases, but not in their object code stages.⁴⁶ The object code in *Data Cash* was embodied in a computer memory device called a ROM, or Read Only Memory chip.⁴⁷ The court reasoned

40. See, e.g., *Apple Computer, Inc. v. Franklin Computer Corp.*, 714 F.2d 1240, 1249 (3d Cir. 1983), cert. dismissed, 104 S. Ct. 690 (1984); *Data Cash Sys., Inc. v. JS&A Group, Inc.*, 480 F. Supp. 1063, 1069 (N.D. Ill. 1979), *aff'd on other grounds*, 628 F.2d 1038 (7th Cir. 1980).

41. See *supra* notes 4 & 6.

42. 209 U.S. 1 (1908).

43. *Id.* at 17-18.

44. 1 M. NIMMER, NIMMER ON COPYRIGHT § 2.03[B][1], at 2-29 (1984).

45. 480 F. Supp. 1063 (N.D. Ill. 1979), *aff'd*, 628 F.2d 1038 (7th Cir. 1980).

46. *Id.* at 1066-67 n.4.

47. *Id.* at 1066. The *Data Cash* court evidently misunderstood the difference between "object code" and a ROM chip, stating that an "assembly program," apparently the assembled version of the source code, see *supra* text following note 16, "was then used to create the object program, the Read Only Memory (the 'ROM')." 480 F. Supp. at 1066. The court had earlier observed that "at some point in its development, a computer program is embodied in material form and becomes a mechanical device which is engaged in the computer to be an essential part of the mechanical process." *Id.* at 1065. The court concluded that "[a]t different times,

that under *White-Smith*, object code contained in a ROM chip was not a copy of the copyrightable computer source program because it was unintelligible to human beings and merely part of the computer hardware.⁴⁸ On appeal, the Seventh Circuit was constrained to affirm the district court decision, but only because plaintiff had failed to comply with the statutory notice requirements of the Copyright Act.⁴⁹ The Seventh Circuit declined the opportunity to rule on the district court's opinion regarding the copyrightability of object code in ROM,⁵⁰ but intimated that copyright protection might have been afforded had the statutory formalities been followed.⁵¹ Since the 1976 Copyright Act clearly abrogated the *White-Smith* doctrine by stating that works which can be perceived "either directly or with the aid of a machine or device" are copyrightable,⁵² the continued viability of the district court's reasoning in *Data Cash* is now in serious doubt.

Perhaps some of the court's confusion in *Data Cash* stems from its evident misunderstanding of the distinction between a ROM chip and the object code contained therein. The court consistently questioned whether a ROM was a copy of a copyrightable source program⁵³ instead of confronting the real issue of whether the object code *contained* in a ROM chip could be copyrighted. A ROM chip is merely a semiconductor memory device capable of containing a computer program—clearly the invention of an engineer, not the work of an author. As such, a ROM chip would be a constitutional "invention," the subject matter of federal patent law, and not a constitutional "writing," the object of federal copyright protection.⁵⁴ Thus, questioning the copyrightability of a ROM chip is analogous to considering the copyrightability of a reel of photographic movie film. In both cases, the real issue is whether the

then, a given program is both 'source' and 'object.' The 'source program' is a writing while the 'object program' is a mechanical tool or machine part." *Id.* This conclusion, while incorrect, may help to illuminate why the court reached the decision that it did. *See also infra* text following note 52.

48. 480 F. Supp. at 1069.

49. Over 2500 copies of the computer chess game containing the ROM had been sold by plaintiffs, but none contained any copyright notice either on the ROM itself, embedded within the ROM, on the packaging, or on the accompanying instructions. 628 F.2d at 1041. The court concluded the omission of any notice had worked a forfeiture of the plaintiff's copyright. *Id.* at 1044.

50. The court stated that neither party had "briefed nor argued that issue [below] and neither side on appeal defends the district court's position, so we do not consider it further," and therefore the court did not "reach the merits" of the lower court opinion. *Id.* at 1041.

51. *Id.* at 1044.

52. 17 U.S.C. § 102(a) (1982).

53. 480 F. Supp. at 1069.

54. *See supra* note 19 and accompanying text.

information *embodied* within the film or chip is itself susceptible of copyright, not whether the mere packaging of the information can be copyrighted.⁵⁵

3. *Tandy Corp. v. Personal Micro Computers, Inc.*

The next case to consider object code was *Tandy Corp. v. Personal Micro Computers, Inc.*,⁵⁶ in which a district court held that under the original 1976 Copyright Act, object code contained in a ROM chip is a “‘work of authorship’ subject to copyright” and the ROM itself is merely a “‘tangible medium of expression’ within the meaning of the Copyright Act and not itself the subject of copyright.”⁵⁷ Moreover, the court believed that even under the original section 117 of the Act,⁵⁸ if there was a proper copyright notice on a chip, the copyright on the contents would be infringed when the chip was duplicated without authorization.⁵⁹ Another court⁶⁰ thought the issue so obvious that it disposed of the copyrightability question in a single paragraph,⁶¹ holding further that the copyright on the computer source code is sufficient to protect the related object code as well.⁶²

4. *Apple Computer, Inc. v. Franklin Computer Corp.*

The issue of the copyrightability of object code was first raised under the 1976 Act as amended in 1980 by *Apple Computer, Inc. v. Franklin Computer Corp.*⁶³ In *Apple*, even though the defendant admitted to copy-

55. In *Midway Mfg. Co. v. Artic Int'l, Inc.*, 547 F. Supp. 999, 1008 (N.D. Ill. 1982), *aff'd*, 704 F.2d 1009 (7th Cir. 1983), defendant contended that plaintiff's attempt to copyright the audiovisual aspects of its video game was “in reality[] an attempt to copyright the ROMs” contained in the game. The district court agreed that “[b]ecause the ROMs are utilitarian objects, they may not be copyrighted,” but concluded the defendant had “misconstrued the copyrights at issue in this case.” *Id.*

Affirming the district court, the Seventh Circuit expanded upon this issue:

Plaintiff claims copyrights in audiovisual works—the distinctive set of images and sounds stored in its circuit boards. It does not claim copyrights in the *design* of those circuit boards, so it matters not that those designs may be patentable. Recording images and sounds in circuit boards does not destroy their copyrightability any more than does recording them on rolls of celluloid film.

