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**COMPUTER COPYRIGHT INFRINGEMENT:
BEYOND THE LIMITS OF THE
ITERATIVE TEST**

Carl Sundholm

I. INTRODUCTION

Technological progress and economic expansion in the computer field are directly related to the effectiveness of copyright law in protecting and rewarding innovation. High technology businesses frequently spend vast amounts of capital in the research and development of computer software products.¹ The time, effort and money invested in program development is, in turn, recovered through the licensing or sales of software products.² However, software pirates have found a faster and less expensive method of making money in this field.

Software pirates are individuals who take a newly developed program and simply restructure or slightly modify it. By circumventing the more costly research and development process, they can afford to underprice a competitor who rightfully owns that program.³ The prevalence of intellectual property thievery threatens to

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1. For instance, the total investment in software in the United States has been estimated to exceed 200 billion dollars. D. BENDER, *COMPUTER SOFTWARE PROTECTION* (1984).

2. For example, IBM's 1980 revenues for separately licensed software exceeded 1 billion dollars. Program packaging or "bundling" of software programs with popular hardware is another way of recouping costs by adequate sales. As long as the "tying" is by technology rather than by contract, the antitrust laws are generally not violated under the holding and reasoning of *Digidyne Corp. v. Data General Corp.*, 734 F.2d 1336 (9th Cir. 1984), *cert. denied*. 105 S. Ct. 3534 (1985), *reh. den.* 106 S. Ct. 18 (1985). See the discussion in Note, *Per Se Unlawful Tying Arrangements Under the Sherman and Clayton Antitrust Acts: Sufficient Economic Power in the Tying Product to Appreciably Restrain Competition in the Tied Product Market Found to Exist*, 2 *SANTA CLARA COMPUTER & HIGH TECH. L.J.* 195 (1986). However, technological tying may ultimately require sound technological reasons for an adequate antitrust defense. See Hershman, *Technological Ties*, 3 *COMPUTER LAW* 8 (1986).

3. Piracy of personal computer programs generally has been calculated to drain \$500 million in sales from software companies. Note, *Copyright Infringement of Computer Programs: A Modification of the Substantial Similarity Test*, 68 *MINN. L. REV.* 1264 (1984).

undermine the very structure of the computer industry since it economically favors the thieves at the expense of the innovative firms.

Because copyright law holds the most promise for software protection,⁴ the effectiveness of the courts in applying copyright

Competitive software piracy may take many forms: (1) industrial espionage and theft of computer chips and programs, (2) leasing or purchasing computer products and "disassembling" the programs to construct illegal copies, and (3) "headhunting" or hiring-away key employees in the research and development process and having them reconstruct a competitor's end product in a matter of months without the years of costly development. Understandably, software developers have become quite concerned with obtaining adequate and effective forms of technological and legal protection for the fruits of their labor.

4. Copyright law is the most important and useful legal weapon for the protection of software. Contractual protection of software is generally supplemental to either trade secret or copyright protection. One form of contractual protection in mass marketed software is through the so-called "shrink wrap" contracts or "box top" licenses whereby the opening of the package (or the use of the program) represents an acceptance of an agreement to abide by the contract provisions, including the "no copying" provisions. For an excellent discussion of the enforceability of such contracts, see Note, *Enforceability of Box-Top Licenses: A Proposal to End the Dilemma*, 2 SANTA CLARA COMPUTER & HIGH TECH. L.J. 171 (1986). Contractual protection for software may also appear in the employer-employee context and impose non-disclosure duties and non-copying obligations.

Patent protection is available for some computer software. See *Gottschalk v. Benson*, 409 U.S. 63 (1972); *Paine Webber v. Merrill Lynch*, 564 F. Supp. 1358 (D. Del. 1984); H. HANNEMAN, *PATENTABILITY OF COMPUTER SOFTWARE* (1986); Sumner, *et al.*, *The Versatility of Software Patent Protection*, 3 COMPUTER LAW 1 (1986). However, software must meet certain statutory requirements of novelty, usefulness, and non-obviousness; it must not be a pure mathematical algorithm; it should be intertwined with a concrete process of production; and it may qualify if it transforms an object into a new state. The trend is toward expanding computer patent protection. Though patent protection provides a virtual monopoly for 17 years, it involves considerable cost, delay, and requires mandatory disclosure.

Trade secret protection is less costly but limited to the degree that a computer program is shielded by internal security measures, contractual protections, notification, and confidential relationships. If the software is sufficiently novel and useful, trade secrecy protects against the misappropriation of software through "improper means" such as theft, bribery, and breach of confidential relationship. However, once the secret is disclosed through negligence, publication, or otherwise, the protection is lost, unlike patent or copyright. Trade secret measures are inexpensive but do not provide the degree of protection accorded by copyright and patent law.

Copyright therefore appears to provide the most cost-effective means of protection for computer programs. It has the advantages of patents in continuing protection after disclosure, but registration is quick, inexpensive, and enforcement costs are lower. Also, the scope of copyright protection is considerably greater. Copyright clearly provides more protection than trade secrecy in the mass marketing situation where the risk of disclosure is high. Moreover, copyright applies to a wider range of subject matter than does patent protection and lasts from the time of invention to 50 years beyond the author's lifetime. Increasing recognition that copyright is the most promising form of protection for computer programs is evidenced by the expansion of the scope of copyright protection for computer programs from the inclusion of "computer programs" in the Copyright Act in the 1980 Amendments of 17 U.S.C. § 101, to the protection of the underlying program in the form of a ROM chip in *Apple Computer, Inc. v. Franklin Computer Corp.*, 714 F.2d 1240 (3d Cir. 1983), to the protection of semiconductor chip masks with the Semiconductor Chip Act of 1984, 17 U.S.C. §§ 900-914 (1984).

law to safeguard the works of innovators against copying is essential to the continued economic growth and technological progress of the computer software industry.

Copyright law protects the expression of an idea, not the idea itself. When dealing with computer programs, the distinction between an idea and its expression is often difficult to discern. As a result, one of the most important aspects of copyright law in this field is the methodology courts use to determine whether an original work's "expression" or "idea" has been copied.

The traditional method used by the courts to determine whether a non-identical work infringes the copyright of another is the "substantial similarity" test. The substantial similarity test first evolved in cases dealing with literary and artistic works. However, when applied to technologically-oriented works, the test has resulted in increasing irregularity and uncertainty. Essentially, the problem is that there is no single, uniform substantial similarity test for copyrighted computer subject matter. Lack of a uniform test has made it difficult to predict whether a court will uphold the copyright of software designers against pirates.

This comment will address the problem of inconsistency in the application of the substantial similarity test to computer subject matter. First, the historical background and development of the test as applied to traditional subject matter will be reviewed. Second, the manner in which the test has changed in response to the novel copyright issues raised by computer programs and output will be explored. Third, the existing tests for substantial similarity will be identified, categorized, and analyzed. Finally, a new "integrative" test will be proposed for determining substantial similarity in the adjudication of computer copyright infringement actions.

II. INCONSISTENT TESTS FOR SUBSTANTIAL SIMILARITY

A. *Historical Background*

Before considering the current situation, it is worthwhile to survey the historical emergence and development of the substantial similarity test as applied to traditional subject matter.

The origins of the substantial similarity test are generally credited to Judge Learned Hand. In *Nichols v. Universal Pictures Corp.*,⁵ the court utilized an "abstractions test" to determine whether Universal Pictures had misappropriated the expression of the plaintiff's play "Abie's Irish Rose" in its motion picture "The

5. 45 F.2d 119 (2d Cir. 1930).

Cohens and the Kellys." Both works featured a story line which reenacted a Romeo and Juliet plot with an Irish-Catholic twist, yet there were many differences in detail and concept. In formulating his abstractions test, Judge Hand commented that the question in this type of case is not the piecemeal appropriation of parts of another's work, but rather the more abstract taking of the overall concept and form of the author's work.⁶

It is of course essential . . . that the right cannot be limited literally to the text, else a plagiarist would escape by immaterial variations. . . . [H]e may appropriate a part . . . [and then] the question is whether the part so taken is "substantial," and therefore not a "fair use". . . .⁷ Upon any work . . . a great number of patterns of increasing generality will fit equally well, as more and more of the incident is left out . . . [B]ut there is a point in this series of abstractions where they are no longer protected, since otherwise [the author] could prevent the use of his "ideas," to which, apart from their expression, his property is never extended.⁸

This substantial similarity test focused on discerning when the similarity between works is due to copying expressions rather than ideas by establishing the degree of remoteness in terms of abstract similarity. The more detailed the similarity, the greater the likelihood that a work's expression has been copied. Furthermore, the *Nichols* test allowed for the introduction of expert testimony to determine similarities and differences. However, because such testimony was extensive and prolonged at the trial, Judge Hand was prompted to argue against the inclusion of expert testimony in future cases.

Three years later, the Ninth Circuit followed Judge Hand's

6. Once a protectable right and access by the defendant have been proven, the plaintiff need not establish that the entire work has been copied verbatim to prove infringement. In copyright law generally, infringement may be proven if there is substantial similarity in one of two forms: (1) what the late Professor Melville Nimmer has termed "comprehensive non-literal similarity," where the overall "total concept and feel" has been appropriated by a paraphrased copy and (2) "fragmented literal similarity," where portions of the plaintiff's work have been duplicated and incorporated into the defendant's work. 3 M. NIMMER, LAW OF COPYRIGHT, § 13.03(A) (1963). Though Nimmer stated at the time he coined the terms, the distinction had never been used by a court, it is clearly made by Judge Hand in the quote from the *Nichols* case which follows in the text.

7. It is questionable whether the "fair use" doctrine applies to computer programs insofar as their elements do not have the requisite communicative intelligibility to the normal human being to be "quoted," as the traditional notions of "fair use" implied. However, with the development of cases like the "Betamax case," *Sony Corp. of America v. Universal City Studios, Inc.*, 464 U.S. 417, 104 S. Ct. 774, 78 L. Ed. 2d 574 (1984), the traditional idea of "fair use" has been potentially extended to include private, non-commercial uses that do not economically harm the copyright owner.

