Reverse Engineering and the Development of Compatible and Competitive Products Under United States Law

Stephen J. Davidson

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REVERSE ENGINEERING AND THE 
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UNITED STATES LAW

Stephen J. Davidson†

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Copyright © 1989 Stephen J. Davidson and Lawrence Keith Stephens. All Rights Reserved.
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INTRODUCTION

In Toro Company v. R & R Products Co.,\(^1\) the United States Court of Appeals for the Eighth Circuit commented that:

> While [the] law prohibits a competitor from taking advantage of another's intellectual property or from palming off its products as another's, the law does not foreclose a competitor from zeroing in on a profitable market segment and offering an alternative product.\(^2\)

In order to develop an alternative product with which to pursue a profitable market segment, it may be necessary to achieve a high level of compatibility with a product already on the market. However, the information needed to achieve such compatibility often is not publicly available. This tends to be the case both where the objective is to develop and market a product which is compatible or competitive with another product already on the market, and where the objective is to develop and market a service, such as third-party maintenance service, competitive with that of a manufacturer of products. The question then arises, "How may one develop competitive products and services without violating the competitor's intellectual property rights?" The answer is by proper reverse engineering and by taking appropriate precautions to guard against actions which could taint the reverse engineering and development effort.

Reverse engineering\(^3\) is the process of starting with that which is public and working backwards to divine the information or process used to develop a product.\(^4\) Successful reverse engineering and product development requires the participant to identify and understand the applicable bodies of intellectual property law, the subject matter to which each applies, the rights afforded by each, and their limitations. It is then necessary to consider the types of procedures

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1. 787 F.2d 1208 (8th Cir. 1986).
2. Id. at 1216.
3. Software engineers prefer the term "reverse translation."
which should be implemented to avoid infringing conduct and to
minimize the risk that the manner in which sensitive information is
gathered and used will be tainted by unlawful conduct. Two recent
cases serve to illustrate the importance of such procedures.

In *E.F. Johnson Co. v. Uniden Corp. of America*, the defendant
sought to develop a mobile radio unit to operate compatibly with a
"logic trunked radio system" marketed by the plaintiff. This re-
quired the defendant's mobile radios to contain computer software
functionally compatible with the plaintiff's system. The court held
that while it was permissible for the defendant to reverse engineer
the plaintiff's software for the purpose of developing specifications
for writing its own functionally compatible software, the defendant
had acted improperly by incorporating into its software certain por-
tions of the plaintiff's programs not essential to functional compati-
bility. The result was a preliminary injunction against the
defendant on a finding of copyright infringement.

In *Sun Microsystems, Inc. v. Helios Sys., Inc.*, the defendants
sought to produce a board compatible with the plaintiff's computer
work station. During the development effort, the defendants used a
proprietary manual which the arbitrator decided qualified as plain-
tiff's trade secret information. Though the development would
have been lawful if based on legitimate reverse engineering, the arbi-
trator granted a damage award based on the defendant's use of the
proprietary manual to develop the compatible board.

This article will discuss generally the three principal bodies of
state and federal intellectual property law which should be consid-
ered before embarking on a reverse engineering and development
effort and the interplay among them. The article will then review
various procedures to minimize the risk that an otherwise lawful
effort will be tainted by unnecessary illegal conduct. The discussion
begins by identifying the applicable bodies of law and their underly-
ing policies.

**Applicable Bodies of Intellectual Property Law and
the Underlying Policies**

In planning a reverse engineering and development effort, one
should consider principally the federal patent law, the federal copy-
right law (including Chapter 9 of the Copyright Act pertaining to

$1 Million).
the protection of semiconductor chip products), and the state law of 
*trade secrets*. The author believes it likely that the protection granted to *trade dress* by the Lanham Act\(^7\) will also come to play an increasingly important role in such cases in the future. While other bodies of law such as the state law of contract and tortious interference with contract (which may form an independent basis for a claim of unlawful acquisition of proprietary information) and the federal antitrust laws (which may present a defense to an otherwise valid claim of infringement) should be considered under some circumstances, they are beyond the scope of this article.

**Patent and Copyright**

As a matter of federal constitutional law, Congress is charged with promoting the progress of science and the useful arts by securing to authors and inventors the exclusive rights to their respective writings and discoveries for limited periods of time.\(^8\) Congress has done so principally by enacting the patent and copyright laws.\(^9\) Both the patent and copyright systems employ uniform standards to promote invention while at the same time preserving free competition.\(^10\)

The limited grants of monopoly under the patent and copyright laws are premised principally upon the belief that "[t]he productive effort thereby fostered will have a positive effect on society through the introduction of new products and processes of manufacture into the economy, and the emanations by way of increased employment and better lives for our citizens."\(^11\) In furtherance of this objective, the patent and copyright laws seek to maintain a balance between an inventor's or author's interest in exploiting the product of his efforts and society's competing interest in the free flow of ideas, information and commerce.\(^12\) The courts have recognized, however, that the public interest is the dominant considera-

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tion in maintaining this balance. Reward to the owner is of secondary importance.

Trade Secret

The broadly stated policies underlying trade secret law are the maintenance of standards of commercial ethics and the encouragement of invention. Unlike the patent and copyright laws, however, trade secret law does not grant a monopoly in the subject matter. The only protections afforded a trade secret owner are those against breach of confidence and acquisition by improper means. Thus, trade secret law seeks to accomplish by maintaining commercial ethics that which the patent and copyright laws seek to accomplish by their respective grants of limited monopolies. As with the patent and copyright laws, the dominant consideration underlying trade secret law is the public interest. Reward to the owner is of secondary importance.

Trade Dress

The broadly stated policies underlying trade dress law constitute a sword to assert against false advertising and the infringement of a trade dress. Similar to Trade Secret law, trade dress law does not grant a monopoly in the subject matter. Trade dress law does provide protection if a competitor's product design or packaging is likely to confuse consumers into thinking the product is produced by the asserting party. Thus, trade dress law seeks to deter unethical business practices designed to exploit existing packaging for a

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14. Id.
15. Kewanee Oil Co. v. Bicron Corp., 416 U.S. at 1974. Although the RESTATEMENT OF TORTS purports to reject the notion that encouragement of invention is one of the interests sought to be furthered by trade secret law, RESTATEMENT (FIRST) OF TORTS § 757 comment b (1939) [hereinafter cited as RESTATEMENT], the RESTATEMENT "test" for determining whether particular information can qualify as a trade secret implicitly recognizes that it is. See Davidson and DeMay, Application of Trade Secret Law to New Technology — Unwinding the Tangled Web, 12 WM. MITCHELL L. REV 579, 582-83 (1986). As the United States Supreme Court stated in Kewanee, "[t]rade secret law encourages the development and exploitation of those items of lesser or different invention than might be accorded protection under the patent laws, but which items still have an important part to play in the technological and scientific advancement of the Nation." 416 U.S. at 493.
16. See generally Davidson and DeMay, supra note 15.
competitor's profit.  

THE SUBJECT MATTER TO WHICH EACH APPLIES

Patent

The subject matter of a patent is "any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof," which fulfills the three statutory conditions of utility, novelty and nonobviousness. The statutory subject matter is broad enough to include "anything under the sun that is made by man," but does not include laws of nature, physical phenomena or abstract ideas. If an invention meets the "rigorous statutory tests" for the issuance of a patent, the patent is granted. Patents fulfilling the statutory requirements of 35 U.S.C. § 101 as described above are called utility patents.