704 F.2d at 1012 (emphasis added).

56. 524 F. Supp. 171 (N.D. Cal. 1981).

57. *Id.* at 173.

58. *See supra* note 29.

59. 524 F. Supp. at 174-75.

60. *GCA Corp. v. Chance*, 217 U.S.P.Q. (BNA) 718 (N.D. Cal. 1982).

61. *Id.* at 720.

62. *Id.*

63. 545 F. Supp. 812 (E.D. Pa. 1982), *rev'd*, 714 F.2d 1240 (3d Cir. 1983), *cert. dismissed*, 104 S. Ct. 690 (1984).

ing thirteen object code programs from plaintiff's computer with little or no modification, the district court denied plaintiff's motion for a preliminary injunction restraining defendant from selling its computer because the judge doubted object code could be copyrighted.⁶⁴ The district judge felt that even if some object code programs could in fact be copyrighted, the programs in suit were operating system programs which merely manipulated the internal workings of the computer, were not meant for human communication, and were thus beyond the reach of copyright protection.⁶⁵

In a decision three days later, the Third Circuit addressed the copyright issue raised in *Apple* in a different case involving the computer programs in a video game.⁶⁶ There, the court rejected defendant's argument that object code is not copyrightable because it is not meant for human communication as being contrary to the intent of the 1976 Copyright Act.⁶⁷

Apple itself was subsequently appealed to the Third Circuit, which, in a complete and well-reasoned opinion,⁶⁸ reiterated its earlier view that all forms of software, in both source and object codes, are copyrightable under the 1976 Copyright Act.⁶⁹ The circuit court also rejected a copyright distinction between operating systems and application programs, holding that "[b]oth types of programs instruct the computer to do something" and that "[t]here is . . . no reason to afford any less copyright protection to the instructions in an operating system program than to the instructions in an application program."⁷⁰

5. *Apple Computer, Inc. v. Formula International Inc.*

The most recent circuit case to consider the issue is *Apple Computer, Inc. v. Formula International Inc.*⁷¹ In *Formula*, the Ninth Circuit rejected defendant's dual contentions that operating system programs cannot be afforded copyright protection because they control only the internal operation of a computer and embody no expression which is communicated to the user. The court characterized these arguments as "contrary to the language of the Copyright Act, the legislative history of the Act, and the existing case law concerning the copyrightability of

64. *Id.*

65. *Id.* at 821.

66. *Williams Elecs., Inc. v. Artic Int'l, Inc.*, 685 F.2d 870 (3d Cir. 1982).

67. *Id.* at 876-77.

68. 714 F.2d 1240 (3d Cir. 1983), *cert. dismissed*, 104 S. Ct. 690 (1984).

69. *Id.* at 1249.

70. *Id.* at 1251.

71. 725 F.2d 521 (9th Cir. 1984).

computer programs,"⁷² citing the section 101 definition of a computer program,⁷³ the CONTU Final Report,⁷⁴ and the earlier Third Circuit decision in *Apple Computer, Inc. v. Franklin Computer Corp.*⁷⁵ The court concluded that a "computer program when written embodies expression" and that "never has the Copyright Act required that the expression be communicated to a particular audience."⁷⁶

6. *Sony Corp. of America v. Universal City Studios, Inc.*

In January, 1984, the United States Supreme Court handed down its long-awaited decision in *Sony Corp. of America v. Universal City Studios, Inc.*,⁷⁷ the so-called *Betamax* case. There the Court held that Universal City Studios could not recover damages from Sony under a theory of contributory copyright infringement for Sony's manufacturing and selling an electronic device capable of infringing Universal's copyrights.⁷⁸ In so doing, the Court expanded on the copyright defense of "fair use," holding that taping a protected television broadcast *in its entirety* for later viewing is *not* an infringement of copyright.⁷⁹

One computer law expert has opined that the *Betamax* case "severely attenuates legal safeguards for the microcomputer industry,"⁸⁰ while another believes that "[e]very defendant in a copyright-infringement suit henceforth will raise the case as a defense."⁸¹ Although the *Betamax* decision may well be among the most important recent Supreme Court copyright opinions, its applicability to computer software may be less than at first feared.

The *Betamax* opinion must be read in its narrow contributory infringement context. By its own terms, the decision merely purports to settle the question of "whether the sale of [Sony's] copying equipment to the general public violates any of the rights conferred upon [Universal City Studios] by the Copyright Act."⁸² The *Betamax* case could thus be used as clear authority for the proposition that manufacturers and retailers of microcomputers are not liable to owners of software copyrights as

72. *Id.* at 524.

73. *Id.* at 525. See *supra* note 14 and accompanying text.

74. 725 F.2d at 524-25. See *supra* note 29.

75. 725 F.2d at 525. See *supra* notes 68-70 and accompanying text.

76. 725 F.2d at 525.

77. 104 S. Ct. 774 (1984).

78. *Id.* at 796.

79. *Id.* at 795.

80. Swartz, *A New Definition of Fair Use*, BUS. COMPUTER SYS., Apr. 1984, at 17, 18.

81. *Id.*

82. 104 S. Ct. at 777.

contributory infringers. However, to use the case as authority beyond that point may be to read too much into the Court's opinion.