8. 45 F.2d 119, 121 (2d Cir 1930).

suggestion in *Harold Lloyd Corp. v. Witwer*.⁹ The *Lloyd* court stated that substantial similarity should be determined from the standpoint of an "ordinary observer," excluding expert testimony and analysis of the work. Later courts termed this test the "audience test" or "ordinary observer test."¹⁰

In *Arnstein v. Porter*¹¹ and *Sid and Marty Krofft Television Productions, Inc. v. McDonald's Corp.*,¹² the substantial similarity test was further modified. *Arnstein* arose from an infringement action against musician Cole Porter. While the lower court dismissed plaintiff's case on summary judgment, on appeal Judge Frank reversed stating that the determination of copyright infringement was a question of fact for the jury which should be decided using a two-step test.

The first step of the test involves a determination of whether the plaintiff's work was actually used by the defendant in preparing his work, i.e., whether the work had been copied. This is determined by a finding of access to plaintiff's work plus discovery of enough similarities to conclude the work has been copied. The similarities are established by using expert testimony and analytic dissection¹³ of the elements of each composition.

The second step of the *Arnstein* test assesses whether the defendant's copying of plaintiff's work is sufficiently detailed to constitute an improper acquisition, i.e., an "illegal" copying. This is evaluated from the standpoint of the ordinary observer, deliberately excluding expert testimony and analytic dissection. Under this standard, if both the copying and improper acquisition tests are satisfied, the plaintiff meets the burden of proving infringement.

The *Krofft* two-stage test resembles the *Arnstein* approach and is the most widely used version of the substantial similarity test. The Ninth Circuit in *Krofft* developed an "extrinsic/intrinsic test" to resolve a claim that the defendant's "McDonaldland" fantasy characters in commercials infringed the copyright of the plaintiff's fictional "H.R. Puffn'Stuff" characters.

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

10. The actual test in *Lloyd* involving the "ordinary observer" has been more influential than the "abstractions test" as first formulated in *Nichols*.

Also, Howard Root has criticized the audience test as not providing an adequate test for assessing the copying of computer programs where there typically is no "ordinary audience." See Note, *Copyright Infringement of Computer Programs: A Modification of the Substantial Similarity Test*, 68 MINN. L. REV. 1264 (1984).

11. 154 F.2d 464 (2d Cir. 1946).

12. 562 F.2d 1157 (9th Cir. 1977).

13. Analytic dissection involves a comparative breakdown and detailed analysis of the elements of both works, segregating their similarities and differences.

The "extrinsic" phase of this test concentrates on whether there is a substantial similarity in the works which indicates the copying of ideas. This phase is termed "extrinsic" because the trier of fact relies exclusively on an analytic dissection of the work, enumerating specific elements of similarity or difference based upon expert testimony. The "intrinsic" stage addresses the question of whether the degree of similarity indicates the copying of the plaintiff's expression. During this second phase, as in the *Arnstein* test, the focus is on the intrinsic similarity of the works as perceived by an ordinary reasonable person, without the aid of expert testimony and analytical dissection.¹⁴ Accordingly, both the *Arnstein* and *Krofft* tests first use a point-by-point comparison using expert evidence to resolve the copying issue and then use the ordinary observer test to decide whether the similarity is so substantial as to amount to illegal infringement.

The foregoing tests represent the fundamental approaches for adjudicating copyright infringement in cases involving traditional subject matter. However, the application of these tests to the non-traditional subject matter of computer output and computer programs brought about further variations of the substantial similarity test.

B. *Substantial Similarity and Computer Products*

1. Similarity Tests and Computer Output

In cases where the disputed issue is the similarity of computer output rather than the underlying program itself, the subject matter, with one exception, has been limited to videogames copyrighted as audiovisual works.¹⁵ Because there is less of a conceptual difference between the audiovisual display of a computer program and the audiovisual aspects of more traditional subject matter such as plays, artwork, photographs, and movies, computerized audiovisual presentations are more amenable to traditional similarity tests than

14. Though some writers have suggested the *Krofft* test modified the *Arnstein* test, there are no significant differences. See *supra*, note 10, at 1279 n. 99.

15. 17 U.S.C. § 101 (1980). Computer products may either be copyrighted as audiovisual works or as literary works. A computer program may be copyrighted in both ways. See *Kramer Mfg. Co. v. Andrews*, 783 F.2d 421, 429 (4th Cir. 1986), for an example of the situation where one competing party to rights in the same videogame had registered a copyright on the audiovisual aspects while another registered the underlying computer program.

Presently, the only non-videogame case is *Broderbund Software, Inc. v. Unison World*, 648 F. Supp. 1127 (N.D. Cal. 1986), which involved an audiovisual copyright on screen menus in a printing program. Many more non-videogame audiovisual copyright cases will follow as the state of the law moves into a different phase which reflects the growing importance of personal computers in the American economy.

are the underlying programs.¹⁶ However, there are very significant differences.

In *Midway Mfg. Co. v. Dirkschneider*, the federal court applied a substantial similarity test to computer-generated audiovisual output for the first time.¹⁷ In this case, a preliminary injunction was sought against the distributors of coin-operated videogames to prevent further distribution of infringing copies of three of the plaintiff's games: Pac Man, Galaxian, and Rally-X.¹⁸ The *Dirkschneider* court utilized a "striking similarity" test in finding that the defendant's games were so overwhelmingly similar that access could be inferred without any other direct proof.¹⁹ A point-by-point comparison of each game was made without the aid of expert evaluation. The court found only minor differences between the works, and each of these differences were so minute that they would not be noticed unless the games were subjected to a side-by-side comparison. Although the court cited *Krofft*, it modified the *Krofft* extrinsic/intrinsic test substantially by merging the two stages and combining the ordinary observer test for expression similarity with the first analytic dissection test for idea similarity. In view of the trivial differences, the court granted plaintiff a preliminary injunction.

The next case to apply the test to modern technology, *Atari Inc. v. Amusement World, Inc.*,²⁰ was an action to enjoin the sale of

16. Yet there are problems with computerized video displays too: for instance, the statutory fixation requirement and the problem of repetitive images.

17. 543 F. Supp. 466 (D. Neb. 1981).

18. The rights to the coin operated versions of these games were assigned to Midway from Namco, a Japanese corporation. Pac Man is a maze chase game where the player guides a "gobbler" figure through a maze while trying to "eat" as many dots as possible and at the same time avoid being "killed" by "ghost monsters" programmed to chase the gobbler. Galaxian is an arcade game where the player moves his ship horizontally along the bottom of the screen to avoid projectiles fired by invading aliens from the top of the screen and at the same time tries to fire missiles at the invaders to slow or stop the invasion. Rally-X is a combination maze chase and race car game where the object is to race through the maze to gather as many checkpoint flags as possible before running out of gas.

19. "[I]f the similarity between the works is so striking that the possibility of independent creation is precluded, a court may find that copying occurred without direct proof of access," 543 F. Supp. 466, 482 (1981) citing *Ferguson v. N.B.C. Co.*, 584 F.2d 111, 113 (5th Cir. 1978); *Testa v. Janssen*, 492 F. Supp. 198, 202-04 (W.D. Pa. 1980). The burden of proof is on the plaintiff and it can be a heavy burden to prove that the similarities could only be explained by copying. Differences considered minor by the court included minor differences in the text, attract modes, quicker play, differently named characters, and differences in maze routes.

20. 547 F. Supp. 222 (D. Md. 1981). Atari's "Asteroids" arcade game is played by a player commanding a spaceship at the center of the screen and responds to "dangerous" situations which threaten to bombard the ship, from interplanetary rocks adrift to enemy spaceships.

the defendant's game "Meteors" as an allegedly infringing copy of the plaintiff's game "Asteroids." Employing a *Dirkschneider* approach, the court found twenty-two similarities and nine differences and queried whether these differences would be apparent to the ordinary player. Although the differences were minor²¹ and very similar to those involved in *Dirkschneider*, including speed of play, movement, coloration, and non-essential textual matter, the *Amusement World* court used the same test to arrive at a different and much-criticized conclusion.²² The court held that an ordinary observer would not find the "overall feel" of the games to be the same and that the similarities that existed were "inevitable given the requirements of the idea of a game involving a spaceship combating space rocks and given the technical demands of the medium of a videogame."²³ Based on this finding and on the rationale that where choice in expression is limited by the idea itself the copy-righting of one of those expressions should not provide a monopoly on the idea,²⁴ the court found that no substantial similarity existed between the games.

In *Atari, Inc. v. Armenia, Ltd.*,²⁵ the plaintiff requested a preliminary injunction against the distribution of defendant's videogame "War of the Bugs" as an alleged infringing copy of the plaintiff's game "Centipedes." The court employed a substantial similarity test based on an analogy to biological taxonomy:

[I]f I were a biologist and the machines were animals, . . . and there was a controversy concerning hominids, I would have to say that both of these machines were *Homo sapiens* . . . at least members of the same type or species.

I think I would have to go further . . . and find that they belonged to the same family.

I would even have to go further but not as far as counsel for the plaintiff says — they are not identical twins. In fact, they are not twins at all, but in my judgment, they are brothers.²⁶

In using this test, the court was, in effect, judging substantial similarity by Judge Learned Hand's abstractions test. Unlike Hand's

21. Relating to speed of play, color versus black and white, small differences in shading, background, and movement, and a minor variation in the introductory sequence.

22. This holding has been criticized in: Note, *The Courts Establish the Rules for Videogames Under the Copyright Act of 1976: Is It Too Hard to Play?*, 10 RUTGERS COMP. & TECH L.J.127, 143-44 (1984) and in *Midway Mfg. Co. v. Bandai-America, Inc.*, see *infra* note 36.

23. 547 F. Supp. 222, 225 (D. Md. 1981).

24. *Mazer v. Stein*, 347 U.S. 201 (1954).

