

An Introduction to the Law and Economics of Intellectual Property

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Article I, Section 8, of the U.S. Constitution grants to the Congress the power: “To promote the progress of science and useful arts, by securing for limited times to authors and inventors the exclusive right to their respective writing and discoveries.” Under this general grant, the Congress has enacted a number of statutes, including the Copyright Act [17 U.S.C.A. Sec. 101–810], the Patent Act [35 U.S.C.A. Sec. 1–376], and the Semiconductor Chip Protection Act of 1984 [17 U.S.C.A. Sec. 901–914]. In addition, the federal government has enacted the Trademark Act of 1946 (“Lanham Act”) as amended [15 U.S.C.A. Sec. 1051–1127] and there is state law regulation of trade secrets and of misappropriation of other information. These six legal regimes constitute U.S. intellectual property law. In addition, the United States has sought protection for the works of its authors and inventors in other countries by joining a number of international intellectual property conventions, including the Berne Convention for the Protection of Literary and Artistic Works, the Universal Copyright Convention, and the Paris Convention for the Protection of Industrial Property. Intellectual property issues have also begun to occupy a prominent place in discussions of the General Agreement on Tariffs and Trade.

For as long as laws have aimed at protecting intellectual property, disputes have raged over which works to protect, for how long, and to what extent. The mainstream of the economics profession has generally argued that economic

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efficiency requires government support for innovative and creative activity (Arrow, 1962), but a dissenting tradition has argued that government action of any kind, including the awarding of copyrights and patents, is unnecessary to stimulate such activity (Plant, 1934a, 1934b; Breyer, 1970; Frase, 1966; Hughes, 1988).

Although economists have written on topics of intellectual property for a long time, the impact of economics on public policy in this area has been slight, especially as compared to the influence of professional writings in areas such as antitrust and taxation. We believe that too few of the profession's resources have been devoted to these issues and that, of those resources that have been employed, too few have been devoted to empirical analyses. We hope that this introductory essay and the three papers that follow will stimulate interest in this subject. This introductory essay first describes some of the basic economic tradeoffs involved in intellectual property law, and then describes the framework of the law in the six areas described above: patent, copyright, semiconductor protection, trademark, trade secret, and misappropriation. It is intended both to provide thumbnail descriptions of the various intellectual property regimes to economists working in this area and to indicate where additional economic research might be useful.

The other papers in this symposium provide important examples of ongoing research on the economics of intellectual property. Suzanne Scotchmer analyzes the complex effects of patent protection when innovation is cumulative. Rather than analyzing situations in which several firms vie to develop the same innovation—the approach of the “patent race” literature—her analysis examines circumstances in which only one firm can develop an initial innovation but others can also build upon it. She focuses on how the incentive to develop both the initial and subsequent inventions may be affected by the scope of patent protection.

Janusz Ordover considers ways of adjusting the patent system that may help to both provide returns to the inventor, and encourage the diffusion of the innovation in the economy. His paper is part of a line of work that explores the place of the intellectual property system among the large number of institutions that affect the amount and nature of research and development that takes place.

In the final paper, David Friedman, William Landes, and Richard Posner examine the law of trade secrets using what might be called the “Chicago school” approach to intellectual property protection. Taking the approach of previous work by Landes and Posner (1987, 1989) on trademark and copyright law, they argue that the availability of trade secret protection may efficiently fill some of the interstices left by the patent law and that the fact that trade secrets are protected against some types of discovery but not others may also be efficient.¹

¹We should note here that, while we find many insights of the Friedman-Landes-Posner approach extremely useful, we are less sanguine than they about the efficiency properties of intellectual property law. Additional empirical analysis is needed to establish the validity of either view.

The Basic Economics of Intellectual Property

The objective of intellectual property protection is to create incentives that maximize the difference between the value of the intellectual property that is created and used and the social cost of its creation, including the cost of administering the system. Several specific issues are subsumed under this general formulation.

First, private producers have an incentive to invest in innovation only if they receive an appropriate return. Whether producers will have the correct incentives depends on their ability to appropriate at least some of the value that users place on those works. If potential innovators are limited in their ability to capture this value, they may not have enough incentive to invest a socially optimal amount in innovative activity.

For example, producers may be unable to capture a sufficient portion of the value of their innovations if other producers can easily emulate or “clone” a new product (Arrow, 1962). Similarly, if private copying by individual users is widespread, the revenues of creators of journals, computer software, and audio and videocassettes may be inadequate to support a socially optimal amount of creative activity (Besen and Kirby, 1989a). The legal treatment of related innovations will also influence the ability of producers to capture sufficient revenues to justify undertaking research and development. If the law permits others easily to “innovate around” an innovation, or to produce complements to it, the incentives to create the innovation may be reduced significantly.²

Price discrimination allows producers to appropriate a larger share of the social benefits of their innovations and, thus, may permit some innovations that would otherwise not occur. Examples of discriminatory pricing include: charging different individual and library subscription rates for professional journals; establishing license fees for computer software that vary with the number of users; and setting prices for hardback and paperback versions of a book that do not reflect differences in their cost of production. It should be noted, however, that the “first sale” and “exhaustion” doctrines prevent copyright and patent owners from imposing resale conditions and thereby limit their ability to practice price discrimination.