The Court was careful to note that historically the judiciary has been reluctant to "expand the protections afforded by the copyright without explicit legislative guidance,"⁸³ and that Congress, not the Court, has the "constitutional authority and institutional ability to accommodate fully the varied permutations of competing interests" that accompany new technology.⁸⁴ Justice Stevens, writing for the Court, acknowledged that "[i]n a case like this, in which Congress has not plainly marked our course, we must be circumspect in construing the scope of rights created by a legislative enactment which never contemplated such a calculus of interests."⁸⁵ Software copyright defendants may point to this language and argue that lower court decisions affording copyright protection to all forms of software overstepped the boundaries of judicial power. This argument ignores the fact that unlike the question of home video taping addressed in the *Betamax* case, Congress *has* contemplated the "calculus of interests" and spoken to the issue of computer software copyright with the 1980 software amendments to the Copyright Act.⁸⁶

As to the question of fair use, the Court concluded that duplicating a copyrighted work for later viewing or "time-shifting" was a fair use of the copyrighted work within the meaning of section 107 of the Copyright Act.⁸⁷ The Court based its holding on (1) the district court's findings that time-shifting was a noninfringing use because "time-shifting for private home use must be characterized as a noncommercial, nonprofit activity";⁸⁸ (2) that "timeshifting [sic] merely enables a viewer to see such a work which he had been invited to witness in its entirety free of charge";⁸⁹ and (3) the Court's conclusion that Universal City Studios had "failed to demonstrate that time-shifting would cause any likelihood of nonminimal harm to the potential market for, or the value of, their copyrighted works."⁹⁰ While the Court may have so held in the "free" broadcast television context, there is no direct analogy to time-shifting with respect to computer software. Thus, while the *Betamax* case may in fact be a radical expansion of the fair use doctrine, it is unlikely that it will induce the Court to overturn the express holdings of at least two

83. *Id.* at 783.

84. *Id.*

85. *Id.*

86. *See supra* note 29.

87. 104 S. Ct. at 795.

88. *Id.* at 792.

89. *Id.*

90. *Id.* at 796.

different circuit courts that software is indeed copyrightable. No circuit court has ever *denied* the copyrightability of computer software.

7. Conclusion

Thus, the recent Ninth Circuit opinion in *Formula*, the Third Circuit opinions in *Williams* and *Apple*, the Seventh Circuit dicta in *Tandy*, and most commentators agree that all software, regardless of form or purpose, is copyrightable.⁹¹ Although some may argue the issue cannot be considered fully resolved without either Supreme Court⁹² or Congressional acquiescence, noncopyrightability of the subject matter no longer appears to be a valid defense to software copyright infringement.

With the threshold question of copyrightability apparently resolved, we turn now to survey the existing tests for copyright infringement and attempt to apply them to computer software.

IV. THE CURRENT INFRINGEMENT TESTS

To prove copyright infringement, a plaintiff need prove only two facts: (1) ownership of a valid copyright; and (2) copying of the protected work by the defendant.⁹³ Ownership of a valid copyright merely requires a copyrightable subject matter and compliance with the statutory formalities⁹⁴ and ordinarily should not be an issue in software copyright infringement suits.⁹⁵ Establishing copying, therefore, is the *sine qua non* of a software infringement action.

Although essential to plaintiff's case-in-chief, courts have recognized that copying can rarely, if ever, be established through direct evidence.⁹⁶ Now that the copyrightability of computer software appears to be well established, few defendants are likely to admit to or stipulate to copying unless the validity of the copyright can be contested as in *Apple* or *Data*

91. See articles cited *supra* note 6.

92. *Apple*, the most likely candidate for Supreme Court review, was settled for \$2.5 million shortly after the Third Circuit opinion that Apple's object code programs were copyrightable subject matter was handed down. *Franklin Settles Apple's Lawsuit Over Copyright*, Wall St. J., Jan. 5, 1984, at 10, col. 1. Although Franklin had appealed the Third Circuit decision to the Supreme Court, all lawsuits between the computer companies were dropped as part of the settlement. *Id.* Accordingly, certiorari was dismissed on Jan. 4, 1984. 104 S. Ct. 690 (1984).

93. 3 M. NIMMER, NIMMER ON COPYRIGHT § 13.01, at 13-3 (1984).

94. 17 U.S.C. §§ 401-412 (1982).

95. Such cases are likely candidates for summary judgment if only the statutory requirements are in issue. *But cf.* *Data Cash Sys., Inc. v. JS&A Group, Inc.*, 480 F. Supp. 1063 (N.D. Ill. 1979) (copyright protection denied for failure to meet statutory formalities), *aff'd*, 628 F.2d 1038 (7th Cir. 1980).

96. *Roth Greeting Cards v. United Card Co.*, 429 F.2d 1106, 1110 (9th Cir. 1970).

Cash.⁹⁷ Direct evidence of copying may not be available even if there were eyewitnesses to the creation of the pirated work.⁹⁸ To overcome this seemingly insuperable burden, copying may be inferred from a showing that a defendant had access to the protected work⁹⁹ and that the allegedly infringing work is "substantially similar" to the copyrighted work.¹⁰⁰

The problem of defining substantial similarity is one of the most difficult and baffling in all of copyright law. Any test for substantial similarity invariably calls for judicial line drawing, and, as Judge Learned Hand once conceded, these lines seem arbitrarily placed no matter where drawn.¹⁰¹ Nevertheless, courts have attempted to fashion tests in order to provide guidance in detecting substantial similarity.

A. Current Substantial Similarity Tests

1. The audience test

The "audience" or "ordinary observer" test was the first attempt to provide a basis for evaluating substantial similarity. As articulated in *Harold Lloyd Corp. v. Witwer*,¹⁰² the audience test measures the effect of the allegedly infringing work upon the average reasonable man, who should be able to detect similarity between works "without any aid or suggestion or critical analysis by others. The reaction of the public to the matter should be spontaneous and immediate."¹⁰³ Thus under this stan-

97. In *Apple*, the defendant admitted to copying plaintiff's object code program ROMs but argued the copyright was invalid because the subject matter was not copyrightable, and, in any event, plaintiff had not complied with formal procedural requirements. 714 F.2d at 1244. *Data Cash* involved similar facts. 480 F. Supp. at 1066.

98. An eyewitness might truthfully testify that the defendant created the allegedly infringing program without any direct reference whatsoever to plaintiff's protected work, but copying from memory is no less an infringement than direct transcription; subconscious copying also constitutes an infringement. *Sheldon*, 81 F.2d at 54.