25. COPYRIGHT L. REP. (CCH), ¶ 25,328 (E.D. Ill. 1981).

26. *Id.*

test, however, it is not clear whether the similarities were considered from the viewpoint of an ordinary player, an expert in the field, or merely from the viewpoint of the impartial judge.

*Atari v. Williams*²⁷ concerned "Jawbreaker," an imitator of Pac Man which substituted a pair of clicking false teeth for the gobler figure. Defendant's videogame displayed differences in the maze, music, colors, and in the shape and movement of characters. Although it was admitted that the idea was taken from Pac Man, the court ruled that the differences were numerous, that "the laws do not protect the strategy of a player symbol being guided through a maze appearing to gobble-up dots in its path while being chased through the maze by opponents," and that an ordinary observer would not have noticed the similarity in the games.

The most frequently cited videogame copyright decision is the Seventh Circuit case of *Atari, Inc. v. North American Philips Consumer Electronics Corp.*²⁸ *Philips* involved a game entitled "K. C. Munchkin" and plaintiff's game, Pac Man. The appellate court reversed the lower court finding of insufficient substantial similarity and found that K. C. Munchkin had many "blatantly similar features," including several similar characters, maze dots, role reversal features, and general maze configuration. The court criticized the approach of the trial court as ignoring the more obvious similarities while focusing on more minute differences in detail which underemphasized the extent of deliberate copying and alteration.

In addition, the court held that several segments constituted "scenes a faire," that is, features which are indispensable or standard in the treatment of a given topic and therefore are not subject to monopolization through copyright.²⁹ Excluding the "scenes a faire" elements from consideration, the appellate court stated that the scope of copyright protection increases with the degree to which the expression differs from the idea. On one end of the spectrum, there are ideas which can be expressed in very few ways, for instance the idea of a pin cast in the shape of a bee.³⁰ On the other end of the spectrum, there are ideas that are capable of a great range of expressions, such as a Romeo and Juliet story. Contrary to the view of the *Williams* court, it was held that the idea of a maze chase game fell on the multiple-expression end of the spectrum and hence the particularized expression merited broader copyright protection.

27. 217 U.S.P.Q. 746 (E.D. Cal. 1981).

28. 672 F.2d 607 (7th Cir. 1982).

29. *Id* at 616. See also *Alexander v. Haley*, 460 F. Supp. 40, 45 (S.D.N.Y. 1978).

30. *Herbert Rosenthal Jewelry Corp. v. Kalapakian*, 446 F.2d 738 (9th Cir. 1971).

The appeals court found infringement because the idea of a maze chase game did not dictate the particular characters of "gobblers" or "ghost monsters" and the similarity in expression of these characters would lead an ordinary game player to conclude K. C. Munchkin was a copy of Pac Man.³¹

The *Philips* test is reminiscent of the Hand abstractions test and is a departure from prior dissection-oriented tests. It focuses on similarities in the "total concept and feel" as perceived by the ordinary observer or audience. Furthermore, where the ordinary audience is indiscriminating, as the court presumed was true with videogames, the differences are given less weight as long as they are minor. The rationale is to prevent plagiarists from circumventing their wrongs by showing how much of the work they did not pirate.

A more analytical version of the substantial similarity test was used in yet another Pac Man infringement case, *Midway Mfg. Co. v. Artic Intern, Inc.*³² In an action to enjoin the distribution of "Puck Man" circuit boards and Galaxian speed-up kits,³³ the court used a simple one-step test which focused on the differences between the works in question and on the use of expert testimony. The *Artic* test thus differed from prior tests emphasizing the ordinary observer.

What is remarkable about the *Artic* opinion is that, although the copyright was only on the audiovisual work, the court relied on expert testimony regarding the similarity of the object code imprinted on the ROM chips.³⁴ In the Galaxian game, expert testimony proved there were only 488 differences out of 10,000 bytes in the source code printouts. Expert witnesses presented evidence that the circuitry of the boards contained an error also found in Midway's game.³⁵ Other than the names of the characters, the name of the game, and the copyright notices, the court found the Artic Puck Man game to be substantially similar, if not identical, to Pac Man.

*Midway Mfg. Co. v. Bandai-America, Inc.*³⁶ is one of the few decisions to faithfully apply the *Krofft* two-step extrinsic/intrinsic

31. Note that a different result was obtained in Amusement World due to the lack of characters and in *Midway Mfg. Co. v. Strohon*, *infra* note 54, due to different characters.

32. 547 F. Supp. 999 (N.D. Ill. 1982).

33. A "speed-up kit" is a set of ROMs and computer programs that increases the difficulty of a particular video game to challenge more skilled players. ROM stands for "read only memory" and is a computer program that is imprinted upon a silicon semiconductor chip which is read by the computer which contains the chip.

34. Before the recent decisions in *Broderbund* and *Kramer*, the *Artic* court was the only case that allowed expert evidence on the substantial similarity of the underlying programs when only the audiovisual work was copyrighted.

35. 547 F. Supp. 999, 1005 (N.D. Ill. 1982).

36. 546 F. Supp. 125 (D.N.J. 1982).

test. In an action to enjoin marketing of defendant's "Galaxian" and "Pakri-Monster" hand-held imitations of Midway's arcade games, the *Bandai* court applied the first stage of the *Krofft* test using analytic dissection and expert testimony to ascertain the similarity of the ideas behind the works. The court found that the idea of Galaxian and Pac Man had been copied based on expert evidence of similarity in musical themes, characters, background, and movement sequences. In employing the intrinsic or ordinary-observer prong of the test to determine whether plaintiffs' expressions had been copied, the court rejected the defendant's argument that any similarities in expression were due to inevitable similarities in the underlying idea, stating:

[This] assumes . . . the idea . . . includes the physical characteristics of the characters involved. If such reasoning were accepted, a copyright defendant could always avoid liability merely by describing a plaintiff's work in great detail and then labeling that as a description of the "idea" of plaintiff's work. The "idea" of any work could always be defined in such detail that the description of the expression would add nothing to the "idea," thus allowing a defendant to engage in all but verbatim copying. Such a ploy cannot be allowed.³⁷

The court ruled that an ordinary observer with an eye to gross features rather than details would find a high degree of similarity between the games as a whole and therefore granted plaintiff's request for a preliminary injunction.³⁸

*Kramer Manufacturing Co. v. Andrews*³⁹ is a recent Fourth Circuit case where a profitable arcade game, "Hi-Lo Double Up Joker Poker," was held infringed by copies produced by an ex-distributor who hired an engineer to copy plaintiff's printed circuit board and ROMs. Although the court did not specify the test it applied, it used an ordinary observer approach to compare the audiovisual works and found that defendant's mere replacement of names and phrases in the attract and play modes constituted only a "frivolous variation." Additionally, the court used an expert dissection test on the similarities in the underlying computer programs (which were not copyrighted by plaintiff) as probative evidence of unlawful copying. The court found the computer programs to be practically identical since many lines of code were literally dupli-

37. *Id.* at 148.

38. The court granted partial summary judgment on the copying issue (extrinsic test) but felt the infringement issue was a matter of fact to be decided by the trier of fact. *Id.* at 158.

39. 783 F.2d 421 (4th Cir. 1986).

cated and, in fact, the defendant's program included plaintiff's hidden legend "9-24-80 M. Kramer Mfg." which would only appear when the game's buttons were pressed in an abnormal code-like sequence. Accordingly, the lower court decision for the defendant was vacated and the case remanded.

The most interesting and far-reaching audiovisual copyright case to date is *Broderbund, Inc. v. Unison World, Inc.*⁴⁰ The case concerned "The Print Shop," a popular mass-marketed software disk enabling a user to create and print customized greeting cards, signs, banners, and posters. Initially, the defendant was hired by plaintiff to develop an IBM-compatible version of the program but, after the relationship deteriorated, Unison World incorporated that information in producing a competing product, "Printmaster." Broderbund filed suit alleging infringement of its audiovisual copyright. On the issue of copyrightability, the *Broderbund* court became the first to hold, in a non-videogame context, that the screen output of a computer program including menu screens, input formats⁴¹ and the sequencing of screens is protected by copyright from nonliteral copying. The court held this subject matter was protected by copyright because it was not (1) a merging of expression and idea as held by the earlier decision in *Synercom*,⁴² (2) a noncopyrightable mechanical or utilitarian feature of the work,⁴³ nor (3) a set of noncopyrightable rules and instructions.⁴⁴

On the issue of actual copying, both direct evidence and circumstantial evidence of copying were found.⁴⁵ The court applied

40. 648 F. Supp. 1127 (N.D. Cal. 1986).

41. A "menu screen" is an introductory image screen presenting multiple options from which the user selects a program function. An "input format" is a particular form for entering data into the computer with specific areas reserved for entering certain data.

42. *Synercom Technology, Inc. v. University Computing Co.*, see *infra* note 50, held input formats were non-copyrightable because the "idea" behind them was only expressible in a limited way, hence the idea and expression "merged."

Broderbund introduced the "Stickybear Printer" into evidence as a competing mass marketed software printing program which was not substantially similar to "Print Shop's" audiovisual format to rebut defendant's claims that the nature of the subject matter forced certain format expressions by the defendant.

43. *Durham Industries, Inc. v. Tomy Corp.*, 630 F.2d 905, 913 (2d Cir. 1980). Note that the traditional notion that copyright law does not cover utilitarian features is quickly eroding with the application of copyright law to computer programs.

44. *Affiliated Hospital Products, Inc. v. Merdel Game Mfg. Co.*, 513 F.2d 1183 (2d Cir. 1975).