Protection is also afforded for ornamental characteristics of designs. The design of an object consists of the visual characteristics or aspects displayed by the object. The protection is for the appearance of the object rather than any functional characteristics. A design and utility patent may be based on the same subject matter. The protection afforded a holder of a design patent is extremely limited because slight changes in the design or ornamental characteristics will easily avoid any claims of the holder. Similar to trade dress, design patents may take on increasing significance in the future.

22. Id.
23. Id. § 102.
24. Id. § 103.
29. Id. at 1500-01.
30. Id. at 1500-03.
31. Gorham Mfg. Co. v. White, 81 U.S. 511 (1871 Term). ("We hold, therefore, that if, in the eye of an ordinary observer, giving as much attention as a purchaser usually gives, two designs are substantially the same, if the resemblance is such as to deceive such an observer, inducing him to purchase one supposing it to be the other, the first one patented is infringed by the other.")
Copyright

Copyright protection subsists in original works of authorship fixed in any tangible medium of expression from which they can be perceived, reproduced, or otherwise communicated, either directly or with the aid of a machine or device. Copyright protection does not, however, extend to any "idea, procedure, process, system, method of operation, concept, principle, or discovery, regardless of the form in which it is described, explained, illustrated, or embodied." Any discussion of what constitutes copyrightable subject matter inevitably draws upon the United States Supreme Court opinion in *Baker v. Selden*, the source of the "idea/expression dichotomy" which is codified at 17 U.S.C. § 102. *Baker v. Selden* has long stood as the seminal authority on the intellectual boundaries of the copyright monopoly. Whether characterized as the author's "method of statement," the "forms... by which the ideas in the mind of the author are given visible expression," or "the author's tangible expression of his ideas," the controlling principle is that copyright protection will not extend to the idea itself, but only to the expression of the idea.

One area in which the copyright laws arguably extend beyond pure expression to encompass utilitarian products is semiconductor chips. In 1984, Congress added a new Chapter 9 to the Copyright Act entitled "Protection of Semiconductor Chip Products." Chapter 9 grants specified exclusive rights to owners of "mask works," which are defined as series of related images, however fixed or encoded —

(A) having or representing the predetermined, three-dimensional pattern of metallic, insulating, or semiconductor material present or removed from the layers of a semiconductor chip product; and

(B) in which series the relation of the images to one another is that each image has the pattern of the surface of one form of the semiconductor chip product.

34. *Id.* § 102(b).
35. 101 U.S. 99 (1879).
36. *Id.* at 104.
40. *Id.* § 901(a)(2).
Trade Secret

Under the common law, "[a] trade secret may consist of any formula, pattern, device or compilation of information which is used in one's business and which gives him an opportunity to gain an advantage over competitors who do not know or use it." Under the Uniform Trade Secrets Act, a trade secret may subsist in any information which:

1) is not generally known to and not readily ascertainable by proper means by those who can obtain economic value from its disclosure or use; and
2) from this, derives independent economic value, actual or potential.

The subject matter of trade secrets is said to lie somewhere on a continuum from what is generally known in a field to what has some degree of uniqueness, although there need not be the degree of novelty or originality required for patent or copyright protection.

Trade Dress

Historically, trade dress infringement consisted of copying a product's packaging. However, trade dress in its more modern sense may refer to the appearance of the product itself. Trade dress comprises a complex composite of characteristics ranging from size and color combinations to texture and graphics arrangements. The term trade dress reflects the overall general impact, usually visual, but also the complete combination of features associated with the product's appearance.

41. RESTATEMENT § 757 comment b. The Restatement suggests six factors for courts to consider in determining whether information qualifies as a trade secret: the extent to which the information is known outside of the business, the extent of measures taken to guard the secrecy of the information, the value of the information to the user and competitors, the amount of effort or money expended in developing the information, and the ease or difficulty with which the information could be properly acquired or duplicated by others. Id. While excluding, from trade secret protection, information which does not meet the "use" requirement, or which would not qualify under the six-factor test, the Restatement separately affords more limited protection for certain types of non-trade secret, confidential business information. See Restatement § 759 comments b and c. The Restatement (Second) of Torts distinguishes trade regulation from tort law and, therefore, does not contain any provision for trade secrets. Restatement (Second) of Torts at 1 (1979).

42. UNIF. TRADE SECRETS ACT, 14 U.L.A. 537, 542 (1980).


44. Brunswick Corp. v. Spinit Reel Co., 832 F.2d 513, 517 (10th Cir. 1987).

A federal cause of action for unprivileged imitation, including trade dress infringement, is available under section 43(a) of the Lanham Act. A product’s trade dress is eligible for protection if it is so distinctive as to become an unregistered trademark. For a plaintiff to prevail in a trade dress action and thus prevent copying of the appearance of its product, certain requirements must be met. First, the trade dress must be nonfunctional. Virtually every product is a combination of functional and non-functional elements. The plaintiff must show that the features of the product’s trade dress considered together are not functional. If the feature must be duplicated to have an equally functional product, then the feature is not entitled to protection. However, if the feature merely provides more effective marketing, it is entitled to protection. Second, the trade dress must have acquired a secondary meaning. A secondary meaning denotes an association in the mind of the consumer between the trade dress of a product and a particular producer. Finally, there must be a likelihood of confusion among consumers as to the source of competing products.

THE RIGHTS AFFORDED BY PATENT, COPYRIGHT, TRADE SECRET AND TRADE DRESS LAW

Patent

The grant of a patent is a finite statutory monopoly. The patent system is intended to encourage invention by rewarding the inventor with the right, limited to a term of years fixed by the patent, to exclude others from the use of his invention. During that period of time, no one else may make, use or sell the patented product without the authority of the patentee. However, in consideration of the countervailing public policy interest in preserving free competition and the free flow of information, the prerequisites to obtaining a patent are strictly observed, and, when a patent does issue,

tection through design patents. Id. (citing W.T. Rogers Co. v. Keene, 778 F.2d 334, 337 (7th Cir. 1985)).

48. Int'l Kennel Club of Chicago, Inc. v. Mighty Star, Inc., 846 F.2d 1079 (7th Cir. 1988), (Thus, a line of greeting cards with a particular distinctive look may qualify for protection).
49. Brunswick Corp. v. Spinit Reel Co., 832 F.2d at 517.
52. See supra note 12.
the limitations on its exercise are strictly enforced.53

One of the prerequisites for obtaining a patent is disclosure. The patent laws require that a patent application include a full and clear description of the invention and of the manner and process of making and using it.54 When a patent is granted, this information enters the public domain with the expectation that it will stimulate ideas and the eventual development of further significant advances in the art.55

In addition, patents themselves are strictly construed.56 A patent cannot be used to secure any monopoly beyond that contained in the patent,57 and control over the product once it leaves the patentee's hands is sharply limited.58 Further, the patent monopoly may not be used in disregard of the antitrust laws.59

Copyright

Like a patent, copyright ownership vests in the owner a specified statutory monopoly. Subject to certain limitations, a copyright owner has the exclusive right to reproduce the copyrighted work in copies, to display the copyrighted work, to prepare derivative works based upon the copyrighted work, and to distribute copies of the copyrighted work to the public.60

The owner of a "mask work" has the exclusive right, subject to specified limitations, to reproduce the mask work by optical, electronic or any other means and to import or distribute a semiconduc-

55. See Kewanee Oil Co. v. Bieron Corp., 416 U.S. at 481.
57. Mercoid Corp. v. Mid-Continent Inv. Co., 320 U.S. 661 (1944); Morton Salt Co. v. G.S. Suppiger Co., 314 U.S. 488, 492 (1942) (Misuse of the monopoly granted by the patent laws to limit competition is an equitable defense to a claim of infringement).
60. 17 U.S.C. § 106 (1982). Notwithstanding the provisions of section 106, it is not an infringement for the owner of a copy of a computer program to make or authorize the making of another copy or adaptation of that computer program provided that: 1) such new copy or adaptation is created as an essential step in the utilization of the program, in conjunction with a machine, and is used in no other manner; or 2) such new copy or adaptation is for archival purposes only. 17 U.S.C. § 117 (1982).