Second, there is the question of whether innovative activity takes place at minimum cost. The cost of creating new ideas will often depend on the extent to which innovators may borrow from, or build upon, earlier works. Copyright law, for example, limits borrowing by giving a creator the right not only to his or her own creation but also to “derivative works,” so that the costs to subsequent innovators may be increased. In a winner-take-all system like that

²Spence (1976) and Dixit and Stiglitz (1977) pointed out the possibility that an innovation that is only slightly more attractive to users may “cannibalize” the market for an earlier product. In such cases, it can be profitable for a firm to incur the costs of developing the new product and bringing it to market, although total industry profits decline by more than consumer welfare is increased. As a result, total welfare, but not the welfare of consumers, would be increased by making it more difficult to produce close substitutes for existing products.

governing patents, competition to get the patent (and thus control over future innovations based on that patent) may result in an excessive amount of resources being devoted to obtaining the prize. In fact, the combined expenditures of two firms seeking the same patentable invention in a patent race may not only be larger than that of a single firm, but their combined expenditures may be greater than is socially optimal (Loury, 1979; Dasgupta and Stiglitz, 1980).

Other provisions of intellectual property law can lower the costs of subsequent innovations. Copyright registration and patent issuance require authors and innovators to disclose the details of their innovations, which provides information that may help later authors and innovators to reduce their own costs. In addition, the copyright law denies protection to “any idea, procedure, process, system, method of operation, concept, principle, or discovery” and patent protection cannot be obtained for “laws of nature, natural phenomena, and abstract ideas,” no matter how great the expense necessary to bring forth these creations. If the market for licensing innovations were frictionless, there would be no need to impose these restrictions since later innovators could efficiently obtain licenses to use the works of early ones. However, the lack of complete information on which to base these transactions and the market power that might accrue to early inventors may explain the restrictions that have been imposed on protectible subject matter. These types of imperfections are addressed by Scotchmer in this symposium.

A third issue, somewhat related to the second, is whether the intellectual property system strikes an appropriate balance between creating and disseminating intellectual property. Providing incentives for the creation of many new works may encourage resources to be devoted to innovative activity. However, if the new innovations are not widely used, the system may be less beneficial than one with less creativity, but where the materials created are more broadly disseminated. This issue focuses on the appropriate scope of protection. It arises, for example, in determining the optimal duration of patents (Nordhaus, 1969) and the optimal tradeoff between duration and breadth (Gilbert and Shapiro, 1990; Klemperer, 1990). Another critical element in deciding how to strike the balance between encouraging creativity and dissemination is the extent to which creative activity responds to economic rewards. The less that innovation depends on the resources invested and the potential economic rewards, the more limited is the case for granting substantial rights to creators.

Patents

A patent may be granted on any new and useful process, machine, manufacture, composition of matter, improvement and plant as well as to new, original and ornamental design for an article of manufacture (Chisum, 1989). The patent right is the most powerful in the intellectual property system,

enabling the patent holder (patentee) to exclude all others from making, selling, or using the subject matter of a valid patent for a term of 17 years (in the case of a design patent, 14 years). The 17-year term of pharmaceutical and medical device patents may be extended for as long as five additional years. During the term of the patent, any use of the patented subject matter requires permission of the patentee, customarily in return for the payment of a royalty. The patentee can even prevent an independent subsequent discoverer of the same subject matter from making, using or selling it. At the end of the term of protection, the subject matter enters the public domain.

The scope of protection offered by a patent is determined by its claims, which are technical descriptions of the process, machine, method, or matter contained in the original patent application. U.S. patent law follows the principle that the first to invent has prior claim to the invention. In all other countries, the “first to file” rule determines the patentee.

The patent statute requires that the claimed invention must be new, useful, and nonobvious to a person of ordinary skill in the art to which the invention pertains. The practical effects of the novelty and nonobviousness requirements are that the inventor must convince the examiners in the Patent and Trademark Office that the claims in the application make a new contribution to knowledge and are more than a mere variation of something already known or foreseeable as an extension of existing knowledge. Examiners have the power to determine that a claim is too broad, and to grant a patent only on a narrower claim, or to reject a claim entirely.

When Patents Are Disputed in Court

A patent holder who believes that a patent has been infringed may bring suit against those who make, use, or sell the offending product. Courts may either choose to interpret the claims of the patent literally, or the “doctrine of equivalents” may be invoked and infringement will be found if there is a substantial, functional identity between the patent claims and the contested item. In fact, there has been a debate as to whether a patent effectively covers more than the literal subject matter of the claim by including the prospective technology inherent in the earlier patent. Kitch (1977) argues that the “prospect” theory of patent interpretation is predominant; Beck (1983) contends that the evidence does not support that conclusion.