45. Direct evidence was based upon the defendant programmer's admission that he directly copied aspects of the Broderbund program. Indirect evidence related to the findings of access and substantial similarity. Although the argument might be made that the application of the substantial similarity test in *Broderbund* was *dicta* because direct copying was admitted, it can also be contended that proof of direct copying is insufficient proof in itself where

the two-step *Krofft* substantial similarity test. In applying the extrinsic test, the court discovered a substantial similarity in the underlying ideas, based upon the opinions of expert witnesses that both programs performed virtually identical functions.⁴⁶

In using the intrinsic test to determine substantial similarity of the expression, the court deviated from the standard *Krofft* test focus on the "total concept and feel" of the work from an ordinary observer's viewpoint and applied an expert dissection test in place of the second step of the *Krofft* test. The court found the expression of the output of both programs substantially similar in the menu screen formats, the sequencing of graphics screens, the appearance of screen layouts, and also noted that the defendant's program retained keyboard limitations characteristic of the original "Print Shop" program which were inconsistent with the claim of an original program designed for the more flexible IBM PC keyboard. While the *Broderbund* court did find similarities in screen format, they were not literal duplications. Therefore, the court based its finding of substantial similarity on the rationale of the *Whelan* court⁴⁷ and held that verbatim duplication of certain audiovisual aspects of a utilitarian computer program was not necessary to prove infringement.⁴⁸

2. Similarity Tests and Computer Programs

The second set of cases involves the application of similarity tests to determine copyright infringement where the computer program itself is the copyrighted work.⁴⁹ The contrast in subject matter from the audiovisual copyright cases presents a different problem in determining substantial similarity. Since the program itself is unintelligible to the average person, unlike a play or novel, special difficulties are presented in applying traditional legal tests.

In *Synercom Technology, Inc. v. University Computing Co.*, the

the amount of text directly copied is not proven to be substantial. To the extent that the fragments copied are of insufficient magnitude to constitute infringement, the application of the substantial similarity test to the total Unison World program using the nonliteral methodology is not *dicta*.

46. 648 F. Supp. at 1136-37. The idea behind Printmaster was exactly the same as the idea behind plaintiff's original program Print Shop. Both programs allow users to create greeting cards, signs, banners and posters with user selected combinations of text, graphics, and borders printed on a dot matrix printer.

47. See *infra* note 76.

48. For a discussion, See Note, *Copyright Protection For Computer Programs Extends Beyond Literal Duplication to Structure, Sequence, and Organization*, 3 SANTA CLARA COMPUTER & HIGH TECH. L. J. 223 (1987).

49. Computer programs copyrights are registered as "literary works."

first computer law decision issued by the federal courts,⁵⁰ Synercom, a software development company, transformed an unsuccessful public domain program into a highly marketable architectural design program with "user friendly" input formats for the structural analysis of certain building materials under specified stress conditions. After leaving Synercom, two employees formed defendant EDI and began to market a competing program that incorporated Synercom's convenient input formats into its preprocessor program and also appropriated the contents of Synercom users' manuals, both of which were copyrighted as literary works. Without significant development expenses to recoup, EDI could afford to underprice Synercom. Synercom filed suit for copyright infringement.

In its analysis, the court did not apply the substantial similarity test. Instead, the court focused upon whether the defendants had copied plaintiff's idea or expression regarding the input formats. Despite conceding that EDI's "statements in its preprocessor program are derived directly and precisely from the copyrighted manual card formats,"⁵¹ the court nonetheless ruled that the ordering and sequence of data in input formats is an idea and not a copyrightable expression. This holding has been criticized, primarily for not using the substantial similarity test to determine the idea/expression dichotomy and for confusing the existence of copyright protection with the question of copyright infringement.⁵²

*Williams Electronics, Inc. v. Artic International, Inc.*⁵³ concerned plaintiff's videogame "Defender" with copyrights on both the audiovisual work and on the underlying computer program. Artic sold circuit board kits containing ROM chips which produced Artic's "Defense Command" game. These kits contained a computer program virtually identical to plaintiff's. Rather than employing the traditional Hand substantial similarity test or the *Krofft* test, the court used the expert dissection similarity test first employed in *Midway v. Artic Intern* and found that the audiovisual work was identical but for minor differences, such as the substitution of "Defense Command" for "Defender." The court also used expert testimony to find infringement of the underlying program based on substantial similarities in the ROM-embedded programs finding

50. 462 F. Supp. 1003 (N.D. Tex. 1978).

51. 463 F. Supp. 983, 1012 (D. Conn. 1978).

52. Note, *Copyright Infringement of Computer Programs: A Modification of the Substantial Similarity Test*, 68 MINN. L. REV. 1264, 1281 (1984).

53. 685 F.2d 870 (3d Cir. 1982).

that at least 85% of the lines of code were identical, that the defendant's program had copied plaintiff's programming errors, and that the Artic Program had a "buried" copyright notice within it which read "Copyright 1980—Williams Electronics."

In *Midway Mfg. Co. v. Strohon*,⁵⁴ Midway sought to enjoin the infringement of the audiovisual and program copyrights on its coin-operated Pac Man game by defendant's "Cute-See" modification kit. This kit included a set of ROM chip replacements which made the game more challenging by adding sophistication and increasing speed of play, pressure-sensitive graphics to cover the Pac Man trademarks and instructions on how to transform the arcade game into the Cute-See arcade game.

Examining the audiovisual work infringement claim, the court found differences in maze complexity, sound effects, and found the Cute-See characters bore no resemblance to Pac Man and the four ghost monsters.⁵⁵ Based on the holding in *Philips*⁵⁶ which held the appropriation of character expressions was determinative, the *Strohon* court found the distinctive copyrightable features of the Pac Man were not present in the defendant's work and therefore plaintiff's audiovisual work had not been infringed.

Turning to the question of whether the defendant's game infringed the copyright on the underlying Pac Man program even though there was no infringement on the audiovisual display, the court employed an expert comparison of the printouts of plaintiff's and defendant's ROM-embedded programs. The court considered expert testimony which compared the source code printouts from both sets of ROM chips.⁵⁷ It was established that 89% of the 16,000 bytes in the Pac Man ROMs were identically reproduced in defendant's corresponding ROMs and when the important instruction bytes were segregated from the data bytes,⁵⁸ over 97% of the 13,382 instruction locations were duplicated. The *Strohon* court found that the "degree of similarity, while not absolute, is substantial" and concluded the defendant illegally copied, modified and re-sold the Pac Man ROM chip programs.

54. 564 F. Supp. 741 (N.D. Ill. 1983).

55. The "characters" were colored squares.

56. See *supra* note 28.

57. This was accomplished with microcomputer development laboratory equipment which hooks up to the chip itself.

58. Midway's experts distinguished between "instructions" that direct the movements of game characters in response to player's movement of the controls and "data" that are directions to the computer to display certain information on the screen, like "High Score" or "Cute-See."

In a case before the International Trade Commission, *In the Matter of Certain Personal Computers and the Components Thereof*,⁵⁹ the ITC used a quantitative expert dissection approach and found substantial similarity based on literal duplication of 25% of the lines of code in the subroutines. Though the *Strohon* court found infringement based on 97% duplication, the ITC held that "substantial similarity ... does not require complete identity. . . . Sufficient similar material is involved here and that material appears to be qualitatively significant, since it includes 23 of the 32 most useful subroutines of the approximately 70 subroutines in the Autostart ROM program."⁶⁰

The next case to emerge was *SAS Institute, Inc. v. S & H Computer Systems, Inc.*⁶¹ an action by computer software developer and licensor, SAS, against a licensee, S & H, for copyright infringement relating to the misappropriation of a statistical analysis program. After negotiations broke down between the defendants and SAS for developing and marketing a version of the program for the VAX computer, defendants acquired a licensed copy of the SAS program to obtain the codes. They recoded and transferred the program into a VAX format and then further modified it using a text editor to produce a marketable S & H statistical analysis program for VAX-compatible computers. SAS filed suit against S & H for copyright infringement of the underlying program in addition to other causes of action.

The *SAS* court employed a substantial similarity test which involved a detailed expert comparison revealing similarities which included: forty-four identical lines of source code; numerous instances of near literal and organizational copying; the term "SAS" was found in at least 145 lines of code in S & H's first program; incoherent statements in the S & H program reflected hasty editing-out of identifying material; the functionless vestige of an earlier abandoned SAS subroutine was found in the S & H program; and there was a lack of design documentation for the S & H product. Accordingly, the court enjoined the marketing, use and further development of the infringing program.

*E. F. Johnson v. Uniden Corp.*⁶² was added to the rapidly expanding list of cases dealing with copyright protection of computer programs in 1985. In 1980, E. F. Johnson Co. was the first on the

59. COPYRIGHT L. DEC. (CCH) ¶ 25,651 at 18,927-9 (1984).

60. *Id.*

61. 605 F. Supp. 816 (M.D. Tenn. 1985).

62. 623 F. Supp. 1485 (D. Minn. 1985).

market with its ROM microchip programmed mobile radio communication systems for police cars, taxis, and other mobile units which automatically maximized operational efficiency by pooling radio channels.⁶³ By 1984, engineers from Uniden had disassembled Johnson's microchip program and used it to design their own mobile radio to compete with Johnson's units at around a 35% lower retail price. Johnson filed a copyright infringement action against Uniden and moved the court for a preliminary injunction to stop Uniden's continuing sales.

Acknowledging that the test of substantial similarity in the Eighth Circuit is "whether the work is recognizable by an ordinary observer as having been taken from the copyrighted source,"⁶⁴ the court applied its own version of the "iterative approach" test to the new high technology subject matter.⁶⁵

The iterative approach requires proof (1) that the defendant used the copyrighted work in preparing the alleged copy, which may be established by proof of access and similarity sufficient to reasonably infer use of the copyrighted work; and (2) that the defendant's work is an iterative reproduction, that is one produced by iterative or exact duplication of substantial portions of the copyrighted work.⁶⁶

The *Johnson* court used expert dissection and a detailed comparison of features between Johnson's and Uniden's program microcode.⁶⁷ Both programs used the same "Barker Code" se-

63. *Id.* at 1488.

64. *Withol v. Crow*, 309 F.2d 777, 780 (8th Cir. 1962).