99. See 3 M. NIMMER, NIMMER ON COPYRIGHT § 13.02[A]-[C] (1984). A plaintiff need not show that defendant actually viewed or had actual knowledge of the protected work; access is proven with evidence that defendant merely had a "reasonable opportunity" to view the work. *Id.* § 13.02[C], at 13-17.

100. *Walker v. University Books, Inc.*, 602 F.2d 859 (9th Cir. 1979); *Franklin Mint Corp. v. National Wildlife Art Exchange, Inc.*, 575 F.2d 62, 64 (3d Cir.), *cert. denied*, 439 U.S. 880 (1978); *Novelty Textile Mills, Inc. v. Joan Fabrics Corp.*, 558 F.2d 1090, 1092 (2d Cir. 1977); *Reyher v. Children's Television Workshop*, 533 F.2d 87, 90 (2d Cir.), *cert. denied*, 429 U.S. 980 (1976).

101. *Nichols v. Universal Pictures Corp.*, 45 F.2d 119, 122 (2d Cir. 1930), *cert. denied*, 282 U.S. 902 (1931).

102. 65 F.2d 1 (9th Cir. 1933).

103. *Id.* at 18.

dard the trier of fact need only "feel" the infringement with no critical analysis or dissection of the work to foster that feeling.

The audience test has been sharply criticized on two grounds. Professor Nimmer has contrasted the "feel" of copyright theft under the audience test with actual copyright theft, stating that the "Copyright Act is intended to protect writers from the theft of the fruits of their labor, not to protect against the general public's 'spontaneous and immediate' *impression* that the fruits have been stolen."¹⁰⁴ Moreover, prohibiting dissection or critical analysis may lead many ordinary observers away from the conclusion, obvious to experts, that substantially similar works are simply cleverly disguised.¹⁰⁵

When applied to computer software generally, major problems with the audience test quickly become apparent. For example, some types of computer programs, such as operating systems, produce no screen displays at all, and the only relevant evidence of their composition is the listings of their computer code. The audience test's premise that an average reasonable man should be able to discern subtle software infringement in computer program listings *without expert aid* is simply not valid—today's average reasonable person has had little, if any, practical experience with extensive and arcane computer program listings.

Although long criticized by courts¹⁰⁶ and commentators¹⁰⁷ alike, for want of a better guide the audience test has never been expressly discarded. Two important cases, however, have attempted to create more workable standards.

2. The *Arnstein* test

The first effort to improve the audience test came in 1946 with *Arnstein v. Porter*.¹⁰⁸ *Arnstein* articulated two separate elements as essential to a successful infringement action: (1) whether the defendant has copied the plaintiff's work in creating the allegedly infringing work;¹⁰⁹ and (2) whether "the copying (assuming it to be proved) went so far as to

104. 3 M. NIMMER, NIMMER ON COPYRIGHT § 13.03[E], at 13-49 (1984) (footnote omitted) (emphasis in original).

105. In *McConnor v. Kaufman*, 49 F. Supp. 738 (S.D.N.Y.), *aff'd*, 139 F.2d 116 (2d Cir. 1943), the court implied that a skilled re-writer or "play doctor" could modify a protected work such that an "ordinary reader would find no connection between the two plays," but that the "keenest critics" might realize that one had been copied from the other. *Id.* at 745.

106. *E.g.*, *Shipman v. R.K.O. Radio Pictures, Inc.*, 100 F.2d 533, 536 (2d Cir. 1938) (the audience test "has had an artificial and disappointingly inaccurate application," and is "acknowledged as inconclusive.").

107. *See supra* note 104 and accompanying text.

108. 154 F.2d 464 (2d Cir. 1946).

109. *Id.* at 468.

constitute improper appropriation."¹¹⁰

Arnstein's most notable improvement on the audience test is the recognition that analysis or dissection of the two works through expert testimony is germane to the first question and should be admissible evidence.¹¹¹ Once copying is established, the *Arnstein* court ruled the second question of how much of plaintiff's work was appropriated to be "an issue of fact . . . a jury is peculiarly fitted to determine,"¹¹² but held dissection and expert testimony to be "irrelevant" on that issue.¹¹³ Thus, *Arnstein* sanctioned the use of expert testimony in making a threshold determination of copying, but relied on an essentially unmodified audience test to determine whether the *amount* of copying was improper. *Arnstein* has since been disapproved on other grounds.¹¹⁴

3. The *Krofft* extrinsic-intrinsic test

Attempting to formulate a more workable test, the Ninth Circuit grappled with the issue of substantial similarity in *Sid & Marty Krofft Television Productions Inc. v. McDonald's Corp.*¹¹⁵ In *Krofft*, the court fashioned an "extrinsic-intrinsic" test, a two-step analysis which first considers whether a substantial similarity exists between the general ideas contained in two works (the extrinsic test), and then whether substantial similarity exists between the expressions of those ideas in the works (the intrinsic test). The court held dissection and expert testimony is relevant to the first question, but "not appropriate" when considering the second.¹¹⁶ Impressed that the defendant's commercials had captured the "total concept and feel" of plaintiff's protected characters, the court found the two works substantially similar and upheld the trial court's finding of copyright infringement.¹¹⁷

110. *Id.*

111. *Id.*

112. *Id.* at 473. Indeed, the *Arnstein* court went on to suggest that "even if there were to be a trial before a judge, it would be desirable (although not necessary) for him to summon an advisory jury on this question." *Id.*

113. *Id.* at 468.

114. "*Arnstein*, which held that a grant of summary judgment is improper whenever there is the slightest doubt as to the facts, is no longer good law." *Ferguson v. National Broadcasting Co.*, 584 F.2d 111, 114 (5th Cir. 1978) (citing *Heyman v. Commerce and Indus. Ins. Co.*, 524 F.2d 1317, 1319 (2d Cir. 1975)). However, the *Arnstein* infringement test has been approved by other courts. *See* cases cited in *Sid & Marty Krofft Television Prods. v. McDonald's Corp.*, 562 F.2d 1157, 1165 (9th Cir. 1977).