At least one court has broadly interpreted section 117 to mean that copying "as an essential step in the utilization of the program in conjunction with a machine" includes copying it into memory for reverse engineering purposes. Vault Corp. v. Quaid Software Ltd., 847 F.2d 255 (5th Cir. 1988). See also E.F. Johnson Co. v. Uniden Corp. of Am., 623 F. Supp. 1485, 1501 n.17 (D. Minn. 1985).
tor chip product in which the mask work is embodied.61 Most important among those limitations is that it is not an infringement:

1) to reproduce the mask work solely for the purpose of teaching, analyzing, or evaluating the concepts or techniques embodied in the mask work or the circuitry, logic flow, or organization of components used in the mask work; or
2) for a person who performs such an analysis or evaluation to incorporate the results of such conduct in a new, original mask work.62

In contrast to the patent laws, the standards for obtaining a copyright monopoly in a work of authorship are relatively easy to meet. As long as the work is “original” (i.e., not copied from a preexisting work and containing a modicum of true authorship), there is no requirement of novelty, usefulness or non-obviousness.63 Moreover, the copyright laws do not require that either the copyrighted work or any information pertaining to it be published or disclosed as a condition of copyright ownership.64

One significant limitation upon the statutory copyright monopoly is that copyright ownership of an original work does not foreclose the independent original authorship of even an identical work by someone else.65 Another limitation is that copyright subsists only in expressions of ideas, not in the ideas themselves.66 Like a patent owner, a copyright owner may not lawfully use his copyright ownership to secure for himself any monopoly beyond the strict boundaries of the conferring statute.67

Trade Secret

Another form of “incentive to invention,”68 trade secret rights are purely a creature of state law. Trade secret rights arguably are not “property” rights at all, since the “owner” of a trade secret has no statutory or common law monopoly in the subject matter.69 The only protections afforded a trade secret owner are those against ac-

62. Id. § 906.
64. Id. § 301.
68. Brunswick Corp. v. Spinit Reel Co., 832 F.2d 513, 517 (10th Cir. 1987).
Public policies favoring competition, the free flow of information and employee mobility figure significantly in limiting trade secret rights. Trade secret protection does not foreclose discovery of the subject matter by fair and honest means, such as by independent development, accidental disclosure, or reverse engineering (i.e., starting with that which the trade secret owner makes public, including products from which the trade secret may be reverse engineered, and working backwards to divine the information or process which aided in its development or manufacture). Trade secret rights may be effectively abandoned by disclosure to the public, such as by the type of disclosure required to obtain a patent.

In addition, courts have recognized that "no restrictions should fetter an employee's right to apply to his own best advantage the skills and knowledge acquired by the overall experience of his previous employment." This is so even to the extent that such knowledge and skill include "techniques which are . . . skillful variations of general processes known to the particular trade." Moreover, even where a trade secret does exist vis-a-vis the general public or employees or others to whom it is disclosed in confidence, an employee who personally developed the information in question may have an equal right to use or disclose it.

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70. Although the "property view" is said to underlie the protection of trade secrets, 1 MILGRIM, TRADE SECRETS § 1.09 (1967), and trade secret rights have been treated as "property" rights for certain purposes, see, e.g., Ruckelshaus v. Monsanto Co., 467 U.S. 986 (1984) (trade secrets treated as property for Fifth Amendment due process purposes), a trade secret "has no property dimension." Kewanee Oil Co. v. Bicron Corp., 416 U.S. at 497 (Douglas, J., dissenting). See also DuPont Power Co. v. Masland, 244 U.S. 100, 102 (1917) ("The word property as applied to . . . trade secrets is an unanalyzed expression of certain secondary consequences of the primary fact that the law makes some rudimentary requirements of good faith.").

71. See Kewanee v. Bicron Corp., 416 U.S. at 475-76; Davidson and DeMay, supra note 15, at 384-85; 1 MILGRIM, TRADE SECRETS § 12.01.


74. Id. See also Electro-Craft Corp. v. Controlled Motion, Inc., 332 N.W.2d 890, 900 (Minn. 1983) (the talent or expertise of employees does not come within the scope of trade secret protection); Jostens, Inc. v. Nat'l Computer Sys., Inc., 318 N.W.2d 691, 701-02 (Minn. 1982) (an employee's experience and skills, to the extent derived from generally known sources, are not considered confidential; a computer programmer, like a real estate sales person, should be able to ply his trade).

Trade Dress

Trade dress protection entitles the creator to protection against a competitor's producing, manufacturing, marketing, advertising, promoting, offering for sale, selling, or distributing products which are so similar in appearance as to create a likelihood of confusion among consumers as to the source of competing products.\textsuperscript{76}

Summary Comparisons and Contrasts Between Patent, Copyright, Trade Secret and Trade Dress Law

Subject Matter

The subject matter of a patent may include "anything under the sun that is made by man," but may not include laws of nature, physical phenomena or abstract ideas. The subject matter of a copyright may include any original work of authorship that is fixed in a tangible medium, but may not include anything beyond the expression itself. The subject matter of a trade secret may be virtually any information which is of value by virtue of not being generally known, including laws of nature, physical phenomena and ideas in which no one may own either a patent or copyright monopoly. The subject matter of trade dress may be any product or the packaging used for a product.

Standards for Obtaining Protection

The standards for obtaining a patent are stringent, requiring usefulness, novelty and nonobviousness, and demanding disclosure in return for the grant of a patent. The standards for obtaining a copyright are relatively easy to meet, requiring only that the author's expression not be copied from a preexisting work and that the work reflect a modicum of true authorship. Neither usefulness, novelty, nonobviousness nor disclosure is required. The standard for trade secret protection is even easier to meet, requiring merely that the information be of some independent economic value by virtue of not being generally known to or readily ascertainable by others and that reasonable efforts be made to avoid public disclosure. The standard for obtaining trade dress protection requires a showing that a product's trade dress is so distinctive as to have become an unregistered trademark.

\textsuperscript{76} Brunswick Corp. v. Spinit Reel Co., 832 F.2d 513, 517 (1987).
Degree of Reward

The reward for making a contribution that rises to the level of patentability is substantial, but lasts for a relatively short period of time. The inventor receives a monopoly which forecloses another from making, using or selling the invention for the specified term of years, even if independently developed. Thus, once a patent issues, one cannot lawfully build or market a compatible product unless it is beyond the valid scope of the patent.

The reward for authoring a copyrighted work (other than a "mask work," for which the period is somewhat shorter) is a longer lasting but more limited monopoly. While the author has a monopoly on his own fixed expression, the copyright laws leave others free to create even an identical work of authorship independently and to make any conceivable use of the ideas expressed or embodied in the copyrighted work. Thus, one is not foreclosed by copyright law from creating and marketing a compatible product through his own independent authorship as long as the means used to obtain the necessary information are not improper.

The reward for developing and maintaining a trade secret may last forever, but merely protects against misappropriation. Others are free independently to develop the same information or to derive it from anything publicly disclosed by the trade secret owner.

Similarly, trade dress protection lasts as long as the product is marketed, but the protection afforded is much more limited than that of patent or copyright protection.