65. Although the court stated that "Under either the traditional 'ordinary observer' or the contemporary 'iterative' test of substantial similarity," the facts would lead to a finding of substantial similarity, 623 F. Supp. at 1493, this somewhat conclusory statement appears unwarranted. Under the *Withol* test, an "ordinary observer" probably would not have the expertise to recognize the similarity of microcode "Barker code," "H-Matrix," "ghost code," "select call prohibit" errors, and the like. The *Johnson* court probably made this statement to minimize the apparent inconsistency between citing the 8th Circuit "ordinary observer" *Withol* test and then applying the fundamentally different "iterative test" of substantial similarity.

There are some indications of confusion in the *Johnson* court's analysis where the "expert dissection" test is confused with the "iterative" test and the *Whelan* approach is confused with the "total look and feel" ordinary observer test. Confusion in the area of copyright analysis as applied to high technology subject matter is not unusual. Some clarification of this type of confusion is provided by a conceptual segregation of the three dimensions of substantial similarity tests into (1) expert versus lay observers, (2) analytic versus synthetic approaches, and (3) literal versus non-literal comparisons, as discussed *infra*.

66. 623 F. Supp. 1485, 1493 (D. Minn. 1985).

67. Interestingly enough, the *Johnson* court went through the entire analysis without deciding the copyrightability of microcode issue. This issue was subsequently decided in the affirmative in the 9th Circuit by Judge Ingram in *N.E.C. Corp. v. Intel Corp.*, 645 F. Supp. 590, 595 (N.D. Cal. 1986).

quence for identification of incoming calls and "H-Matrix" codes for identifying transmission errors. The Uniden program repeated errors, anomalies and functionless "ghost code" remnants in the Johnson program and thirty-eight of forty-four routines included literal copying of code. Moreover, the manual for the Uniden program contained large segments of text lifted verbatim from the Johnson manual and the court held that "[v]erbatim copying of a computer manual is inferential evidence of pirating of the underlying software."⁶⁸ Accordingly, the court found that Uniden had infringed Johnson's copyrighted program and ordered the issuance of a preliminary injunction.⁶⁹

Another case, *Q-Co Industries, Inc. v. Hoffman*,⁷⁰ concerned a copyrighted teleprompting computer program developed by Q-Co for use in television broadcasting and theatrical performances to display and scroll scripts. At the time, such programs were only compatible with the Atari computer. However, the idea occurred to two computer scientists, defendants in the action, who worked for Q-Co that it would be technologically possible and economically profitable to design such a prompter program for the IBM personal computer. The defendants left the employ of Q-Co and formed Computer Prompting Corporation (CPC) to develop and market the IBM-PC prompting program.

Q-Co filed a copyright infringement action and requested a preliminary injunction against defendants. At the hearing, both sides presented expert testimony and evidence comparing the Q-Co VPS-500 and the CPC-1000 programs at the hearing. Many differences were due to hardware deficiencies of the IBM-PC's graphics which required extra programming and memory. Other differences were due to the different languages used (BASIC for the Atari and PASCAL for the IBM-PC). Similarities included: (1) four similar modules (a title module which was required for the Atari but unnecessary for the IBM, an opening menu module, a text scroll and edit module, and a character module); (2) similar menu lists using identical command terms; (3) that both programs used a high-level programming language for the second module and low level assem-

68. 623 F. Supp. 1485, 1497 (D. Minn. 1985).

69. "The mere fact that defendant's engineers dumped, flow charted, and analyzed plaintiff's code does not, in and of itself, establish pirating. . . . Had Uniden contented itself with surveying the general outline of the EFJ program, thereafter converting the scheme into detailed code through its own imagination, creativity, and independent thought, a claim of infringement would not have arisen." 623 F. Supp. at 1501 n.17.

70. 625 F. Supp. 608 (S.D.N.Y. 1985).

bly language for the third module; and (4) that the programs' character generation process operated similarly.

The court held that the CPC-1000 program was not a copy or paraphrase of the Atari-based Q-Co program,⁷¹ that it "employ[ed] wholly distinct algorithms,"⁷² and that there was "no direct evidence that [the defendant] employed the VPS material and indeed direct copying was impossible since the Atari programming was in BASIC and IBM in PASCAL."⁷³ Although a defendant-engineer admitted he used the structure and concept of the VPS-500 in re-writing the CPC-1000 program, the court held that the programs were not substantially similar since there was no literal duplication of code, the similarities in structure and organization were "an inherent part of any prompting program" and the program modules' "order and organization can be more closely analogized to the concept of wheels for the car rather than the intricacies of a particular suspension system."⁷⁴ Accordingly, the court held that, notwithstanding similarities in structure, sequence and organization, the idea rather than the expression was used and therefore copyright infringement had not been established.

The most recent⁷⁵ and controversial computer copyright case

71. *Id.* at 614.

72. *Id.* at 614.

73. *Id.* at 615.

74. *Id.* at 616.

75. At this writing, yet another computer program substantial similarity case has been decided, *Plains Cotton Cooperative Association v. Goodpasture Computer Service, Inc.*, *slip. op.*, No. 86-1126 (5th Cir., Jan 21, 1987). In this action, Plains unsuccessfully appealed a denial of their preliminary injunction against Goodpasture. Plains, a non-profit cotton cooperative developed a mainframe software system called "Telcot" which provided members with information on cotton prices and availability, accounting services, and the capability to electronically complete sales transactions. The employee software engineers who developed the program left Plains and eventually joined defendant Goodpasture Computer Service to develop a personal computer version of Telcot and brought a diskette containing the Telcot source code with them. This was used to design Goodpasture's personal computer version of Telcot, called "GEMS." When Goodpasture marketed GEMS, Plains filed suit for copyright infringement in District Court and moved for a preliminary injunction.

Expert testimony was presented showing the similarities between the two programs. Although the record reveals no evidence of verbatim copying (because such copying would have been improbable given the transformation from a large mainframe computer to a small personal computer program), there was evidence presented of "organizational copying." Nonetheless, the District Court presumably concluded that this was insufficient to find substantial similarity and denied plaintiff's request for a preliminary injunction, and plaintiff appealed.

In the Fifth Circuit Court of Appeals, plaintiff argued that the District Court applied the wrong test for substantial similarity because it only focused upon verbatim copying and not upon organizational copying, urging the court to adopt the non-literal reasoning of the Third Circuit in *Whelan v. Jaslow*. The court, instead, declined to accept the non-literal test of *Whelan* citing Judge Higginbotham's *Synercom* decision (from the same Circuit) with ap-

is the landmark Third Circuit decision in *Whelan Associates, Inc. v. Jaslow Dental Laboratory, Inc.*⁷⁶ In *Whelan*, a dispute arose between an independent software contractor (Whelan) and a client (Jaslow Dental Laboratory, Inc.) over the ownership of a commissioned computer program. Jaslow Dental Laboratory, run by Rand Jaslow, hired programmer Elaine Whelan to develop a program for accounting, inventory and billing functions which Whelan subsequently named Dentalab and copyrighted as a literary work. Rand Jaslow realized the profit which could be made if the program could be rewritten from EDL to BASIC and adapted to run on IBM-PC personal computers. After attempting to write such a program himself using his misappropriated copy of the Dentalab source code, Jaslow hired an expert programmer to build upon his work and finish what was to be called the "Dentcom PC" program. Subsequently, Jaslow formed Dentcom, Inc. to market the software. Thereafter, Jaslow Dental Laboratory filed suit against Whelan Associates in state court alleging trade secret misappropriation. Whelan filed a copyright infringement action in the United States District Court which was consolidated with the removed state action.

After the District Court established Rand Jaslow's access to the source code of the Dentalab program, it turned to consider the matter of substantial similarity. The court applied an expert dissection substantial similarity test which was not limited to verbatim

proval. The Plains decision suffers from several logical flaws. Parts of the opinion imply that the decision was based upon a repudiation of Whelan and a literal substantial similarity test. However, the court in Plains never got to the point of even applying a substantial similarity test to determine whether copying or infringement existed but rather based its decision on a preliminary determination that "many of the similarities . . . are dictated by the externalities of the cotton market" and "decline[d] to hold that those patterns cannot constitute 'ideas' in a computer context." Therefore, the court's statements regarding Whelan's non-literal substantial similarity test are *obiter dicta* because that issue is never reached.

An alternative analysis would have been to establish access and apply a test of substantial similarity to the comparison of the two programs. If the court decided to apply an iterative test, presumably the absence of literal copying would have led to the same decision and provided an actual basis for rejecting the Whelan approach. It is suggested here that the decision on whether a particular expression is dictated by surrounding circumstances and is therefore not copyrightable should logically be made *after*, rather than before, a preliminary determination of access and impermissible copying of the author's expression for the reason that it is only after the court determines that the defendant actually copied plaintiff's work (literally or by paraphrase) that the court should reach the matter of deciding whether defendant had no choice but to copy plaintiff's pattern because circumstances restricted the alternative expressions.

76. 797 F.2d 1222 (3d Cir. 1986), *aff'g* 609 F. Supp. 1307 (E.D. Pa. 1985), *cert. denied* 93 L. Ed.2d 831 (Jan. 13, 1986). See the discussion of Whelan in Note, *Copyright Protection for Computer Programs Extends Beyond Literal Duplication to Structure, Sequence, and Organization*, 3 SANTA CLARA COMPUTER & HIGH TECH. L. J. 223 (1987).

copying as required by the "iterative test."⁷⁷ The court held for the plaintiff based on expert testimony that, though written in different languages and involving no literal duplication, the programs were sufficiently similar in several significant areas: (1) the file structures, (2) the screen outputs, and (3) the modular organization of the program into order entry, invoicing, accounts receivable, end-of-day and end-of-month subroutines which performed nearly identically.

Jaslow Laboratory appealed to the Third Circuit Court of Appeal attacking the District Court's finding of substantial similarity as error arguing that it was beyond the existing scope of copyright protection for software since no prior case had found infringement in the absence of evidence of literal copying. Notwithstanding the confines of prior case law, the Court of Appeal moved beyond the restrictive iterative approach and utilized broader notions from copyright law to hold that a program's copyright covers nonliteral elements of the program including the structure of the program itself. Following the lead of Judge Hand's original abstractions test in *Nichols*, the *Whelan* court could find no sound reason why computer programs should not be subject to the same nonliteral test that applies to other subject matter.