The supposed patent infringer may defend against the charge in four principal ways. First, the validity of the patent may be challenged as having been improvidently issued; that is, lacking the requisite requirements of novelty and nonobviousness. Second, a patent may be invalidated for fraudulent conduct; for example, by misrepresenting the prior art in the patent application. Third, the patent is invalid if the invention was patented or described in a printed publication here or abroad, or was in public use or on sale in the United States more than one year prior to the date of the patent application. Finally, there is the defense of patent misuse, a doctrine limiting the use of the

patent beyond its statutory scope (Kaplow, 1984). An allegation of infringement may be defeated under this doctrine if the license to use contains a condition that the licensee must purchase another product from the patent holder, that is, if a tying arrangement is created. However, the doctrine cannot be invoked unless the patent holder has market power.³

There are three basic remedies available to a patentee in an infringement suit. First, the court may issue an injunction barring further use of the infringing device, composition, method, process, or improvement. Second, the court may award damages equal to a reasonable royalty or lost profits. If the court deems a reasonable royalty inadequate in a particular case, it may treble the proven damages. Third, the court may award costs and attorney's fees.

Patent litigation is distinctive in the federal court system in that all patent appeals from U.S. District Courts and from the Patent and Trademark Office are heard only in the Court of Appeals for the Federal Circuit. The Federal Circuit was organized in 1982 to provide greater expertise and uniformity in the interpretation of patent law and to achieve greater efficiency in case management. An interim review of the performance of this specialized court notes that the interpretation of patent law is becoming more precise and coherent, patentees are successful more frequently against challenges of validity, and the expansion of injunctive relief and modified methods of damage computation have made infringement more costly (Dreyfuss, 1989).

Research and Policy Issues About Patents

The patent system was perceived by the framers of the Constitution as a system of incentives and rewards. The patent offers the incentive of the statutory right to exclude as a means of inducing creative activity. The right, in turn, permits the holder to obtain the reward by having the legal power either to sell the right for the payment of a royalty or to retain the exclusive exploitation rights (Katz and Shapiro, 1985b). The right of the patent owner is conditioned on the disclosure of the subject matter to the public when the patent is issued.

Although economic literature about the patent system is substantial, many questions are still heavily disputed. For example, there is no consensus as to the impact of patent protection on the growth of technology (Kitch, 1986); or on the optimal duration of the patent right (McFetridge and Rafiquzzaman, 1986);

³Patent and Trademark Authorization Act, approved November 19, 1988. Pending legislation, H.R. 469, 101st Cong., 2d Sess. (1990), would restrict the doctrine of patent misuse further by overruling Supreme Court antitrust cases that presume market power from the existence of a patent or copyright. In hearings on February 8, 1990, this legislation was supported by representatives of the computer industry who stated that the presumption impeded owners of intellectual property rights from appropriating the return on their creative efforts. Opponents of the legislation stated that the existing caselaw was needed to bar illegal tying arrangements in the computer and broadcasting industries. BNA, *Patent, Trademark & Copyright Journal*, Volume 39, No. 968, p. 289, February 15, 1990.

and the data on whether patents have been used to facilitate cartel behavior is inconclusive (Hall, 1986).

The current controversy over the role of patent protection in the computer software industry suggests the practical importance of patent protection on a developing industry. Most of the early computer programs were marketed without patent protection. When Visicalc was developed in 1979, the Patent Office, relying upon Supreme Court case law, took the position that the mathematical algorithms in computer programs were not protectible subject matter. Subsequently, the Supreme Court in the *Diehr* case did find patentable subject matter in a process utilizing a computer algorithm.⁴ Since that case, the Patent Office has begun to grant patents on computer programs.

The uncertainty as to the scope of patent protection of computer software may limit the attraction of the patent regime for it. Recently, Refac Technology, a firm producing no software, acquired a 5 percent ownership interest in many software patents relating to spreadsheet programs in exchange for its promise to bring infringement actions. Refac was to receive a portion of all resulting royalties. It then filed some 2000 patent infringement suits against large and small software companies for current and retroactive royalties. Recently, in the first of these suits, Refac was dismissed on the legal technicality that Refac's slight ownership interest in the patent was void for having been acquired solely for the purpose of bringing abusive litigation. The court noted, however, that the actual patent owner could bring the suit (131 Federal Rules Decisions 56, May 29, 1990). This case has had the unsettling effect of causing software producers to undertake costly and time-consuming patent searches before marketing new products, an effort made difficult by the inadequacy of the present system of software classification by the Patent and Trademark Office. The suitability of patent protection of software in comparison to copyright protection, remains an unsettled question (Mennell, 1989; Sumner and Lundberg, 1989).