CONGRESSIONAL AND JUDICIAL ADHERENCE TO POLICY

The policies underlying the patent, copyright and trade secret laws are substantially the same, i.e., to encourage innovation while promoting the free flow of ideas, information and commerce. Although property rights in the subject matter constitute the principal incentive to innovation under all three bodies of law, they are not the primary underlying legal consideration. In light of the public policy interests involved, both Congress and the courts have sought to limit the effect of the patent, copyright and trade secret laws to minimize the adverse impact on the free flow of ideas, information, commerce and fair competition. Thus, public policy favors the creation of competitive products and services by reverse engineering and independent effort.

Congress has established rigorous standards for obtaining a
patent, including the requirement of disclosure as the "quid pro quo" for the right of exclusion. As to copyright, Congress has limited the author's monopoly to the bare expression of his ideas and has been careful to limit the scope of copyright protection with respect to articles having intrinsic utilitarian function. In addition, Congress has codified the doctrine of "fair use" and, with respect to "mask works," the doctrine of reverse engineering.

In amending the copyright laws to provide explicit coverage of computer programs, Congress was sensitive to the concern that copyright might be construed to extend protection to the methodology, or processes adopted by the programmer, rather than merely to the "writing" expressing his ideas. Section 102(b) of the Copyright Act was intended, among other things, to make it clear that the programmer's expression of a computer program is a copyrightable work, but that the actual processes or methods embodied in the program are not within the scope of the copyright. The Semiconductor Chip Protection Act of 1984 expressly allowed for both "fair use" and reverse engineering of the subject matter and the preparation by others of new, original works based on the results of such efforts. Although the rights granted under the patent and copyright laws may not be used to violate the antitrust laws by expanding monopolies, Congress has evinced a willingness to relax the antitrust laws in the interest of promoting technological advances and the sharing of new technology.

78. Id.
84. Id.
87. Id., The only case decided to date under the Chip Protection Act is Brooktree Corp. v. Advanced Micro Devices, Inc., 705 F. Supp. 491 (S.D. Cal. 1988). In Brooktree, the court held that where development of the accused chip resulted from reverse engineering, the standard for infringement was not substantial similarity, but rather substantial identity, and denied the plaintiff's motion for preliminary injunction because reverse engineering was shown and substantial identity was not.
88. See supra notes 59 and 67.
In the interest of preserving the integrity of the patent and copyright systems, the courts have been cautious to limit the rights of authors and inventors to the strict confines of the statutory grants. Recognizing that “it is Congress that has been assigned the task of defining the scope of the limited monopoly that should be granted to authors or to inventors in order to give the public appropriate access to their work product”, judicial policy is to be circumspect in construing the scope of rights created by legislative enactment. When technological change renders the literal statutory terms ambiguous, they are to be construed in light of their basic purpose.

In the chart which appears below, the author has attempted to depict in rough, graphic form the relative requirements of and protection granted by the three principal bodies of American intellectual property law. Each is limited in application to its own respective subject matter, each requires a different level of innovation, and each provides a different scope and duration of protection against use of the subject matter by others.

It is only by maintaining a proper balance between the rights of authors, inventors, trade secret owners and the public that the American system of intellectual property law will serve its intended

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90. See Mercoid Corp. v. Mid-Continent Inv. Co., 320 U.S. 661, 668 (1944).
92. Id. at 431.
93. Id. at 432, citing Twentieth Century Music Corp. v. Aiken, 422 U.S. 151, 156 (1975).
purposes. If the standards for obtaining various types of protection were increased or the scope of protection reduced, the incentive to new development and protection against unethical competitive conduct would be similarly reduced, and new development would likely diminish, at least within the United States. If the standards for obtaining protection were decreased or the scope of protection increased, the development of competitive products and the development of new products based on what has gone before would likely diminish, at least within the United States.

It is this delicate balance of which the United States Supreme Court spoke in the Sony case, 94 and it is this delicate balance which underlies this country's technological and commercial ecology and its ability to compete in the world technology market. It is also this delicate balance which permits reverse engineering and development of compatible and competitive products by activities which are outside the scope and duration of the limited rights of authors, inventors and trade secret owners. 95

FEDERAL PREEMPTION AND THE INTERFACE AMONG PATENT, COPYRIGHT, TRADE DRESS AND TRADE SECRET LAW

Federal Preemption

Although the constitutional grant of power to Congress to promote the progress of science and the useful arts is not exclusive, 96 the patent and copyright laws, like other laws of the United States enacted pursuant to constitutional authority, are the supreme law of the land. 97 When state law touches upon this area of Congressional power, the federal policy may not be set aside or its benefits denied by the state law. 98 This is true even if the state law is enacted in the exercise of otherwise undoubted state power. 99 The federal "benefits" which may not be denied under state law include both the rights conferred upon patent and copyright owners and the rights conferred upon the public at large by the conditions for obtaining, and the limitations on, those rights. 100 The question is not only whether Congress has expressly preempted a particular area of regulation, but also whether the operation of the pertinent state law

94. See supra note 13 and accompanying text.
95. See supra note 13 and accompanying text.
96. See supra note 13 and accompanying text.
98. Id.
99. Id.
100. Id. at 230.
under the facts of a given case clashes with federal policy.101

One such policy is that of allowing freedom to use and copy whatever the federal patent and copyright laws leave in the public domain.102 For that reason, the Supreme Court recently invalidated state "plug molding" statutes that sought to extend "patent-like" protection to product designs.103 In Bonito Boats, defendant copied the plaintiff's hull design for a fiberglass ski boat using a manufacturing process that was prohibited under a Florida statute.104 The Florida statute prohibited copying of a boat's hull design by a direct molding process and the subsequent sale of the boats. Bonito sought damages, injunctive relief and attorney's fees for the defendant's actions in violation of the Florida molding statute. Justice O'Connor, writing for the court, rejected the reasoning of the Florida Supreme Court and held that state molding statutes are preempted by the federal patent laws.105 Therefore, the defendant was free to copy, manufacture and sell the plaintiff's boat hull design. Any state patent-like protection for ideas deemed unprotectable by federal patent law will not be permitted because of conflict with strong federal policy favoring free competition using ideas that do not merit patent protection.106 Thus, a state is not free to impose its own patent-like restrictions on the free exchange of ideas except to the extent those ideas may be protected by trade secret and trade dress.

**Patent/Trade Secret Interface**

In Kewanee Oil Co. v. Bicron Corp.,107 the United States Supreme Court questioned whether state trade secret protection is preempted by the federal patent law.108 The court concluded that: 1) trade secret law encourages the development and exploitation of those items of lesser or different invention than might be accorded

101. See, e.g., Sears, 376 U.S. at 227-28 ("We granted certiorari to consider whether this use of a State's law of unfair competition is compatible with the federal patent law.") (emphasis added); Kewanee Oil Co. v. Bicron Corp., 416 U.S. 470, 480-81 (1974).