Before *Whelan*, the substantial similarity test in computer copyright cases was limited to literal or "fragmented literal" similarity where fragments have been exactly copied and incorporated into the defendant's work. The decision in *Whelan* extends copyright protection to cover comprehensive nonliteral copying of: (1) the general format of file structures to the extent that they are innovative in arrangement and convey information;⁷⁸ (2) the overall structure, ordering, and processing sequences of component program modules; and (3) translations to other computer languages. The progressive approach of the *Whelan* court marks the genesis of a far-reaching expansion in copyright protection for computer programs.⁷⁹

77. See Note, *Copyright Infringement of Computer Programs: A Modification of the Substantial Similarity Test*, 68 MINN. L. REV. 1264 (1984).

78. *Contra* the substance of the early decision in *Synercom*.

79. Additional cases have not been covered in this discussion because they are tangentially relevant to the application of the substantial similarity test to computer subject matter: *Hubco Data Products Corp. v. Management Assistance, Inc.*, 2 COPYRIGHT L. REP. (CCH) ¶ 25,529 (D. Idaho Feb. 3, 1983) (no substantial similarity issue, total identical copy), *Dynamic Solutions, Inc. v. Planning & Control, Inc.*, 646 F. Supp. 1329 (S.D.N.Y. 1986) (derivative work issue), *Williams v. Arndt*, 626 F. Supp. 571 (D. Mass. 1985) (copyrighted commodities trading manual infringed by commodities trading program), *Koontz v. Jafarian*, 787 F.2d 906 (4th Cir. 1986) (copyrighted manual with data base for estimating electrical contractor's bids held infringed where data stored without copyright notice on

C. *Summary: An Analysis of Existing Tests for Substantial Similarity Applied to Computer Technology*

The foregoing history of the substantial similarity test discloses considerable variation and inconsistency in its formulation and application. However, substantial similarity tests, from *Nichols* to *Whelan*, may be systematically classified along several dimensions: (1) the *approach* which is taken to evaluate the similarities and differences; (2) the *perspective* from which these similarities and differences are evaluated; and (3) the *measures* of similarity as restricted or expanded.⁸⁰ First, the approaches utilized tend to be either *analytic*, involving a breakdown of elements and a detailed dissection of differences and similarities or *synthetic*, resisting a dissection approach in favor of a gestalt-type "overall look and feel" test. Second, the perspectives for evaluation are inclined to be either from the viewpoint of an *expert* in the field or from the standpoint of an *ordinary observer*. Finally, the measures of similarity vary in terms of their level of abstraction from the low-level *iterative approach* to the more abstract *nonliteral approach*. Segregating these variables reveals at least six different types of similarity tests which have actually been employed by the courts.⁸¹

computer tapes was copied by infringing manual), *Evans Newton Inc. v. Chicago Systems Software*, 793 F.2d 889 (7th Cir. 1986) (infringement of computer program manual by competing program and manual).

80. It is important to note that these classifications of types of tests are often based on matters of *emphasis*. Some cases may use overlapping tests, e.g. *Amusement World* at one point also mentions "overall concept and feel."

81. Theoretically more combinations of approaches are possible, however these are the most significant combinations.

Figure 1. Varieties of Substantial Similarity Tests

		PERSPECTIVE OF EVALUATION	
		Ordinary Observer	Expert
A P P R O A C H	Synthetic	LLOYD PHILIPS ARMENIA ("Intrinsic")	NICHOLS
	Analytic	DIRKSCHNEIDER ATARI AMUSEMENT WORLD KRAMER	ARTIC WILLIAMS STROHON PERSONAL COMPUTERS SAS JOHNSON Q-CO ("Extrinsic")
M E A S U R E	Two-Stage	ARNSTEIN/KROFFT BANDAI (BRODERBUND)	
	Integrative Nonliteral Tests	BRODERBUND WHELAN	

1. The Expert Overall Similarity Test: The Abstractions Test

Though the classic version of this test has not been applied in the computer field, it is the original abstractions test as used by Judge Learned Hand in *Nichols v. Universal Pictures Corporation*.⁸² The test uses experts to compare the original work with the alleged copy in determining whether the degree of similarity is at such an abstract level as to constitute an appropriation of the unprotectable idea rather than the expression. In conducting this test, the court uses an expert perspective to compare similarities and differences, not on a point-by-point basis, but on a general comprehensive level to ascertain whether the organization of the expression of the al-

82. 45 F.2d 119 (2d Cir. 1930).

leged copy is substantially similar enough to the original work to constitute a wrongful taking. The classic version of Learned Hand's abstractions test has not been extensively used in the computer field because the use of expert testimony is seen as more compatible with a point-by-point dissection. However, there is no reason that an expert overall similarity test could not be used in cases involving computer games or non-game visual displays.

2. The Audience Overall Similarity Test: The Total Look and Feel Test

The audience overall similarity test is a later version of Judge Learned Hand's abstractions test which excludes expert testimony and makes the comparison from the standpoint of the ordinary observer. This audience test or ordinary observer test was first applied in *Harold Lloyd Corp. v. Witwer*⁸³ and was incorporated into the second stage of the *Krofft*⁸⁴ and *Arnstein*⁸⁵ tests.

This gestalt version of the ordinary observer test was introduced into the computer field by *Atari, Inc. v. Armenia, Ltd.*⁸⁶ and *Atari, Inc. v. North American Philips Consumer Electronics Corp.*⁸⁷ to assess the substantial similarity of computer output in an audio-visual games context. In *Philips*, the Seventh Circuit focused on whether the total concept and feel of K. C. Munchkin was substantially similar to that of Pac Man as experienced by the ordinary player. The court deliberately avoided an analytic dissection of differences because this would unduly favor defendants who could defend their misappropriations by pointing out the minor differences and changes they made. The *Philips* version of the audience overall similarity test tends to favor the plaintiff because the evaluation is made from the standpoint of the audience, and in the computer field it is reasonable to assume that an ordinary observer would be less discriminating than an expert. Where the audience is less discriminating, differences between works are generally given less weight. Therefore, a finding of substantial similarity between the expressions of the works is more likely.⁸⁸

83. 65 F.2d 1 (9th Cir. 1933).

84. *Sid and Marty Kroft Television Productions, Inc. v. McDonalds Corp.*, 562 F.2d 1157 (9th Cir. 1977).

85. *Arnstein v. Porter*, 154 F.2d 464 (2d Cir. 1977).

86. *See supra* note 25.

87. 672 F.2d 607 (7th Cir. 1982).

88. Other aspects of *Philips* also recommend it as a plaintiffs test, such as the focus on the many possible expressions which an idea may have depending upon where it falls on the spectrum of specificity.

The court in *Broderbund Inc. v. Unison World, Inc.*⁸⁹ incorporated aspects of this test into its analysis in the intrinsic phase of the *Krofft* test. The focus on overall similarities in expression and the down-playing of minor differences from the perspective of an ordinary observer would probably have led to a different outcome in *Atari, Inc. v. Williams*⁹⁰ and possibly in *Atari, Inc. v. Amusement World, Inc.*⁹¹ had the audience overall similarity test been properly applied in those cases.⁹²

3. The Audience Analytic Similarity Test

The use of a similarity test featuring point-by-point comparisons of the differences between works without the aid of expert testimony was first applied to computer output in 1981 in *Midway Mfg. Co. v. Dirkschneider*.⁹³ In focusing on the differences between the plaintiff's three videogames and those of the defendant, the court felt the proper standpoint of evaluation was the perspective of the ordinary game player. The court held that the differences would not be readily apparent to the average player unless they were subjected to side-by-side comparison. Since such side-by-side evaluation is inherent in the expert dissection test, it might be concluded that the *Dirkschneider* test, when focusing on minor differences, is more favorable to the plaintiff.

Virtually the same test was used in *Atari v. Williams* but with a different result. In enumerating the differences in color, music, movement, and maze shape, the court held that although the idea was admittedly copied, an ordinary observer would not conclude that they were substantially similar.

Similarly, the audience analytic test yielded results favorable to the defendant in *Amusement World* where the court concluded that an ordinary observer would not find the feel of the games to be the same. The court neutralized the greater number of similarities by concluding that they were inevitable given the limited expressions of the idea behind the game. However, the *Amusement World* court differed in its application of this test from the courts in *Dirkschneider* and *Atari v. Williams* insofar as those courts focused on the enumeration of differences, while the *Amusement World* court enumerated similarities as well.

89. 648 F. Supp. 1127 (N.D. Cal. 1986).

90. 217 U.S.P.Q. 746 (E.D. Cal. 1981).

91. 547 F. Supp. 222 (D. Md. 1981).

92. It is interesting to compare the approaches of Philips and Atari v. Williams since they both deal with the "Pac Man" game.

93. 543 F. Supp. 466 (D. Neb. 1981).

The *Kramer* court⁹⁴ likewise used an audience analytic similarity test in evaluating the infringement of an audiovisual work. As in *Dirkschneider*, the court performed a point-by-point analysis of differences and indicated that the variations in features between the programs were minor, primarily consisting of the textual replacement of company names, game titles, and stock phrases. It was found that the differences enumerated would not negate the overwhelming similarities or keep the ordinary game player from the conclusion that the games were substantially similar.⁹⁵

Generally, the audience analytic similarity test may have a tendency to be more favorable to the defendant than other tests. The test focuses on the enumeration of differences on a point-by-point basis and then asks whether an ordinary observer would notice them. Unless, as in *Dirkschneider* or *Kramer*, the differences are very few and very minor, it is probable that the courts will find the differences noticeable by the ordinary consumer and conclude such works are not substantially similar. Conversely, if the overall audience similarity test were used on the same facts, it is more likely to favor the plaintiff because it tends to submerge such differences in the application of the test.