Since computer programs are functional statements constructed to solve problems, they pose the issue of whether algorithms are patentable. Reports in 1988 and 1989 that the Patent and Trademark Office had adopted a more liberal approach to software patent applications, which might result in granting patent protection to fundamental building blocks of research, led the Office to publish a statement of guidelines to clarify its position (Official Gazette, September 5, 1989). The statement concluded that mathematical algorithms

⁴The original line of Supreme Court precedents included *Gottschalk v. Benson*, 409 U.S. 63 (1972); *Parker v. Flook*, 437 U.S. 584 (1978). The revised decision was *Diamond v. Diehr*, 450 U.S. 175, 185-187 (1981). The Court held: "Excluded from . . . patent protection are laws of nature, natural phenomena, and abstract ideas . . . [A]n algorithm . . . is like a law of nature, which cannot be the subject of a patent . . . [Here] . . . patent protection . . . [is sought] for a process of curing synthetic rubber. Their process admittedly employs a well-known mathematical equation, but they do not seek to preempt the use of that equation. Rather, they seek only to foreclose from others the use of that equation in conjunction with all of the other steps in their claimed process."

are, as such, unpatentable, but that applications of such algorithms may be protectible as new processes.

Two recent decisions by the Court of Appeals, Federal Circuit, have further unsettled this issue. The court recently affirmed a Patent and Trademark Office rejection of a patent application for a computer program that diagnosed the condition of a patient by aggregating a plurality of clinical laboratory tests (*In re Grams*, 12 USPQ 2d 1824 [1989]). However, even as the court held that the claim was no more than the application of a mathematical algorithm to data, it also noted that the presence of a mathematical formula as a step in a process involving mathematical steps could permit patent protection. In a later decision, *In re Iwahashi* (12 USPQ 2d 1908 [1989]), the court reversed the Patent and Trademark Office for refusing to allow a patent on a program used to calculate the correlation of signals for recognition of voice patterns. Where the Office had considered the program no more than a more efficient means of calculation of correlations and, thus, unpatentable as an algorithm, the court interpreted the claim to involve the description of an apparatus in the form of a series of interrelated means. It held that such an apparatus may qualify for patent protection.

These apparently contradictory decisions create considerable uncertainty and have raised fears among industry participants that overprotection of algorithms may stifle innovation by raising the costs of subsequent innovation, an example of the issue analyzed by Scotchmer in this symposium. (See 39 Pat. Trademk. & Copyr. J. 369 [1990].) To the extent that patent protection is utilized, perhaps increased federal expenditures are needed to improve the classification system and accelerate the examination process. Another alternative is to permit a patent application to be made public after, say, one year, even if the patent examination process is not completed, as is done in Britain and some other countries. This step would at least help to avoid unintentional infringements of patents that are still working their way through the examination process, although it would not deal with the "overprotection" issue.

Another public policy issue that invites economic analysis is the recent extension of the term of patent protection for pharmaceuticals. The brand-name producers sought the extension because the delay in marketing patented products caused by the required review and approval of the Food and Drug Administration (FDA) encroached on the effective term of patent protection, making it more difficult to recoup their R&D investment. The makers of generic drugs, on the other hand, objected to the long FDA review and approval period required for modifications of compounds already approved under brand names, arguing that this duplicative review process inhibited their ability to compete with brand-name drugs. Economic analysis of this industry would illuminate the welfare effects of the resulting legislative compromise, which extended the duration of the patent monopoly while facilitating the subsequent entry of generic drugs (Wheaton, 1986).

Patent protection is also a current policy concern as an aspect of international trade (Mossinghoff, 1984). The current GATT negotiating round is seeking agreement on patent norms and standards (Braga, 1989). As technological innovation is linked to concerns about the balance of payments and competitiveness, economic analysis should be extended to the international as well as the domestic aspects of patent protection.

Copyright

Although works can be registered and deposited at the Copyright Office, the rights under the copyright statute exist independently of any such registration, prior examination, or other formalities (Nimmer and Nimmer, 1989; Goldstein, 1989). Instead, copyright protection attaches to the stated subject matter when an "original work of authorship" is "fixed in any tangible medium of expression." For example, protection attaches to the pages of a novel when the word processor causes the word order to be printed on paper, meeting the "fixation" requirement. The words on the cathode ray tube are considered an unprotectible evanescent image.

Copyright law gives protection in most circumstances for the life of the creator plus 50 years. One exception is that a work prepared and published by the U.S. government, like the annual *Economic Report of the President*, cannot receive copyright protection. Presumably, the basis of this limitation is to encourage the dissemination of government materials to the electorate. Case law has extended this principle to preclude copyright in state laws, municipal codes, legislative hearings, and judicial opinions.

Because copyright law has no parallel to the patent system's process of application and definition of claims, the scope of copyright protection is ultimately defined by litigation. Litigation involving the validity of a patent involves a review of the file of prior art and competing claims prepared by the Patent and Trademark Office. By contrast, the Copyright Office makes no independent review of the article or the circumstances of its creation, there is no official file, and the copyright owner must produce the evidence to support the validity of the copyright.

For copyright, it is only necessary that the work originated with the claiming author; therefore, unlike patents, more than one valid copyright can be held on identical works. The traditional hypothetical example is that there could be multiple valid copyrights to identical versions of Keats's "Ode on a Grecian Urn," as long as the each author produced the word order of each poem independently.