104. Id.

105. Id.

106. Id.


108. Id. at 472.
protection under the patent laws, but still have an important part to play in the technological and scientific advancement of the Nation; 2) trade secret law promotes the sharing of knowledge and the efficient operation of industry; and 3) Congress, by its silence over the years, had seen the wisdom of allowing the states to enforce trade secret protection. Thus, the Court held that states should be free to grant protection to trade secrets.\textsuperscript{109}

In so doing, the court recognized that because the constitutional grant of power to Congress to promote the progress of science and the useful arts was not exclusive,\textsuperscript{110} "[t]he only limitation on the States is that in regulating the area of patents and copyrights, they do not conflict with the operation of the laws in this area passed by Congress ..."\textsuperscript{111} The court reasoned that the patent policy of encouraging invention would not be disturbed by another form of incentive and that the federal policy requiring that matter once in the public domain must remain in the public domain was not incompatible with trade secret protection.\textsuperscript{112}

Thus, trade secrets may subsist in patentable, non-patentable and questionably patentable subject matter. Although the election to obtain a patent requires disclosure of information which otherwise might be treated as a trade secret, authorities differ as to whether this constitutes an effective abandonment of trade secret rights with respect to such information or merely allows one who learns of the information as a result of the patent disclosure to use it with impunity.\textsuperscript{113}

\textit{Patent/Copyright Interface}

In \textit{Mazer v. Stein},\textsuperscript{114} the United States Supreme Court addressed the availability of copyright protection for a work intended primarily for use as an article of manufacture within the purview of

\begin{itemize}
\item \textsuperscript{109} \textit{Id.} at 493.
\item \textsuperscript{110} \textit{Id.} at 478-79 (citing, Goldstein v. California, 412 U.S. 546 (1973))
\item \textsuperscript{111} \textit{Id.} at 479.
\item \textsuperscript{112} \textit{Id.} at 484.
\item \textsuperscript{113} See 1 MILGRIM, TRADE SECRETS § 2.06(1) (1967) and authorities cited therein.
\item \textsuperscript{114} 347 U.S. 201 (1954).
\end{itemize}
the patent laws and, therefore, possibly patentable as well. Finding
that the works in question (statues intended for use as lamp bases)
were copyrightable as works of art, the Court confronted the inter-
pretative question of whether their intended use as articles of manu-
facture served to bar or invalidate their registration as copyrighted
works. Noting that "[n]either the Copyright Statute nor any other
says that because a thing is patentable it may not be copyrighted,"\footnote{115} the
court held that the patentability of statues, fitted as lamp bases
or unfitted, did not bar copyright as works of art.\footnote{116}

The Court's opinion in \textit{Mazer v. Stein} relied heavily upon the
idea/expression dichotomy as articulated in \textit{Baker v. Selden}, \textit{i.e.},
that an idea itself cannot be protected by copyright, but merely the
expression of the idea. Unlike a patent, a copyright gives no exclu-
sive right to the art disclosed. The Court recognized that "copy-
right protects originality rather than novelty or invention" and that
the pertinent copyright regulations made it clear that artistic arti-
cles are protected in "form but not their mechanical or utilitarian
aspects." The Court found nothing in the copyright laws to suggest
that the use or intended use in industry of an article eligible for
copyright bars or invalidates its registration as a copyrighted work.
The Court would not read such a limitation into the Copyright
Act,\footnote{117} but reached this conclusion \textit{because of} the inherent limita-
tions of copyright coverage.\footnote{118}

\textit{Copyright/Trade Secret Interface}

As the Supreme Court noted in \textit{Kewanee}, "[t]he only limitation
on the States is that in regulating the area of patents and copyrights,
they do not conflict with the operation of the laws in this area
passed by Congress. . . ."\footnote{119} It is difficult to apply the \textit{Kewanee}
analysis to the copyright/trade secret interface, however, because of
the significant differences between patent and copyright law. First,
unlike the patent laws, the objective of the copyright laws is not

\footnotesize
\begin{itemize}
\item[115.] \textit{Id.} at 217.
\item[116.] \textit{Id.}
\item[117.] \textit{Id.} at 218.
\item[118.] In \textit{Mazer v. Stein}, 347 U.S. 201, 217 (1954), the court expressly avoided the issue of
whether the grant of a patent or copyright, upon election by an author or patentee, bars a
grant of the other. This may not be significant for purposes of the present discussion, how-
ever, since the court in \textit{Mazer} was concerned with design patents only; and made it fairly
clear that copyright could not, by definition, overlap the patent laws in other respects. This
seems to preclude election except in cases of ornamental design of an article of manufacture.
\textit{Cf.} 17 U.S.C. \textsection 113 (1982) (Congressional attempt to codify the holding of \textit{Mazer v. Stein}).
\item[119.] \textit{Kewanee}, 416 U.S. at 86.
\end{itemize}
disclosure, but rather the reduction of ideas to original forms of expression. Second, unlike the patent laws, copyright does not encompass ideas, but only the form by which they are given expression. Third, unlike the patent laws, where Congress by its silence is deemed to have tacitly approved the coexistence of state trade secret law with the federal patent laws, Congress has incorporated an express preemption section into the Copyright Act. The extent, if any, to which federal copyright law preempts state trade secret law as to copyrightable subject matter is not at all clear, and a conservative approach would be to assume that both forms of protection may apply to original works of authorship which meet the requirements for trade secret protection.

**APPLICATION TO COMPUTER PROGRAMS IN PARTICULAR**

While the laws of patent, copyright and trade secret are generally well defined in theory and in their application to mature technologies, their application to new technologies often requires further definition on a case-by-case basis. This has been particularly true with respect to intellectual property components of computer programs and continues to be an ongoing evolution in that context.

120. The patent law objective of disclosure has been characterized by the United States Supreme Court as “the quid pro quo of the right to exclude.” *Id.* at 484 (citing, *Universal Oil Co. v. Globe Co.*, 322 U.S. 471 (1944)).

121. It would have been easier to apply the Kewanee analysis under the copyright laws as they existed before 1978, since the law required publication for federal copyright monopoly, while distinguishing protected expression from unprotected ideas. As with the patent laws, the quid pro quo for federal copyright protection was creativity plus disclosure (although “disclosure” in the copyright sense of publication was not necessarily the same as “disclosure” in the trade secret sense). Because of the changes brought about by the 1976 Act, however, the analysis under present law differs; no longer requiring publication as a condition to federal copyright protection.

122. “Congress, by its silence over these many years, has seen the wisdom of allowing the States to enforce trade secret protection. Until Congress takes affirmative action to the contrary, States should be free to grant protection to trade secrets.” *Kewanee*, 416 U.S. at 493.


On and after January 1, 1978, all legal or equitable rights that are equivalent to any of the exclusive rights within the general scope of copyright as specified in section 106 in works of authorship that are fixed in a tangible medium of expression and come within the subject matter of copyright as specified by sections 102 and 103. . .whether published or unpublished, are governed exclusively by this title. Thereafter, no person is entitled to any such right or equivalent right in any such work under the common law or statutes or any State.

This preemption does not, however, operate to limit state law rights or remedies regarding subject matter outside the scope of copyrightable subject matter as defined in section 102 and 103; or activities violating legal or equitable rights that are not equivalent to any of the exclusive rights within the general scope of copyright. *Id.* at § 301(b).
Although it is not the intention of this article to track that evolution, predict its future course or pontificate on the wisdom of individual decisions, this section will summarily review the manner in which some courts have applied patent, copyright and trade secret principles to computer programs.