4. The Expert Analytic Similarity Test: The Expert Dissection Test

Although the expert analytic similarity test is typically applied to cases in which the underlying computer program is copyrighted as a literary work, this is not always the case. In *Midway Mfg. Co. v. Artic Intern, Inc.*,⁹⁶ the copyright was on the audiovisual display, yet the court allowed expert analysis of the similarity of the underlying ROM chip programs.⁹⁷ Similarly, in *Midway Mfg. Co. v. Bandai-America*, the court used professors of music to compare the music patterns of the games in order to evaluate similarities in the audiovisual works in the first phase of a *Krofft* test.⁹⁸

Ever since its first application to computer programs in 1982,⁹⁹ the expert analysis test has become the standard test when the underlying software is copyrighted as a literary work. Because the

94. 783 F.2d 421 (4th Cir. 1986).

95. Note that the *Kramer* court did admit extensive expert testimony on the points of similarity and difference in the linked underlying computer program.

96. 547 F. Supp. 999 (N.D. Ill. 1982).

97. *Accord* *Kramer* and *Whelan*.

98. Although *Bandai* was not part of the 9th Circuit, it nonetheless opted to adopt the *Krofft* test.

99. *See* *Williams v. Artic*, 685 F.2d 870 (3d Cir. 1982).

nature of a computer program is quite unlike a play or story, the gestalt concept of the expert overall similarity approach is typically rejected in favor of the point-by-point dissection approach which is better suited to comparing lines of code.¹⁰⁰ Since the workings and structure of a computer program are unintelligible to an ordinary observer, the use of experts becomes necessary. However, the incompatibility of the traditional ordinary observer test with the new high technology subject matter has caused confusion on the part of some courts and observers in mistakenly identifying this expert dissection approach with the iterative approach. They are not identical. The iterative approach restricts the perspective to the expert viewpoint and restricts the measure of infringement to literal or verbatim copying. Since courts have used the expert dissection test without the verbatim limitation, it is important not to equate the expert dissection test with the iterative approach.

The expert dissection test was first hinted at in *Synercom Technology, Inc. v. University Computing Co.*¹⁰¹ The court in *Synercom* admitted expert evidence on a point-by-point comparison of the input format programs and found them to be virtually identical. However, the court never conducted a formal substantial similarity test since it made an a priori decision that input formats were ideas and not copyrightable.

The first true application of the expert analytic similarity test to determine substantial similarity in the computer program context was in *Williams Electronics v. Artic International*,¹⁰² where both the program and audiovisual display were copyrighted. The court applied an expert analysis test to both media and found that the audiovisual displays were virtually identical and the programs contained over 85% identical code in addition to hidden legends and common errors.

In *Midway Mfg. Co. v. Strohon*,¹⁰³ the court applied an expert analysis approach to a similar situation where the games' display was copyrighted as an audiovisual work and the underlying program as a literary work. Although the court found no substantial similarity in the audiovisual displays, the expert evidence showed approximately 90% of the code to be identical and the court found substantial similarity in the computer programs. The same expert

100. See for example, *SAS Computers*, 605 F. Supp. 816 (M.D. Tenn. 1985) and *Johnson v. Uniden*, 623 F. Supp. 1485 (D. Minn. 1985).

101. 462 F. Supp. 1003 (N.D. Tex. 1968).

102. 685 F.2d 870 (3d Cir. 1982).

103. 564 F. Supp. 741 (N.D. Ill. 1983).

analytic similarity test with a focus on the amount of similar code was continued by the ITC in *In the Matter of Certain Personal Computers*¹⁰⁴ with a finding of infringement based on evidence that only 25% of the code had been literally duplicated.

In *SAS Institute, Inc. v. Computer Systems, Inc.*,¹⁰⁵ the application of the expert dissection test also centered on a detailed enumeration of similarities, rather than differences in the code. Furthermore, the *SAS* court took a progressive approach by supplementing the substantial similarity test with circumstantial evidence of copying. The court's analysis in *SAS* is one of the more sophisticated applications of the expert dissection test to a computer program. Interestingly, although the decision in the case was based upon blatant literal copying, the court indicated that nonliteral evidence of similar structure and organization would be relevant to determining substantial similarity. This idea would come to fruition in *Whelan Associates, Inc. v. Jaslow Dental Laboratory, Inc.*

Finally, the *E.F. Johnson v. Uniden Corp.*¹⁰⁶ court applied an iterative version of the expert dissection test in finding the Uniden radio system software infringed Johnson's program. Detailed expert analysis was used and, although it was dicta, the court indicated that if there was no literal copying, there would have been no copyright cause of action. The *Q-Co Industries, Inc. v. Hoffman* court¹⁰⁷ applied a similar iterative dissection test in holding the lack of evidence of literal copying of the teleprompter program justified a decision for the defendant.

5. Two-Stage Similarity Tests: Extrinsic/Intrinsic

The fifth type of similarity test to be used in the computer copyright field is a combination of prior tests into a two stage test. Originally developed by Judge Frank in *Arnstein* and refined in *Krofft*, this test was first applied to computer output in *Midway Mfg. Co. v. Bandai-America, Inc.*¹⁰⁸ The extrinsic test uses the expert dissection test to determine if the idea behind the product was copied and the intrinsic test uses the ordinary observer test to evaluate whether the expression has been misappropriated. The *Bandai* court used experts in music and software to detail the similarities in

104. See *supra* note 59.

105. 605 F. Supp. 816 (M.D. Tenn. 1985).

106. 623 F. Supp. 1485 (D. Minn. 1985).

107. 625 F. Supp. 608 (S.D.N.Y. 1985).

108. 546 F. Supp. 125 (D.N.J. 1982).

the extrinsic phase and found the intrinsic test of substantial similarity satisfied from the standpoint of an ordinary player.

The court in *Broderbund* also applied this Ninth Circuit test and determined that the extrinsic test was satisfied by expert evidence showing that the ideas behind the programs in question were substantially the same and found the intrinsic test was met because an ordinary observer would find the expression of the works to be substantially similar. However, in the second test, the *Broderbund* court did not apply the traditional audience overall similarity test (the total look and feel test) but rather used the audience analytic similarity test with extensive use of detailed comparisons between the audiovisual displays of both programs.

6. The Nonliteral Substantial Similarity Test

A new type of substantial similarity test has come to the forefront with the well-reasoned decision in *Whelan v. Jaslow*¹⁰⁹ which, in one respect, brings copyright law "full circle" back to *Nichols*. The approach taken in *Whelan* takes an unprecedented position on the definition of copying by refusing to restrict the scope of computer copyright protection to literally copied elements. Instead, *Whelan* harks back to Judge Learned Hand's early remark in *Nichols* that copyright "cannot be limited literally to the text, else a plagiarist would escape by immaterial variations."¹¹⁰ Under the *Whelan* test, the mere fact that the defendant has paraphrased rather than literally copied the work will not preclude a finding of substantial similarity.¹¹¹

The *Whelan* court combined this nonliteral approach with an expert dissection test in judging the substantial similarity of the applications programs at issue. The court evaluated expert evidence of similarity in each program's file structures, screen outputs, and arrangements of subroutines. However, since the infringing program was copied in a different computer language, there was no literal duplication. Accordingly, the *Whelan* court took a flexible approach which added to the expert dissection test by blending elements of the expert overall similarity test. The court then examined the similarities in the overall organization, structure, and sequencing of the two programs and found them substantially similar.

The court proposed a means-ends rule for determining the

109. 797 F.2d 1222 (3d Cir. 1986), *aff'g*, 609 F. Supp. 1307 (E.D. Pa. 1985), *cert. denied*, 93 L. Ed.2d 831 (Jan. 13, 1986).

110. 45 F.2d 119, 121 (2nd Cir. 1930).

111. See NIMMER, THE LAW OF COPYRIGHT § 13.03[A] (especially footnote 8).

copyrightable expression of a computer program in a way that transcends its literal embodiment. Since computer programs, unlike works of art, are functional and utilitarian, the rule for distinguishing idea from expression can be framed in terms of the purpose or function of the program representing the idea and the means for achieving the purpose being equal to the expression of the idea. The court stated the rule as follows:

[T]he purpose or function of a utilitarian work would be the work's idea, and everything that is not necessary to that purpose or function would be part of the [protectable] expression of the idea Where there are various means of achieving the desired purpose, then the particular means chosen is not necessary to the purpose; hence, there is expression, not idea.¹¹²

The 'expression of the idea' in a software computer program is the manner in which the program operates, controls and regulates the computer in receiving, assembling, calculating, retaining, correlating, and producing useful information either on a screen, print out or by audio communication.¹¹³

Using this rule and approach, the court indicated that the idea of a program for the efficient management of a dental laboratory's accounting, inventory, and marketing tasks could be accomplished with a number of different programming structures and, therefore, the structure, sequence, and organization of the manner in which the Dentalab program accomplishes this is part of the program's protectable expression.

The court in *Broderbund* followed the lead of *Whelan*. Although it applied the two-stage *Krofft* test, it also adopted the nonliteral approach of *Whelan* and the means-ends test. It found that the function of a menu-driven program allowing the user to print greeting cards, signs, banners, and posters was an idea and that there are a number of different expressions for accomplishing this function. Therefore, the court held that in the absence of literal or verbatim copying of audiovisual images, the overall arrangement, structure and sequencing of a program's menu screens, input formats, text, and artwork is protected under the copyright laws.

In effect, *Whelan* established the nonliteral test for computer programs copyrighted as literary works and *Broderbund* instituted it for computer displays copyrighted as audiovisual works. With this "double-barreled" revolution in the scope of a program's pro-

112. 797 F.2d 1222, 1236 (3d Cir. 1986).

113. *Id.*

tectable expression, computer copyright law has entered a new frontier.

III. A NEW UNIFORM SUBSTANTIAL SIMILARITY TEST FOR COMPUTER COPYRIGHT INFRINGEMENT: THE INTEGRATIVE TEST

The scope and application of the substantial similarity test in the field of computer copyright law has displayed prodigious variability and has recently been developing with extreme rapidity.¹¹⁴ The field is swiftly coming of age and there is a need for a uniform substantial similarity test for computer copyright law which provides a better solution to the problems of software developers who need protection against parasitic copiers.