Technically, a work is eligible for copyright protection if it is within one of five statutory categories, is original in the sense that it was neither already in

the public domain nor copied from another, and represents a modicum of intellectual activity. As already described, patents attach to the application of an idea in the form of a machine, method, or matter. In contrast, copyright is said to attach only to the expression, as distinguished from the idea.

The statute also requires "authorship." Thus, if a chimpanzee were to manipulate the keyboard of a personal computer with a graphics program and produce an attractive design, protection would not exist because the modicum of intellectual activity to support copyright is deemed lacking. As Congress has extended the subject matter of copyright from books and maps to photographs, sound recordings, motion pictures, computer programs, and so on, courts have had to determine the relevant "authorship" for each new subject (Raskind, 1990).

Copyright law defines its subject matter more specifically than does the patent statute. Copyright protection is extended to literary works, musical works (including accompanying words), dramatic works (including accompanying music), pantomimes and choreographic works, pictorial, graphic and sculptural works, motion pictures and other audiovisual works, and sound recordings. The rights accorded to a copyright owner are also tightly defined. Copyright protection grants five basic rights: 1) the right to reproduce the protected work; 2) the right to prepare derivative works from the protected work; 3) the right to distribute copies; 4) the right to perform literary, musical, dramatic, choreographic works publicly, as well as pantomimes, motion pictures, and other audiovisual works; and 5) the right publicly to display literary, musical, dramatic, choreographic, pantomimes, and pictorial, graphic, and sculptural works, including the individual frame of a motion picture and other audiovisual works. Notice that sound recordings are omitted from the listed properties having the performance right, although the composer and publisher of the recorded work do have the right.

In 1980, Congress expressly extended copyright protection to computer programs as literary works, defining a program as "a set of statements or instructions used directly or indirectly in a computer in order to bring about a certain result." At the same time it provided that the owner of a copy of a copyrighted computer program could lawfully make or authorize the making of another copy or adaptation of that program, provided that either: 1) the new copy is created only as an essential step in utilization of that program; or 2) the new copy is for archival purposes only. The maker of the archival copy is required to destroy it if the maker's legal right to possession of the program ends. On any transfer or exchange of the underlying copyright program, the archival copy may be transferred only with the permission of the copyright owner of the underlying program.

Extending protection to computer programs requires modifying the interpretation of the basic copyright requirement of fixation. Accordingly, cases hold that although the image generated by the program on the cathode ray screen is evanescent, the fixation requirement for a computer program is met when the

source code is written on paper or when the object code or microcode is fixed in a computer chip.

Remedies granted the copyright owner are more powerful than those provided under any other regime of intellectual property protection. Injunctions are liberally granted in copyright cases. Monetary damages measured by lost profits or the profits of the infringer may be awarded. If willful infringement is shown, the court may award statutory damages up to \$50,000. In addition, infringing material along with the equipment used to produce the infringing copies may be impounded. As part of final judgment, a court may order sale or other disposition of impounded material or may order its destruction. Copyright infringement also is a misdemeanor under the federal criminal statute which carries a sanction of a fine of up to \$10,000 or imprisonment for up to one year.

Because copyright has its origins in the protection of books and other printed expression, it is sometimes mistakenly assumed that patent protection exclusively covers industrial products, while copyright is limited to products with a high content of creativity that address the intellect and the aesthetic sense. However, case law has extended copyright protection to a large group of commonplace functional articles, from lamp bases to ash trays and can openers, items that have nothing in common with the fine arts.

For some products there is a choice between patent and copyright protection. A computer program producer may seek either copyright or patent protection at the outset. Exercising one alternative may restrict the other. If copyright is selected first and the program is registered and sold in the United States, access to foreign patent protection is lost and unless a U.S. patent application is filed within twelve months of the initial sale, patent protection here is also barred. If patent protection is chosen first, a copyright notice may also be attached. Similarly, protection of some commonplace functional articles may be sought either under the design patent regime or under copyright, but the Copyright Office takes the position that material protected by a design patent is ineligible for copyright protection.

The Limits of Copyright Protection

Copyright also expressly qualifies and limits the granted rights in three general ways. First, the more modest copyright threshold of "originality" means only that the work has not been copied. Thus, independent creation of an identical work is a defense against a claim of copyright infringement.

Second, the scope of protection varies with the creative content of the material. For example, copyright in a fact work (like a news story or a database) does not extend to the names, places, and events, but only to the expression in the writer's interpretation. However, all of the expression in a poem or a novel is protected by copyright.

Third, reproduction of a copyrighted work is not infringing if the copying can be shown to be for a "fair use," such as literary criticism, making a parody,

or classroom teaching. Moreover, the reproduction must not adversely affect the present or potential economic interest of the owner of the protected work. An example of a situation in which there is no adverse effect would be the reprinting an out-of-print work (Gordon, 1982; Raskind, 1984).