_Patent_

The Patent and Trademark Office recognizes several "significant points of law" from the United States Supreme Court's landmark decision in _Diamond v. Diehr_. With respect to the examination of patent applications involving computer programs to determine whether the claimed invention is patentable subject matter:

1. The "claims must be considered as a whole. It is inappropriate to dissect the claims into old and new elements and then to ignore the presence of the old elements in the analysis. . . . The 'novelty' of any element or steps in a process, or even of the process itself, is of _no relevance_ in determining whether the subject matter of the claim falls within the [Section] 101 categories of possible patentable subject matter" (emphasis added).
2. "When a claim containing a mathematical formula implements or applies that formula in a structure or process which, when considered as a whole, is performing a function which the patent laws were designed to protect (e.g., transforming or reducing an article to a different state or thing), then the claim satisfies the requirements of § 101."
3. "When a claim recites a mathematical formula (or scientific principle or phenomenon of nature), an inquiry must be made into whether the claim is seeking patent protection for that formula in the abstract." (If the claim does seek protection for such a mathematical formula, it would be non-statutory under 35 U.S.C. § 101).
4. "A mathematical formula as such is not accorded the protection of our patent laws . . . and this principle cannot be circumvented by attempting to limit the use of the formula to a particular technological environment. . . . Similarly, insignificant post solution activity will not transform an unpatentable principle into a patentable process."
5. When a claim as in _Parker v. Flook_, 198 USPQ 193 (1978), is drawn "to a method for computing an 'alarm limit' (which is simply a number," the claim is non-statutory under 35 U.S.C.

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§ 101 because *Flook* "sought to protect a formula for computing this number."

6. "It is now commonplace that an *application* of a law of nature or mathematical formula to a known structure or process may well be deserving of patent protection."\(^{125}\)

Processes employing computer programs have been held to represent patentable subject matter. These processes include a computer-controlled process for molding raw, uncured synthetic rubber into cured precision products;\(^{126}\) a program for converting a computer from a sequential processor (one dependent on the order in which it receives program steps) to a nonsequential processor;\(^{127}\) and a data processing methodology for managing cash management accounts.\(^{128}\)

If an invention employing or embodied in a computer program qualifies under the above standard as patentable subject matter and meets the requisite standards of utility, novelty and nonobviousness, and if the inventor is willing to make the requisite disclosure, a patent may be granted. Once granted, the inventor has the right to exclude others from making, using or selling the invention for the specified period of years in return for the *quid pro quo* of disclosure. This right to exclude is valid regardless of whether the form in which the program itself is expressed is copyrighted or copyrightable or whether pertinent information not required to be disclosed as a condition of the patent is a trade secret of the inventor.

Once granted, the patent will be strictly construed and the limitations on its exercise strictly enforced. The requisite description of the invention and the manner and process of making and using it will enter the public domain with the expectation that it will stimulate ideas and the eventual development of further significant advances of the art.\(^{129}\) The patent cannot be used to secure any monopoly beyond that contained in the patent.\(^{130}\)

*Trade Secret*

"Information" concerning computer programs, including

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130. See supra notes 57-59 and accompanying text.
ideas, procedures, processes, systems, methods of operation, concepts, principles, and discoveries, may qualify as a trade secret if it meets the requisite common law or Uniform Trade Secrets Act standards for trade secret protection. This is so regardless of whether the subject matter of the trade secret is patentable and regardless of the form in which it is described, explained, illustrated or embodied. Thus, courts have held that unique principles, engineering, logic and coherence in computer programs may be accorded trade secret status.

Even generally known computer elements may gain trade secret protection by the nature of their combination, but information or program elements which can be easily, properly ascertained or independently duplicated by others may not.

Although trade secret protection may continue in perpetuity, it may also enter the public domain upon accidental or deliberate disclosure by the trade secret owner or upon the grant of a patent requiring disclosure of the subject information. Information disclosed and products marketed without valid restriction by the trade secret owner are fair game for reverse engineering by others. The information may also be subject to independent development by

131. See supra notes 41-43 and accompanying text.
136. See Jostens, 318 N.W.2d at 699 (mere assertion that a trade secret resides in some combination of otherwise known data is not sufficient); see also Dental Office Computer Sys., Inc. v. Glutting, slip op., No. 88818 (Mich. Ct. App., Aug. 13, 1987), where the court comments:

The ease or difficulty with which the information could be independently, properly duplicated by others is an important factor in determining whether there is a trade secret. To hold otherwise would be to convert trade secrets into a bizarre sort of copyright or patent in which the first person to write software in particular area would have a right to stop all others from writing software in that area. * * * [The fact that a party] considered his file definitions, program specifications and modular structure to be confidential . . . does not mean that they were trade secrets.

138. Id. at 481.
139. Id. at 476. See Vault Corp. v. Quaid Software Ltd., 847 F.2d 255, 261 (5th Cir. 1988) (holding that copying of a program into memory by the “owner of a copy” for reverse engineering purposes is authorized by 17 U.S.C. § 117(1) (1982)); E.F. Johnson Co. v. Uniden Corp. of Am., 623 F. Supp. 1485, 1501 n.17 (D. Minn. 1985) (suggesting that dump-
others who might not treat it as a trade secret, or it may be subject to use or disclosure by employees of the trade secret owner who participated in the development of the information if not restricted by their employment contracts. Such is the treatment which federal policy requires be accorded "those items of lesser or different invention than might be accorded protection under the patent laws, but which items still have an important part to play in the technological and scientific advancement of the Nation."

Copyright

Computer programs are copyrightable subject matter. The Copyright Act defines a computer program as "a set of statements or instructions to be used directly or indirectly in a computer in order to bring about a certain result." The courts have recognized that copyright coverage of computer programs may encompass not only the literal, human-readable source code of application software, but also object code, operating system software, firmware and microcode. The United States Copyright Office has recognized that the copyright in a computer program encompasses not only original authorship in the program itself, but also the protectable expression in the screen displays generated by the program. Copyright protection may be given even if the program

Note, however, that neither Vault nor Uniden involved an enforceable license agreement. Compare SAS Inst., Inc. v. S & H Computer Sys., Inc., 605 F. Supp. 816 (M.D. Tenn. 1985). While patent and copyright owners may not use their patents or copyrights, to expand their monopolies beyond the strict boundaries of the conferring statutes, see supra, notes 57 and 67, this does not mean that pertinent trade secret information cannot be separately licensed under a valid trade secret license agreement without losing its trade secret status. See Kewanee, 416 U.S. at 475.

140. Kewanee, 416 U.S. at 476.
142. Kewanee, 416 U.S. at 493.
144. Stern Elec., Inc. v. Kaufman, 669 F.2d 852 (2d Cir. 1982).
146. Id.
147. Id.
embody or is part of a patentable process and regardless of whether information pertaining to the program may be protected as a trade secret of the author. Subject only to the limitations of the Copyright Act itself, an author who avails himself of copyright protection will have the right for the term of years specified by the Copyright Act to exclude others from the unauthorized copying, distribution or display of the program or the preparation of derivative works based upon it.

Beyond the literal, line-by-line code of a program and the protectable expression in any display which the program produces, the purview of the author's copyright is uncertain, the most pressing issue being the line of demarcation between the "idea" and the "expression" of a computer program. The answer to this question affects such things as the scope of the author's monopoly in various aspects of the program, the ability of the author's employees to exploit their own skills and abilities in other employment, the ability of others to produce compatible products and to use ideas, information and methods of operation which can be derived from existing products to develop compatible products, competitive products and improved technology, and the extent to which the federal copyright laws preempt state law including trade secret law.

In consideration of the public policy interests involved, Congress and the courts traditionally have endeavored to limit the application of copyright so as to exclude the utilitarian aspects of works of authorship. This has been particularly true with respect to the design components of useful articles. Thus, for example, the design of a machine or utilitarian object will not itself be eligible for copyright, although drawings showing the design generally will be. See the holding in *Synercom Technology, Inc. v. University*
that computer program input formats were ideas, not expressions, and thus were beyond the scope of copyright, seems consistent with the traditional approach.