115. 562 F.2d 1157 (9th Cir. 1977). The issue in *Krofft* was whether defendant through its advertising agency had infringed plaintiff's copyright on the "H.R. Pufnstuf" cartoon characters with the fanciful "McDonaldland" television commercials. *Id.* at 1161-62.

116. *Id.* at 1164.

117. *Id.* at 1167.

Krofft interprets *Arnstein*'s two-step analysis to be the same idea/expression, extrinsic-intrinsic test articulated in *Krofft* itself.¹¹⁸ Assuming arguendo that this questionable interpretation of *Arnstein* is correct,¹¹⁹ the *Krofft* court's analysis suffers from two major weaknesses.

First, since the Copyright Act does not protect ideas, the entire *Krofft* extrinsic test is irrelevant to a copyright infringement action.¹²⁰ As a practical matter, any infringement suit in which the ideas are so disparate as to *not* be substantially similar is a likely candidate for summary judgment.

Krofft's second problem lies in the restrictions placed on the intrinsic test. The *Krofft* court held that dissection and expert testimony are irrelevant to the determination of substantial similarity in the expression of ideas, and that the factfinder should consider only whether the accused work has captured the "total concept and feel" of the protected work.¹²¹ However, the "total concept and feel" test identifies only similarity between two *ideas*, which may not be copyrighted, *not* between two *expressions* of an idea, which may be copyrighted. Absent dissection and analysis, sanctioned in *Arnstein*, *Krofft*'s "total concept and feel" test is essentially indistinguishable from the older, unworkable audience test.

Since *Krofft* was decided in 1977, the Ninth Circuit has declined at least two invitations to clarify the *Krofft* substantial similarity analysis, handing down only brief memorandum opinions without further explication of the extrinsic-intrinsic test.¹²² Apparently unwilling to overrule

118. *Id.* at 1165.

119. The *Arnstein* court had referred to something it termed "permissible copying." 154 F.2d at 472. The cases cited by the *Arnstein* court to illustrate this "permissible copying" are generally examples where copying the protected work was excused because the articles depicted or the expression copied could be traced to an unprotectable source such as the public domain. *Id.* at 472 n.18. See *Mathews Conveyer Co. v. Palmer-Bee Co.*, 135 F.2d 73 (6th Cir. 1943) and *Eggers v. Sun Sales Corp.*, 263 F. 373 (2d Cir. 1920) as examples.

According to the *Krofft* interpretation of *Arnstein*, however, the permissible copying in *Arnstein* was not the copying of unprotectable public domain material as the cases cited there indicate, but was instead the permissible copying of *ideas*. *Krofft*, 562 F.2d at 1165 & n.7. Ideas are not, of course, protectable through copyright, 17 U.S.C. § 102(b) (1982), and in that sense they may perhaps be "permissibly" copied.

The *Krofft* court was careful to note that its analysis of the issues in the case did not depend on whether its *Arnstein* interpretation was correct or not. 562 F.2d at 1166 n.7.

120. "In no case does copyright protection . . . extend to any idea, procedure, process, system, method of operation, concept, principle, or discovery . . ." 17 U.S.C. § 102(b) (1982).

121. 562 F.2d at 1167.

122. Both opportunities arose in a massive copyright infringement lawsuit filed by Twentieth Century-Fox Film Corp. (Fox) against MCA, Inc. In June, 1978, Fox charged that its copyright in the movie "Star Wars" was infringed by "Battlestar: Galactica," a movie produced and owned by MCA's subsidiary, Universal Studios, Inc. Twentieth Century-Fox Film

Krofft, the Ninth Circuit has perhaps saddled itself with an unworkable test and taken refuge behind summary affirmances and reversals of district court opinions. Until further clarified by the Ninth Circuit, the *Krofft* extrinsic-intrinsic test has minimal value as a practical analytical tool for detecting computer software infringement.

B. *Inadequacies of the Current Tests for Computer Software*

The existing infringement tests all differ sharply as to the propriety of dissection and the relevance of expert testimony to determining whether the defendant has copied the plaintiff's protected work. The courts' aversion to dissection may be more easily understood if placed in the context of most previous copyright actions. Heretofore, infringement actions have been instituted to recover damages for the unauthorized taking of books, graphic works, dramatic performances, movies, and the like; mostly familiar, everyday subjects with which ordinary people have had at least some minimal exposure. Presented with complete evidence at trial, it was thought that an ordinary person would be able to draw informed inferences without the need for expert testimony vis-a-vis unauthorized copying of those subjects.

However, computer software, like sophisticated musical composition or advanced literary work, is a subject with which most ordinary

Corp. v. MCA, Inc., 715 F.2d 1327, 1328 (9th Cir. 1983). Universal counterclaimed against Fox, alleging that Fox's "Star Wars" itself infringed Universal's motion picture "Silent Running." Twentieth Century-Fox Film Corp. v. MCA, Inc., No. 79-3342, slip op. at 1 (9th Cir. 1981). The district court, applying the *Krofft* analysis and dismissing the counterclaim, concluded that "[i]t is just impossible to say that STAR WARS has preempted, stolen, taken away or used, or to put it in legal terms, infringed, the expression of ideas in SILENT RUNNING." Twentieth Century-Fox Film Corp. v. MCA, Inc., No. 78-2437-IH, Reporter's Transcript of Proceedings at 16 (C.D. Cal. Apr. 16, 1979). In applying *Krofft*, the judge noted that he was "not sure that the Circuit used the best or clearest language in describing what the requirements are, but [he was] bound by the language they did use and must apply it." *Id.* at 12.

Without explanation, the Ninth Circuit affirmed, stating only that it had viewed both films and was satisfied that the "district court correctly concluded, as a matter of law, that [the two films] contain no substantial similarity of expression." Twentieth Century-Fox Film Corp. v. MCA, Inc., No. 79-3342, slip op. at 3 (9th Cir. 1981).