To begin to meet this need, an integrative test is proposed here for determining substantial similarity of computer programs and output which follows the progressive direction of the courts in *Whelan* and *Broderbund*.

A new uniform substantial similarity test for computer copyright infringement cases should incorporate the strengths of the prior tests while avoiding or minimizing their weaknesses. Aside from unsystematic variability and inconsistency in application, the most significant weaknesses of existing tests are (1) a limitation to verbatim copying, (2) an incompatibility between the test and the subject matter, and (3) a narrow focus which does not consider relevant external evidence. Hence, the elements of the integrative test are (1) a nonliteral measure of copyright infringement, (2) an integration of prior substantial similarity tests to provide the best coverage of the subject matter, and (3) a flexible approach which encourages the introduction of probative evidence on external aspects related to the issue of substantial similarity.

A. *The Integrative Test Is Nonliteral*

The iterative test for computer copyright has outlived its usefulness because it does not offer adequate protection against paraphrase copying of computer programs and output. The iterative test, as originally proposed, was intended to clearly draw the line between the idea and the protectable expression.

Focusing on the literal similarities between the two works and

114. For example, in the year between the rough draft of this comment and the final draft, five significant cases on computer copyright substantial similarity tests were decided: *Q-Co*, *Johnson*, *Kramer*, *Whelan*, and *Broderbund*.

their significance in the alleged pirate's program, however, will yield a more clearly defined and ascertainable distinction between the idea and its expression.¹¹⁵

Nevertheless, the clearest place to draw-the-line is not necessarily the wisest. Rather than sacrifice the effectiveness of copyright law protection for mere simplicity, a better test is offered by the *Whelan* court. The means-ends test which distinguishes idea from expression by distinguishing ultimate function and purpose from the variable means of accomplishment is a workable approach which provides a more effective distinction.

Three fundamental contentions are advanced to support the iterative test. First, because computer programs are different from any other subject matter covered by copyright, a different rule is necessary which only protects against literal copying. The mistaken assumption is made that "One cannot simply 'approximate' the entire copyrighted computer program and create a similar operative program without the expenditure of almost the same amount of time as the original programmer expended."¹¹⁶ This is a gross overstatement and, if true, would condone nonliteral copying and the plaintiffs in cases like *Q-Co*, *Plains*, *Whelan* and *Broderbund* would be left without a remedy. The fact is that these cases are occurring with increasing frequency, perhaps as an indirect response to the literalist restrictions which many courts place on the substantial similarity tests. Obviously, nonliteral misappropriation of other's copyrighted works is also much cheaper and faster than developing the product from the outset.

The second argument advanced is that the concept of structure in computer programs is too vague to be useful as a subject of copyright protection.¹¹⁷ The difficulty with this assertion is that the notion of structure in computer programming is very clearly defined by means of flow charting, prescribed and preferred paths for data flow, and conventions for "structured programming." Moreover, the misappropriation of the basic structure of another's program may involve just as direct a misappropriation of their time, labor, and creativity as an exact copying of their lines of code.

The third contention is that because progress in the programming field is qualitatively different in requiring the "stepping stone"

115. See Note, *Copyright Infringement of Computer Programs: A Modification of the Substantial Similarity Test*, 68 MINN. L. REV. 1264, 1299 (1984).

116. *Id.*

117. Radcliffe, *Recent Developments in Copyright Law Related to Computer Software*, 4 COMPUTER L. REP. 189, 194-97 (1985).

use of others' works, extension of protection for nonliteral elements will constitute "overprotection" that will stifle innovation in the software field. This argument fails for a number of reasons. The assumption is unfounded since it presumes there can be no progress without the near-literal copying of others' work. The presumption that these so-called "building blocks" would be sufficiently similar to the original programs to be infringing is also questionable. Moreover, it begs the question by first assuming that nonliteral copyright protection would block stepping stone innovation and then invoking that very assumption as a reason against extending protection against nonliteral copying.

It is doubtful that extending software protection to nonliteral elements will have a negative impact. On the contrary, it is likely that this protection will have a very beneficial impact in encouraging technological progress in software development by rewarding the innovators with the protection of the right to economically harvest the fruits of their labor and creativity free from parasitic competition. Because the arguments supporting the iterative approach are not persuasive and because there are strong reasons to extend copyright protection to nonliteral copying, the integrative test adopts the nonliteral measure of infringement.

B. *The Integrative Test Combines Similarity Tests*

There are two situations which merit different substantial similarity test approaches. The first type of situation involves copyrighted subject matter which is itself designed to be directly perceived by the consumer and calls for an ordinary observer variant of the integrative test. Where computer program displays are copyrighted as audiovisual works, the substantial similarity test which is appropriate is a two-phase test. In the first phase, the court should apply the audience analytic similarity test as it was applied in the second step of the *Broderbund* analysis. The elements of similarity and difference (literal and nonliteral) in the appearance of the audiovisual display should be subject to a detailed point-by-point comparison. If the trier of fact determines that there is substantial similarity at this level, then the second stage application of the audience overall similarity test determines whether those similarities and differences enumerated in the first phase would lead the ordinary consumer to the conclusion that they were substantially similar.

The second situation calls for the expert variant of the integrative test where the copyrighted subject matter is not intended to be

directly perceived by the end user, generally where the underlying computer program is copyrighted as a literary work. Again, a two phase approach would prove useful. In the first phase, the expert analytic similarity test should be used to determine whether there is a literal or near-literal copying by a close examination and enumeration of similarities and differences. Substantial similarity can be found at this level and the case resolved. If there is no resolution during the first phase, the second step paraphrase test (using the expert overall similarity test similar to the test in *Whelan*) should be conducted to determine whether there has been a misappropriation of the organization, sequence or arrangement of the program's elements.

It is recommended that the traditional two-stage tests of *Arnstein* and *Krofft* be abandoned for application to computer-related subject matter because they mix the expert (phase I) tests with the ordinary observer/audience (phase II) tests where the subject matter in computer cases tends to favor *either* one perspective *or* the other.

C. *The Integrative Test Uses Probative Relevant Evidence*

The integrative test represents a flexible approach which allows the introduction of probative and relevant evidence on indirect aspects related to the issue of substantial similarity.

First, the integrative test allows the incorporation of probative indirect evidence. Where the computer program's audiovisual aspect is copyrighted and at issue, the application of an expert dissection test using expert evidence on the similarities and differences in the underlying program (even if it is not copyrighted) is desirable for its corroborative or probative value and should be utilized as in *Artic*, *Kramer*, and *Broderbund*. Where the computer program itself is the copyrighted subject matter at issue and where it produces an audiovisual display intended for an end user, the use of the audience analytic similarity test to determine similarities and differences in the computer program's output should be considered as probative of the substantial similarity of the underlying program as interpreted by the court in *Whelan*. Even similarities in documentation, manuals or other accompanying materials should be accepted as probative evidence as stated by the *Johnson* court.

It should be noted that the audiovisual display and underlying program are merely two different aspects of the same process. In *Kramer*, one party held the copyright on the audiovisual aspect of a videogame while the other held a copyright on the underlying pro-

gram. Perhaps where it can be shown that an audiovisual display and program are directly linked, the copyright first obtained on one aspect should also cover the other. This approach is supported by the rationale of *Apple Computer, Inc. v. Franklin Computer Corp.*¹¹⁸ which recognized that the copyrighting of a written computer program extended to its expression in object code on a ROM chip since it was merely a different aspect of the same computer process.

Second, the integrative test allows the introduction of probative negative evidence. For instance, evidence relating to the absence of documentation (as in *SAS*) or the absence of other evidence (such as plans, receipts and contracts) which would normally accompany the legitimate research and development process of the computer product is probative of the likelihood of independent invention. Probative negative evidence also includes evidence of lack of reasonable development time where there is a surprisingly quick research and development period for the allegedly infringing product as compared to the amount of time it took to develop the allegedly infringed computer product.

Evidence of improbable coincidence in program structure and content is also probative and should be considered. Such evidence may include the following facts: the programs share similar errors (as in *Artic, Williams Electronics, and Johnson*); the particular solution to a problem is identical under circumstances which would indicate a high level of improbability for such a coincidence; the alleged copy also contains the same or similar "ghost code" remnants of aborted but unerased programming attempts in the infringed program (as in *SAS*); or the allegedly infringing program has features which are more consistent with the plaintiff's version of the program than with the defendant's, such as specialized keyboard differences (as in *Broderbund*) or irrelevant program modules (as in *Q-Co*).

Finally, the integrative test looks to probative evidence of probable cover-up activities. Such evidence may include unexplained blank spots where identifying information would be expected; evidence of selective changes in nonfunctional text; and evidence of scattered bits of code, hastily edited material and superficial modification (as in *SAS*).

IV. CONCLUSION

We have come a long way in technological progress from the

118. 714 F.2d 1240 (3d Cir. 1983).

time when the Copyright Act was first formulated in 1790. Applying a set of rules originally designed to protect the literary and artistic creations of authors, composers, and artists presents unique problems when applied to protect the products of the computer age. Rules originally tailored to protect aesthetic forms of creative expression are now being stretched to protect the electronic designs and logical programming structures devised by engineers.

In addition to this conflict between traditional legal tests and technological change, the current state of confusion in substantial similarity tests is due in part to the conflicting policies behind copyright law. On one side, there is the protection of an innovator's creative merit, investment of time, energy, and resources against misappropriation by others. On the other side, there is the policy of preventing the monopolization of an entire area through overprotection resulting in the stifling of free competition. Perhaps as an attempt to encourage free competition, a number of the early computer copyright cases were decided using a rationale which inadequately protected a program author's investment of time, money, effort, and imagination from misappropriation by others. But computer technology is moving into a new era which will require a greater need for protection of high technology intellectual property and necessitate the movement of copyright law into a new frontier. With the rapidly expanding scope of copyright protection from computer programs to object code on ROM chips, to microcode, to screen formats, and to nonliteral copying, it becomes even more important to establish a uniform integrated substantial similarity test that will protect computer innovations from infringement.