The issue is more difficult, however, in cases where the line of demarcation between ideas embodied or reflected in computer programs and the expressions of those ideas are unclear. In Apple Computer, Inc. v. Franklin Computer Corp.\(^{155}\) the Third Circuit Court of Appeals adopted the following test:

> If other programs can be written or created which perform the same function . . . then the program is an expression of the idea and hence copyrightable. In essence, this enquiry is no different than that made to determine whether the expression and idea have merged, which has been stated to occur where there are no or few other ways of expressing a particular idea.\(^{156}\)

In Whelan Associates, Inc. v. Jaslow Dental Laboratory, Inc.,\(^{157}\) the Third Circuit Court of Appeals held that “copyright protection of computer programs may extend beyond the programs’ literal code to their structure, sequence, and organization. . . .”\(^{158}\) Discounting the notion that copyright protection is not available for ideas, program logic, algorithms, systems, methods, concepts or layouts,\(^{159}\) the circuit court adopted the trial court’s conclusion that 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. . . .”\(^{160}\) While the Fifth Circuit Court of Appeals has “decline[d] to embrace Whelan,”\(^{161}\) it is not clear whether it did so because of a fundamental intellectual


\(^{156}\) Apple Computer, Inc. v. Franklin Computer Corp., 714 F.2d 1240, 1253, citing, the CONTU report, and Freedman v. Grolier Enters., Inc., 179 U.S.P.Q. 476, 478 (S.D.N.Y. 1973) ([C]opyright protection will not be given to a form of expression necessarily dictated by the underlying subject matter.").

\(^{157}\) 797 F.2d 1222 (3rd Cir. 1986).


\(^{159}\) Whelan, 797 F.2d at 1242 n.38 (discussing Copyright Office Circular). Compare Mazer v. Stein, 347 U.S. 210, 211-13, 218 (discussing construction by Copyright Office as reflected in its regulations); Esquire, Inc. v. Ringer, 591 F.2d 796, 801-03 (D.C. Cir. 1978).

\(^{160}\) Whelan, 797 F.2d at 1239.

\(^{161}\) Plains Cotton Coop. Assoc. v. Goodpasture Computer Serv., Inc., 807 F.2d 1256, 1262 (5th Cir. 1987).
disagreement with the holding in *Whelan*\(^\text{162}\) or merely because it believes that the sequence and organization of computer programs may be "ideas" and not "expression" if determined by external factors.\(^\text{163}\) The *Whelan* decision has been the source of much discussion and debate as to where the "idea/expression" boundary should be drawn.

The *holding* of *Whelan* is easier to reconcile with other decisions than is the *dictum*. For example, in *SAS Institute, Inc. v. S & H Computer Systems, Inc.*,\(^\text{164}\) the court similarly held that copying the organizational and structural details of a program constituted infringement where the resulting program was essentially a translation of the original work. In its opinion, the court described the procedure for writing a computer program as follows:

> Beginning with a broad and general statement of the overall purpose of the program, the author must decide how to break the assigned task into smaller tasks, each of which must in turn be broken down into successively smaller and more detailed tasks. At the lowest level the detailed tasks are then programmed in source code. At every level, the process is characterized by choice, often made arbitrarily, and only occasionally dictated by necessity.\(^\text{165}\)

In *E.F. Johnson Co. v. Uniden Corp. of America*,\(^\text{166}\) where the court found substantial likelihood that the plaintiff would prevail on its claim of copyright infringement involving software for a trunked mobile radio system, the court quoted the foregoing language from *SAS* and continued by stating:

> Obviously, at some point in the process the idea or "broad and general statement of the overall purpose" of the program merges into the expression, the "smaller and more detailed tasks" necessary to carry out that idea. The Court need not pinpoint the exact line of demarcation in this case, however, inasmuch as the

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\(^{162}\) One could use the *ratio decidendi* of *Whelan* to argue, for example, that the structure, sequence and organization of a program may be expressed in any number of ways, such as: logic diagrams, flow charts, narrative descriptions, or implementation in the writing of the code itself. While there may be a variety of ways, to design a program to perform a particular function, there are, also, numerous ways to express a given design. This suggests that the design is the idea, and the program in which the design is embodied is but one possible expression of it — *i.e.*, a particular method of communicating the idea to the computer which will perform the functions intended by the programmer.

\(^{163}\) Plains Cotton, 807 F.2d at 1262. This view would seem consistent with the Third Circuit's discussion in Apple Computer, 714 F.2d 1240, *see supra* note 156. *See also* discussion in E.F. Johnson v. Uniden Corp. of Am., 623 F. Supp. at 1500-03 (D. Minn. 1985).


\(^{165}\) *Id.* at 825.

evidence establishes and the Court finds that more than one or a few ways of achieving compatibility existed. While defendant may have permissibly dumped, flow charted, and analyzed plaintiff’s code, it could not permissibly copy it.\textsuperscript{167}

Although the court in \textit{E.F Johnson} did not specifically mention “reverse engineering” of programs per se, it made the following significant observation:

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 EJF program, thereafter converting the scheme into detailed code through its own imagination, creativity, and independent thought, a claim of infringement would not have arisen.\textsuperscript{168}

More recently, in \textit{NEC Corporation v. Intel Corporation},\textsuperscript{169} the United States District Court for the Northern District of California denied a claim of copyright infringement where the defendant had, among other things, reverse engineered the plaintiff’s computer programs (in this case, microcode) and used information derived through that process to develop compatible microcode. The court recognized that it was permissible for the defendant to disassemble plaintiff’s microcode and to use information and ideas derived through that process in developing its own microcode. Because there was some similarity between portions of plaintiff’s microcode and portions of the defendant’s microcode, the court considered both the qualitative importance of the substantially similar code and whether the substantially similar portions resulted from impermissible copying of the plaintiff’s code.

Judge Gray’s opinion in the \textit{NEC} case should be studied thoroughly by anyone seriously interested in reverse engineering and development of compatible or competitive computer programs.\textsuperscript{170} For present purposes, the following aspects of the decision are noteworthy:

1. The court seemed untroubled by any copying or preparation of derivative works that took place in the course of the reverse engineering process;

\textsuperscript{167} Id. at 1502 n.17.

\textsuperscript{168} Id. at 1501 n.17. \textit{See also} Vault Corp. v. Quaid Software, Ltd., 847 F.2d 255, 261 (5th Cir. 1988) (holding that copying of a program into memory by the “owner of a copy”, for reverse engineering purposes, is expressly authorized by 17 U.S.C. § 117(1) (1982)).

\textsuperscript{169} No. 1409 (N.D. Cal. Feb. 6, 1989) (LEXIS, Genfed library, Dist file).

\textsuperscript{170} \textit{See Casenote, NEC v. Intel: A Brief Synopsis, 5 S. C. COMPUTER & HIGH TECH L.J.} (this issue) for an overview of the case.
2. The court was satisfied that substantially similar portions of code developed through the use of proper "clean room" procedures were "independently created" and therefore not infringing;

3. The court found that substantial similarity between protected expression in the plaintiff's code and intermediate versions of the defendant's code did not support a claim of copyright infringement where the defendant's final product did not reflect such similarity;

4. The court's opinion suggests that whether an accused work is a derivative work "based upon one or more preexisting works" is to be determined not in a causative sense, but rather by comparing the final version of the accused work to the preexisting work; and

5. The court held that it was not an infringement for the defendant to use aspects of the plaintiff's code which were mandated by functional constraints.