In the original action, the same district court judge then ruled that as a matter of law, "Battlestar: Galactica" did not infringe "Star Wars," and that the "reasonable minds of a trier could not differ on this matter." Twentieth Century-Fox Film Corp. v. MCA, Inc., 209 U.S.P.Q. (BNA) 200, 203 (C.D. Cal. 1980), *rev'd*, 715 F.2d 1327, 1329 (9th Cir. 1983). However, the reasonable minds of the Ninth Circuit disagreed and reversed, holding the question "close enough . . . that it should be resolved by way of a trial." Twentieth Century-Fox Film Corp. v. MCA, Inc., 715 F.2d 1327, 1329 (9th Cir. 1983). The court was careful to note that it intimated "no opinion whether the films are substantially similar as to either idea or expression," but offered no other guidance to help determine whether the films were, in fact, substantially similar. *Id.*

people have had very little practical experience. Without guidance, an ordinary person may be unable to detect well-disguised or highly modified programs. Using only the ordinary observer audience tests and their progeny, the trier of fact may be easily misled by unimportant factors when confronted with two disparate-looking programs. Expert testimony in software copyright infringement cases may be indispensable,¹²³ and mechanical application of any infringement test which prohibits such testimony may preclude a correct disposition.

V. PROPOSED ANALYSIS OF SOFTWARE COPYRIGHT INFRINGEMENT ACTIONS

A. Overview

Court decisions which have previously touched on the issue of software infringement have involved either computer software itself or the audiovisual sounds and displays generated by a computer video game. In the computer software cases, the issue was whether a particular form of software could be subject to federal copyright protection, and the defendant either admitted or stipulated that it had copied from the protected work,¹²⁴ or copying could be inferred as a matter of law because of a "striking similarity" between the two works.¹²⁵ Since each decision

123. Although one district court characterized the brief testimony of plaintiff's expert witnesses as "with respect, sometimes not cogent and occasionally conclusory," the court decried defendant's failure to introduce any expert testimony as "an omission that is glaring and unfortunate in light of the highly technical nature of this controversy." *Midway Mfg. Co. v. Strohon*, 564 F. Supp. 741, 749 n.5 (N.D. Ill. 1983). Though the testimony was related to the threshold issue of whether a computer program contained in a ROM could be copyrighted, *see supra* notes 48-57 and accompanying text, the logic that the court's conclusion is appropos also to the issue of infringement appears inescapable.

124. *See Apple Computer, Inc. v. Formula Int'l Inc.*, 725 F.2d 521, 522-23 (9th Cir. 1984) ("Formula concedes for purposes of appeal that the two programs are substantially similar to two programs for which Apple has registered copyrights"); *Apple Computer, Inc. v. Franklin Computer Corp.*, 714 F.2d 1240, 1245 (3d Cir. 1983) (Franklin's witness "admitted copying each of the works in suit from the Apple programs"), *cert. dismissed*, 104 S. Ct. 690 (1984); *GCA Corp. v. Chance*, 217 U.S.P.Q. (BNA) 718, 720 (N.D. Cal. 1982) (defendants admitted to copying plaintiff's operating programs); *Data Cash Sys., Inc. v. JS&A Group, Inc.*, 480 F. Supp. 1063, 1066 n.3 (N.D. Ill. 1979) (parties "have stipulated that the chess computer program of the JS&A Chess Computer is identical to the chess computer program of plaintiff's CompuChess"), *aff'd*, 628 F.2d 1038 (7th Cir. 1980).

125. *See Williams Elecs., Inc. v. Artic Int'l, Inc.*, 685 F.2d 870, 876 & n.6 (3d Cir. 1982) (district court finding that defendant's program was a copy of plaintiff's upheld; "the extent of the copying could reasonably lead to no other conclusion"); *Midway Mfg. Co. v. Bandai-America, Inc.*, 546 F. Supp. 125, 146 (D.N.J. 1982) ("After its detailed examination of the works, this court discerns such overwhelming similarity that it believes no reasonable jury could find that Bandai's work was not copied from plaintiff's"); *Midway Mfg. Co. v. Dirkschneider*, 543 F. Supp. 466, 483 (D. Neb. 1981) ("the [c]ourt finds that the defendants

focused only on the threshold question of copyrightability, these cases did not reach the question of whether an infringement had actually taken place. On the other hand, each video game case considered whether a particular expression of a game idea was close enough to a protected expression of the same idea so as to constitute a copyright infringement.¹²⁶ Unfortunately, these cases were *sui generis* and each necessarily turned on its own facts. Consequently, neither the computer software cases nor the video game cases provide much assistance in determining whether there has been an infringement.

However, combining the two lines of cases with existing copyright precedent suggests a two-sided analytical framework which may help guide future infringement actions. Substantial similarity in computer software may be detected either in the actual program listings themselves by applying a modified "literary work" analysis, *or* by applying the classic ordinary observer test to the screen displays and audio sounds produced by the programs when executed. Sufficient evidence of substantial similarity between the protected and accused works in either instance should create an immediate presumption of copying. The burden of producing evidence would then shift to the defendant to explain why its accused program does *not* infringe plaintiff's protected program.¹²⁷

B. *Analysis of the Program Code*

1. A presumption of copying as a matter of law

During the first stage of the inquiry, the plaintiff should attempt to convince the judge that the two works are *prima facie* identical, virtually identical, or strikingly similar. If the plaintiff meets this burden, it is suggested that an immediate presumption of copying arise as a matter of law, shifting the burden to the defendant to explain why its work is so similar to the protected work.¹²⁸ The legal basis for this presumption is found in previous infringement cases where findings of copying have been permitted, even absent a showing of the defendants' access to the copy-

games are so strikingly similar to the plaintiff's works that a finding of independent origin is precluded.").

126. See, e.g., *Atari, Inc. v. North Am. Philips Consumer Elecs. Corp.*, 672 F.2d 607, 618 (7th Cir.), *cert. denied*, 459 U.S. 880 (1982); *Midway Mfg. Co. v. Strohon*, 564 F. Supp. 741, 752 (N.D. Ill. 1983); *Atari, Inc. v. Amusement World, Inc.*, 547 F. Supp. 222, 227 (D. Md. 1981); *Midway Mfg. Co. v. Bandai-America, Inc.*, 546 F. Supp. 125, 139 (D.N.J. 1982).