In the recent revision of the Copyright Act, an impasse developed between the higher education establishment and representatives of the publishers over a statutory provision permitting photocopying by classroom teachers. The matter was resolved by providing guidelines that undertake to define the circumstances where multiple copying by classroom teachers does not constitute infringement. The Guidelines were intended to describe a clearly permissible "safe harbor" amount of multiple copying for classroom use for which permission is not required. They were not intended to state a maximum. For copying beyond the Guidelines, courts are to decide fair use in the classroom setting on a case by case basis. There is pending litigation involving a group of major publishers and a prominent commercial copying firm which may provide the first interpretation of the scope of the Guidelines.

It is generally agreed that a scholar may make one copy of protected material for study. Under a separate statutory provision, a library may make that single copy on behalf of a patron as well as for preservation, archival, or interlibrary loan purposes. This provision restricts the library to "isolated" and "unrelated" reproduction of the single copy. If the library persons become "aware or have substantial reason to believe" that they are participating in "concerted reproduction or distribution" of multiple copies, they become liable for infringement, unless the fair use provision applies. A library is further restricted from making a copy (except for archival or preservation purposes) of a musical work, a pictorial, graphic, or sculptural work, a motion picture or other audiovisual work. However, a library may make a copy of an audiovisual work dealing with news.

Transfer of Copyrights

Copyright provides a legal framework governing market relations. An owner of a copyright is empowered to grant a license to reproduce, distribute, perform, or display the copyrighted work and to obtain a royalty for granting the right. In most circumstances, the outcomes are uncomplicated. A textbook author obtains the copyright in the manuscript by completing it, and the author can then transfer the copyright to the publisher in exchange for royalties. In this way, the copyright statute provides the framework for private contractual bargaining and transfer of economic interests.

Although the copyright law is generally silent as to the terms on which private parties may strike bargains, there are some exceptions. For example, the Copyright Act provides for compulsory licenses with statutorily determined license fees for some uses, like the retransmission of broadcast signals by cable television systems (Besen, Manning, and Mitchell, 1978). Moreover, a number of European countries have enacted compulsory licenses for off-air taping,

other forms of home recording, and photocopying, where the license fees are collected through levies on blank recording machinery or media.⁵ Copyright owners have unsuccessfully attempted to have similar levies imposed in the United States to compensate for losses from home taping.

In cases where the value of a given piece of copyrighted material is small relative to the transaction costs of licensing, copyright owners may employ collective administration of the licensing process (Besen and Kirby, 1989b). For example, the American Society of Composers, Authors and Publishers (ASCAP) and Broadcast Music Incorporated (BMI) issue blanket licenses to radio stations to play recorded music and to live entertainers to perform individual songs in public, with the proceeds of the license fees distributed among their members. Since collective administration creates the potential for anticompetitive behavior, ASCAP and BMI have both been the subjects of government and private antitrust suits. Both now operate under court-administered consent decrees in which the government suits were settled in return for changes in licensing procedures.

Similarly, the Copyright Clearance Center is an organization that centralizes photocopying authorization and royalty collection for literary material. Founded in 1977 as a non-profit entity, the Center obtains permission from copyright owners to grant licenses permitting users to photocopy registered titles at fees set by the owners and indicated by a notation printed on the materials; for example, 50 cents per page. The Center may issue a license on a transaction basis and require detailed records of copying or it may issue a blanket license based on a sample audit period. The royalties paid by users, mainly libraries and corporations, are distributed to the copyright owners. Several lawsuits by publishers against photocopiers have been settled following the agreement of the user to register with the Center.

A work made "for hire" is another important instance in which the transfer of copyright is governed by different rules. If a work is determined to be one made "for hire," the employer takes the copyright in the material prepared by the employee. Then the duration of protection of a work becomes the lesser of 75 years after publication or 100 years from the date of creation (Hardy, 1988).⁶ Industry practices vary with regard to the uses of the "work for hire" provisions, yet there have been no economic studies of these practices. However, it appears that in cases when a commissioned work is to be treated as a work for hire, courts sometimes make assumptions about relative bargaining power and prevailing rates and fees that are unsupported by any evidence or analysis.

⁵Besen and Kirby (1989a), Johnson (1985), Liebowitz (1985), and Novos and Waldman (1984) all contain analyses of the effects of private copying. For a model of library borrowing that deals with many of the same issues, see Ordovery and Willig (1978).

⁶A recent Supreme Court opinion held that in the case of a commissioned work, the author presumptively is entitled to the right, absent an express written designation of the commissioning person as the owner of the copyright. *Community for Creative Non-Violence v. Reid*, 109 S. Ct. 2166 (1989).

Copyright and Incentives for Innovation

By expanding and restricting the protection given to copyright, courts alter the incentives accorded to a potential innovator. The development of new products may be impeded by a legal rule that overprotects existing works.

Among the basic rights granted the copyright owner is the right to prepare a derivative work, defined as a work based on one or more preexisting works. Others must obtain permission from the owner to prepare a derivative work from copyrighted material. The statute gives as examples of derivative works a translation, musical arrangement, and motion picture version. There may be more than one tier of derivative works as, for example, when a three-dimensional toy or a T-shirt picture is made of a character in a motion picture version of a novel. The independent preparer of a derivative work obtains no rights in the preexisting material.