Neither Judge MacLaughlin in E.F. Johnson nor Judge Gray in NEC explained why copying and the preparation of derivative works in the course of the reverse engineering process do not constitute copyright infringement and thus the use of "improper means" to acquire the information used in developing a new, compatible or competitive product. While the United States Court of Appeals for the Fifth Circuit has held that such copying is a statutory right of the owner of a copy, this author believes it more likely that such copying is a form of "fair use" authorized by the Copyright Act under the "equitable rule of reason" standard engrafted upon the "fair use" exception by the United States Supreme Court. The courts do not seem troubled by such copying where the objective is to produce an end product which is not itself an infringing copy or derivative work. Thus, it appears from well-reasoned decisions that, consistent with the public policies underlying the intellectual property laws and absent an enforceable contract limiting the use of an authorized copy of a program, reverse engineering of computer programs is fair game.

Another important area in which the law of copyright pertaining to computer programs continues to evolve is the area of screen

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171. See infra at p.432.
displays and user interfaces. The early cases decided in this area suggested that courts might be liberal in granting protection to what some consider to be either utilitarian aspects of such displays and interfaces or elements of them that can be expressed in only one or a few ways.\(^{177}\) The more recent cases, however, suggest that courts are beginning to be more careful to focus on only the protected expression in making their substantial similarity comparisons for copyright purposes.\(^{178}\)

At the same time, trade dress claims and design patent claims will undoubtedly further complicate the area of screen display and user interface similarity in ways which are not yet clear. The pending Apple and Lotus cases may shed further light on the subject. In the meantime, the prudent developer of competitive products may wish to avoid substantial similarity in these respects if it is practical to do so and if it is desirable to avoid litigation in an uncertain area.

**Suggested Procedures for Reverse Engineering and the Development of Compatible and Competitive Products**

*Identification of Goals and Sources of Information*

As in any development project, it is helpful to begin by formulating a specific written statement of the goals to be accomplished by the development effort. This should include identification of the specific hardware, software, documentation and operational capabilities required to produce the desired product or service. It is also advisable to identify existing sources of such hardware, software and documentation, and, to the extent not available for purchase through proper channels, to identify potential sources of the information needed to independently develop the equivalent.

*Acquisition by Proper Means*

It is extremely important to ensure that all information used in developing competitive and compatible products and services is acquired by proper means. Even though a hardware or software product may be susceptible to reverse engineering, one may still be in violation of the competitor's proprietary rights if the product it-

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self is improperly acquired,\textsuperscript{179} or if the information used is acquired through breach of a common law, statutory or contractual duty of confidence.\textsuperscript{180}

Although it may be permissible for an "owner of a copy" of a computer program to copy it into memory for reverse engineering purposes, it may not be permissible to do so if the copy is acquired under an enforceable license agreement which effectively prohibits reverse engineering.\textsuperscript{181} Similarly, while it might be permissible to utilize information disclosed through an issued U.S. patent or a foreign patent or patent application, it may be deemed trade secret misappropriation to utilize the same information obtained from an employee or licensee of the competitor, even though the information would have been readily ascertainable by reference to the patent filings.\textsuperscript{182}

\textit{Avoid Tainting the Process}

Relative to the foregoing, it may be appropriate to identify and review pertinent contracts, including employment agreements, customer contracts, distributor agreements, etc., which set forth the terms by which the competitor sells or licenses its products and which evidence measures taken by the competitor to maintain secrecy of the pertinent information. It may also be appropriate to conduct an independent investigation into measures taken by the competitor to treat pertinent information as a trade secret. In this regard, it is worth noting that the mere placement of confidentiality or "trade secret" notices on materials does not automatically qualify them as trade secrets if reasonable precautions are not otherwise taken to preserve secrecy.

Caution should be exercised with respect to the employment of, or acquisition of information from, any former employee of the competitor or other person (such as a consultant or customer) who may have been in a confidential relationship with the competitor or


\textsuperscript{182} See 1 MILGRIM, MILGRIM ON TRADE SECRETS § 2.06[1] (Mathew Bender 1987).
who may have entered into a non-competition agreement with the competitor.

The goal is to ensure that the development process does not involve any act or the use of any information which would constitute an infringement or breach of the competitor's valid intellectual property or contract rights. It is advisable not to make any use or be in possession of any of the competitor's hardware, software, documentation or information if the specific manner of acquisition is in doubt.

With regard to copyrightable subject matter, it is important to note that such materials may be subject to both copyright and trade secret protection. The mere absence of a copyright notice does not necessarily mean that the material is not protected by copyright.

"Clean Room" Procedures

Once the necessary goals have been defined and the necessary information obtained, the development of copyrightable material should proceed independent of, and without access to, the underlying work.

Using a procedure known as a "clean room" technique as applied to software development, one team of analysts or programmers analyzes or "reverse engineers" the underlying program and produces a set of specifications for the development of a new, functionally equivalent or compatible program. The specifications are carefully drawn bearing in mind the importance of excluding any copyrightable subject matter (e.g., literal expression, sequence, structure, or organization) which is not essential to functional compatibility. Those specifications are then passed to a second team of programmers who have never had access to the underlying work and who develop a new, wholly original program to meet the specifications.

Since both access and substantial similarity of protected expression are necessary to establish a prima facie showing of infringement (absent direct evidence of copying), one of the essential elements will be lacking if the authors of the accused work can be shown never to have had access to the underlying work. 183

Avoid Unnecessary Similarities

Aside from potential utility patent infringement issues, which

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are beyond the scope of these materials, it is extremely important when developing competitive or compatible software or documentation to avoid unnecessary similarity to the underlying work. The copying or development of derivative works based upon copyrighted elements not necessary to functional compatibility may result in a finding of infringement, as may the copying of protected trade dress or patented designs.

With respect to computer programs, the likelihood of similarity in the final product will be a function of two things; one is the extent to which literal or structural elements of the underlying work are incorporated into the new work, and the other is the extent to which detailed specifications call for the new work to be written in a certain way. Obviously, if a new work is properly developed in a "clean room" environment and the specifications are not unduly restrictive, such unnecessary similarity will likely be the product of coincidence or the result of programming convention.

If "clean room" procedures are not available or too costly, it may be necessary to deliberately write similarly functioning components in a manner different from the competitor's program simply for the sake of avoiding similarity. Though this may appear to be a waste of resources, it could minimize the risk of expensive litigation and the concurrent risk of a judgment against the developer.

Maintain Evidence of Development Efforts

Since the courts often look to whether a defendant has invested the time and effort which reasonably would have been required to properly engineer or independently develop its own products, it is important that procedures be established to maintain proper evidence of the reverse engineering and development effort and the ways in which information utilized in those efforts is acquired. Recognizing that this will be done in anticipation of possible litigation, it is important that such evidence be as detailed and accurate as possible and that it be preserved in tangible and admissible form.

This may include written policies and procedures pertaining to the activities to be undertaken, records of how a competitor's hardware, software, documentation or other information have been properly acquired, steps taken by the developer to ensure that the process is not tainted by unlawful conduct, lab notebooks, daily time records of the persons involved in the project, expense records,
and even video tapes, disks, listings, and other “snapshots” of the development as it proceeds.

CONCLUSION

As noted at the outset, the law does not prohibit one from zeroing in on a profitable market segment and offering an alternative product or service, provided the methods used do not infringe upon a competitor’s intellectual property or other legal rights. Many of the cases in which courts have awarded damages or injunctive relief based on findings of infringement or trade secret misappropriation might have turned out differently if more care had been taken by the defendant in the early stages of the project to guard against such exposure. Although each endeavor will raise unique considerations, the foregoing discussion has identified the principal applicable bodies of intellectual property law and examples of procedures that can be followed to avoid infringing conduct and minimize the risk that such development efforts will be found tainted by unlawful conduct.