127. Copyright actions, being under exclusive federal jurisdiction, 28 U.S.C. § 1338(a) (1982), are governed by the Federal Rules of Evidence. Rule 301 provides that presumptions shift the burden of going forward with evidence to meet or rebut the presumption, but do not shift the burden of proof. FED. R. EVID. 301.

128. See *infra* notes 140-41 and accompanying text.

righted works, where such “striking” similarities existed between the works that there was no possibility of independent creation by the defendant as a matter of law.¹²⁹

The first analysis thus consists of an ocular, side-by-side examination and comparison of the listings or printouts of the two computer programs in suit. If source code is in issue, the listings will present English-like statements which are easily understood. If only object code is contested, however, the printouts may show only what looks like so much alphabet soup. Although such printouts may have little more meaning than Egyptian hieroglyphics and may be exceedingly voluminous to boot, identity or *substantial* identity, if it exists, should be easily demonstrable.

Of course, two works need not be verbatim copies for the similarity between them to be striking.¹³⁰ Striking similarity may be demonstrated by the inclusion of common errors in both works. Common errors are considered to be among the strongest evidence of piracy, giving rise in and of themselves to at least a *prima facie* case of copying.¹³¹ A type of common “error” was used to demonstrate copying of computer software in *Apple*, where the plaintiff’s programmer had embedded his name within an object code program and the defendant’s program for some reason had the same programmer’s name in the identical location.¹³² Similarly, in *Williams Electronics, Inc. v. Artic International, Inc.*,¹³³ the plaintiff’s “buried” copyright notice also appeared in printouts of the defendant’s ROM chips.¹³⁴ Applied generally to computer software, the inclusion of common “hidden” or “buried” information such as the programmer’s name in *Apple* or the copyright notice in *Williams* should constitute “striking similarity” between the two works that, absent rebuttal or explanation, is almost dispositive.¹³⁵

129. “[A] case could occur in which the similarities were so striking that we would reverse a finding of . . . no illicit appropriation.” *Arnstein*, 154 F.2d at 469.

130. *Testa v. Janssen*, 492 F. Supp. 198, 203 (W.D. Pa. 1980).

131. *Southwestern Bell Tel. Co. v. Nationwide Indep. Directory Serv., Inc.*, 371 F. Supp. 900, 906 (W.D. Ark. 1974).

132. *Apple*, 714 F.2d at 1245. *See also* *Heim v. Universal Pictures Co.*, 154 F.2d 480, 488 (2d Cir. 1946), where the court stated: “In an appropriate case, copying might be demonstrated, with no proof or weak proof of access, by showing that a single brief phrase, contained in both pieces, was so idiosyncratic in its treatment as to preclude coincidence.”

133. 685 F.2d 870 (3d Cir. 1982).

134. *Id.* at 876 n.6.

135. Of course, even the existence of common errors does not guarantee a judgment for plaintiff if the defendant can offer a satisfactory explanation of the errors—such as that the errors were copied from the same unprotected source or the entire industry or profession is in error on that point. *See* 3 M. NIMMER, NIMMER ON COPYRIGHT § 13.03[C] (1983).

2. A presumption of copying as a question of fact

While determining that two works are identical or virtually identical should present little difficulty and ordinarily may be decided as a matter of law, a more difficult situation arises when the plaintiff must demonstrate that two works which appear radically different are in fact substantially similar. Whether the presumption of copying will be drawn in these cases is a question of fact for the factfinder. To assist the factfinder, expert testimony as outlined below will be essential, and it is suggested that the factfinder direct special attention to the following areas.

It is well-settled copyright law that an "immaterial variation" will not protect an infringer from liability.¹³⁶ Alterations to the documentation or explanatory messages and annotations embedded in source code are easily effected and would not be considered material variations by a programmer, yet may so dramatically change the "looks" of a source code listing that a factfinder could reasonably conclude the two works to be totally different. These textual passages are in fact ignored by the computer and have no effect whatsoever during the actual execution of a program. Thus, only the actual computer instructions should be analyzed; the comments and annotations should be ignored. Expert testimony may be useful to help separate executable statements from extraneous annotations or comments.

Similarly, alterations in the order and placement of subroutines¹³⁷ and variable names in a program have no impact during execution but may radically alter the appearance of the printed listing. Thus variable names and the order and placement of subroutines within a program should also be disregarded. Expert testimony on these points may again be valuable.

Finally, expert testimony may also be useful when "translated" computer programs are in issue. Software is ordinarily written in only one of the plethora of computer languages available today. While there is some standardization, more often than not a program written in a particular language will be of little value to other computer operators unless first translated into a language their particular computer can under-

136. The copyright "cannot be limited literally to the text, else a plagiarist would escape by immaterial variations." *Nichols*, 45 F.2d at 121.

137. A subroutine is a short program within the larger program that only performs a specific function or task. Subroutines are "called" from the body of the main program, usually by reference to the subroutine's location. When the function or task of the subroutine is complete, the flow of program control returns to the place from which the subroutine was called. Subroutines are often used to eliminate redundant instructions in a program.

stand.¹³⁸ Unfortunately, a translation may produce such a dramatically different expression of the work that courts and juries may not recognize the unauthorized translation as an infringement of the original program. Similar problems arise when trying to prove an English language literary work was translated to (or from) a foreign language. The problem may be further compounded if, as in the case of some computer programming languages, the two languages do not even share a common alphabet or character set. An alternative method of handling translated programs is outlined in the following section.

C. *Analysis of the Audiovisual Displays*

When, as in the case of a translation, comparing the program code of each work would only so bewilder the jury such that the plaintiff would be unable to make out even a prima facie case of infringement, an alternative approach is suggested. This second analysis is totally distinct from the comparison of the "looks" of the two program listings, focusing instead on a comparison of the audiovisual sounds and screen displays generated by the two works. As above, evidence of identity or striking similarity between the two *displays or sounds produced* should shift the burden to the defendant to explain why such similarity exists as a matter of law; whether the burden is shifted given evidence of substantial similarity presents a question of fact for the factfinder.