A substantial legal literature has probed where the line of protection should be drawn for derivative works. One view is that creators of initial or underlying works should have broad protection to have the maximum incentive to produce. On this view, infringement occurs if there is substantial similarity between the underlying work and a recast, transformed version. In addition, Landes and Posner (1989) have argued that granting control over derivative works to creators encourages early release of the underlying work since otherwise creators might delay release while they prepare derivatives to gain a marketing advantage over other producers. The other view would give narrower protection to the original work and accord the producer of the derivative work a zone of freedom from infringement as an incentive to produce new variations. Here, the theory is that the societal interest is better served by providing the incentive for others to create derivative works.

Economic analysis would illuminate the social choices. In one recent case, a manufacturer of framed pictures purchased copyrighted volumes of an art history book, clipped the photographed illustrations, and mounted them for sale as framed pictures. In *Mirage Editions, Inc., v. Albuquerque A.R.T. Co.*, (856 F.2d 1341 [9th Cir. 1988]), the court protected the copyright owner of the book, by holding that the framed pictures infringed the copyright. The owner of the book apparently never saw the market opportunity for framed pictures during the half dozen years the book was being sold. The person who saw that opportunity and who paid the asking price for the protected book was effectively denied any economic reward for entrepreneurship.

A similar example with more serious technological implications involves the copyright provision (Sec. 117) that restricts the copying of computer software to archival uses.⁷ Restricting duplication solely to archival uses makes it an act of copyright infringement for a programmer, whether independent

⁷In the case of *Vault Corp. v. Quaid Software, Ltd.*, 847 F.2d 255 (5th Cir., 1988), the court gave a broader interpretation, permitting destruction of the manufacturer's anticopying code to make a copy for archival purposes.

contractor or employee, to copy a protected program for the purpose of modifying it to the particular needs of a user. Some consider this an undue restriction on the role of programmers as well as users (Stern, 1985). Making it illegal to copy for innovative uses, such as analysis and study for the purpose of improving routines and enhancing functions, serves to inhibit and restrict an important activity associated with the advance of this new technology (Braunstein, Fischer, Ordovery, and Baumol, 1977), and thus raises the cost of subsequent innovation.

The legal literature has tended to focus on restricting the protection of the underlying work. Economic analysis could contribute here by analyzing the impact of changing the relative costs and returns of initial creators and subsequent derivative work producers.

An Illustration: Computer Operating Systems and Interface Standards

The issue of how to protect computer operating systems and screen displays provides an example of extending traditional copyright principles to new technology. These computer interfaces are of increasing importance to the industry, because of their potential for standardizing menu displays, keystroke usage, and operating systems. The Copyright Office has announced as its position that all the copyrightable expression embodied in a computer program, including screen displays, is to be considered as a single work (53 Federal Register, 21817-20, June 10, 1988). By reversing its earlier position of accepting screen displays for separate registration and deposit, the Office has placed itself at odds with the courts⁸ and with some commentators (Menell, 1989).

Computer users may benefit from the existence of standardized interfaces in a number of ways (Farrell and Saloner, 1985; Katz and Shapiro, 1985a). The greater the degree of standardization, the larger is the array of complementary inputs (software, repair services, and the like) available to users, and the easier it is to switch from one system to another. These forces also create a tendency for only a small number of standardized features of interfaces to exist at any one time, and make the introduction of new interfaces more costly and difficult (Farrell, 1989).

Much litigation has occurred and is pending over the copyright protection of both computer operating systems and computer screen displays. However, this litigation does not seem likely to refine the analysis of visual displays. In Apple's suits against Microsoft and Hewlett-Packard, for example, the court found that the alleged infringing use of Apple's visual displays was covered by Apple's software license to the defendant (*Apple Computer, Inc. v. Microsoft Corp.*, 717 F. Supp. 1428 [N.D. Cal. 1989]). Xerox's suit against Apple is

⁸For example, see *Manufacturers Technologies, Inc. v. Cams, Inc.*, 704 F. Supp. 984 (D. Conn. 1989); *Digital Communications Associates v. Softklone Distributing Corp.*, 659 F. Supp. 449 (N.D. Ga. 1987).

pending a further hearing, but it is unlikely to require analysis of the scope of protection since Xerox does not allege infringement, but rather seeks to have Apple's copyright declared invalid, a novel copyright remedy (*Xerox Corp. v. Apple Computer, Inc.*, D.C. N.Cal. CCH Copy. Rep. Par. 26, 556). A recent decision extending copyright protection to the menu command structure of a popular spreadsheet program has rekindled the controversy over the protection of screen displays (*Lotus Development Corp. v. Paperback Software Intn'l.*, 740 F. Supp. 37 [D. Mass. 1990]). Most troublesome is the protection of the input command words (such as Move, Copy, Print) and the court's rejection of the defendant's argument that these familiar components of a screen display should be considered an unprotectible, *de facto* industry standard.