The premise behind this alternative test is that even if a factfinder is unable to discern subtle programming differences in the actual program listings, substantial similarity is far more readily seen when comparing two graphic works or when considering comparatively simple musical sounds. Although a plaintiff might successfully maintain a separate infringement action based on the audiovisual displays and sounds qua audiovisual displays and sounds if registered as such in the Copyright Office,¹³⁹ evidence of substantial similarity of the sights and sounds produced by a computer program using this analysis should be considered sufficient circumstantial evidence to create a presumption that the under-

138. Recognizing this unfortunate reality of computer life, Congress amended the Copyright Act in 1980 to sanction the otherwise illegal translation of a copyrighted work when the translation is created as an essential step in the use of the program by the *owner* of a copy. 17 U.S.C. § 117(1) (1982). However, a translation made for any other purpose or by any other person would violate the copyright owner's exclusive right to make derivative works from the protected work. See *supra* notes 29 & 31.

139. See, e.g., *Stern Elecs., Inc. v. Kaufman*, 669 F.2d 852, 857 (2d Cir. 1982); *Midway Mfg. Co. v. Artic Int'l, Inc.*, 547 F. Supp. 999, 1003 (N.D. Ill. 1982), *aff'd*, 704 F.2d 1009 (7th Cir. 1983); *Atari, Inc. v. Amusement World, Inc.*, 547 F. Supp. 222, 226 (D. Md. 1981); *Midway Mfg. Co. v. Bandai-America, Inc.*, 546 F. Supp. 125, 139 (D.N.J. 1982).

lying program has been copied. This mode of analysis effectively neutralizes a factfinder's lack of experience with computer software.

By working in a medium far more familiar than arcane listings of computer software, the audiovisual analysis transforms the inquiry from a credibility contest between experts into a substantive exploration of the merits of the case in which a jury can more easily participate. While a factfinder might require extensive expert testimony to determine substantial similarity of coded statements, no such assistance is needed in order to compare the relatively simple graphic displays and sounds produced by computer programs. Thus, this audiovisual analysis would be governed by the classic ordinary observer test.

Note that this second method of analysis will not be available in all actions. Some programs, such as operating systems, operate entirely within the computer and generate no screen displays or sounds whatsoever. In actions involving this type of program, screen and audio comparisons are meaningless and should not be performed. Cases of this type should be governed solely by use of the program listing analysis.

D. Rebuttal of the Presumption

The presumption of copying drawn from either inquiry is, of course, rebuttable. After the plaintiff meets the initial burden, the burden shifts to the defendant to rebut the presumption either through sufficient evidence of independent creation or another affirmative defense. Independent creation by the defendant is a complete defense to copyright infringement.¹⁴⁰ However, absent evidence of independent creation, a finding that there had been no copying after the plaintiff introduced prima facie evidence of both access and substantial similarity would be "clearly erroneous."¹⁴¹ Sufficient evidence of any other copyright defense also rebuts and destroys the presumption of copying.

Since working, error-free programs ordinarily entail many weeks of development and refinement, the strongest evidence of a program's independent creation consists of previous program listings in various stages of completion, showing the dates of creation and a record of the problems encountered and corrected. To that end, programmers and software publishers should keep all previous listings, sample outputs, test reports, user feedback, and any other documentation created during the development cycle of a program that may help substantiate a claim of independent creation. Given the ease of fabrication of such evidence, a

140. *Selle v. Gibb*, 741 F.2d 896, 901 (7th Cir. 1984).

141. *Roth Greeting Cards v. United Card Co.*, 429 F.2d 1106, 1110 (9th Cir. 1970).

particularly strong foundation for such evidence may be required, and counsel should be prepared to meet such an eventuality.

VI. CONCLUSION

Although no cases have attempted to apply existing infringement tests to computer software, it seems clear that even the current judicial state-of-the-art is inadequate if mechanically applied to computer software. Software is new and foreign to our judicial system, and under current infringement tests, courts and juries are likely to flounder in a sea of contradictory and probably inadmissible expert testimony about whether a particular software program actually infringes another. An infringer could possibly escape liability merely through modifying source code annotations or juxtaposing subroutines within a program, or perhaps by embedding substantial quantities of copied code within a protective shell of new work. New methods of analysis are required which recognize the unique nature of software but retain the richness and wisdom of more than two hundred years of judicial achievement in detecting copyright infringement, albeit in other contexts.

With the most recent circuit court decisions, the threshold question of whether software is a proper subject matter for federal copyright protection appears to have been resolved. These cases stand for the proposition that all forms of software are "works of authorship" that may be fixed in a tangible medium of expression that satisfies the statutory requirements. A workable analysis to determine whether or not an infringement has actually taken place must now be developed.

Under the proposed analytical framework, a plaintiff is effectively afforded two different avenues to make out a case of infringement. The first focuses on printouts of the two programs; the second on a comparison of the screen displays and sounds generated by the two works. Identity or striking similarity in either comparison would create a presumption of copying as a matter of law. Substantial similarity presents a question of basic fact for the factfinder to resolve before the presumption can arise. Once the presumption arises in either instance, the burden shifts to the defendant to explain why its program is so similar to a copyrighted work.

In practice, both approaches may be required. A typical scenario may proceed as follows: the plaintiff begins with the assertion that the two works in suit are substantially similar and offers as proof the substantially similar screen displays and sounds produced by the two programs. The defendant in turn may respond by offering evidence that the two programs were independently created. In rebuttal the plaintiff might

counter with evidence of striking similarity between the two program listings. The plaintiff would then be entitled to have the jury instructed on the rebuttable presumption that the defendant copied the copyrighted work. The jury would then, as always, be required to make the ultimate determination of whether or not the defendant infringed the protected work.

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