Proponents of independent protection of screen displays have argued that substantial expenses are involved in developing interfaces and that without legal protection, too few resources will be devoted to this activity (Clapes, Lynch, and Steinberg, 1987). In response, it has been argued that many standardized interfaces result from arbitrary choices among a number of equally good and widely-known alternatives, or conversely, that there may be only a single way to accomplish a given objective. In either case, providing intellectual property protection would grant considerable market power to the owner of the right to control the standardized interface. For this reason, Menell (1989) has argued that courts should give only "thin" copyright protection to screen displays by finding infringement only on a showing of actual copying.

An alternative approach is to require the developer of the interface to seek protection under the patent system. Since copyright protection does not require novelty or non-obviousness, using copyright to protect computer interfaces might cause insignificant advances to receive a high degree of protection, with risks that widespread use of innovations in this industry will be delayed.

Strong intellectual property protection might also create the possibility for patent or copyright races, as discussed earlier. Because of the potentially large returns to winning in the race to develop a broadly used interface standard, an excessive amount of resources may be devoted to this activity.⁹ If protection were more limited, this effect would be attenuated. Alternatively, the degree of protection could be limited by requiring that compulsory licenses be made available on reasonable terms. Indeed, some standards organizations have been able to impose such licensing requirements as a condition for selecting a particular technology as a standard, and user groups have succeeded in lowering royalty fees by threatening not to support a standard. IBM and Unisys were recently forced to reduce their proposed fees for licensing patents needed for the manufacture of modems that conformed to a new standard (Lefton, 1990).

⁹There is probably less need to be concerned about resources spent in efforts to develop trivial variation on an existing standard. Even if those variations were to receive protection under the copyright law, trivial changes would be less likely to dominate the marketplace.

Semiconductor Chip Protection

The semiconductor chip has become the principal building block of contemporary electronics technology. By the mid-1970s, U.S. and European chips were being copied and distributed by foreign competitors (Stern, 1986). In 1978, the industry appealed to Congress for protection and hearings were begun.

The resulting Semiconductor Chip Act of 1984 is the newest addition to the intellectual property system. The Chip Act is sometimes erroneously described as a piece of special or *sui generis* legislation, implying that the special nature of the technology made it ineligible for copyright protection. It is more accurately characterized as legislation within the copyright regime, a copyright-like statute that is fine-tuned to reflect the particular needs of this industry.¹⁰ Thus it provides a 10-year term, shorter than either patent or copyright, codifies the industry practice of reverse engineering, and provides for more limited remedies.

The two subjects eligible for protection under the Chip Act are the semiconductor chip products and the mask work. The first are integrated circuits containing transistors, resistors, capacitors and their interconnections, fabricated into a tiny, single piece of semiconductor material. A mask work is defined as a set of images, however fixed or encoded at a later stage of manufacturing, that produces the circuitry of the final chip product; essentially, these are the blueprints of the chip. For domestic producers, protection attaches on fixation and commercial exploitation. Protection for foreign products can be granted by the president upon a finding that a foreign nation extends to U.S. nationals the same protection as the United States accords to the foreign nationals. The obvious aim of this provision is to induce other countries to enact chip protection measures.

As in traditional copyright, the Chip Act imposes a condition of "originality" for protection to attach, but the Chip Act standard is expressly set somewhat higher. The Chip Act states that a mask work design is not original if it is staple, commonplace, or familiar in the semiconductor industry. Although a mask work is eligible for protection upon fixation, the right may be forfeited by failure to register within two years after the first commercial exploitation. Clearly, this is unlike traditional copyright law.

Two basic rights are given the owner of a protected mask work: the right to bar reproduction of the mask work by optical, electronic, or any other means; and the right to import or distribute a semiconductor chip product in which the mask work is embodied. Accordingly, importing a pirated chip is an infringement of the owner's importation right.

¹⁰Statement, Leo J. Raskind, testimony before the House Subcommittee on Courts, Intellectual Property, and the Administration of Justice, Oversight Hearings on Computers and Intellectual Property, p. 3, November 8, 1989.

Reverse engineering, like fair use in copyright law, is a defense to a claim of infringement. Reverse engineering differs from the fair use defense in two material respects. First, the reverse engineering provision was expressly drafted to provide exemption from infringement liability despite proof of unauthorized copying and striking similarity, so long as the resulting chip product was the result of study and analysis and contained technological improvement, like decreased chip size, lower thermal output, or enhanced speed.

The second difference is one of scope. Under fair use, the extent of economic injury is the primary concern. But injury is irrelevant under reverse engineering; what matters is that more than a trivial improvement was made. In the course of these hearings, legislators pressed various witnesses for guidance in distinguishing piracy from reverse engineering. The uniform industry response was that in a case of piracy, the copier would not be able to show a "paper trail" of initial flow charts, time sheets, computer simulations, or an improved chip (Sen. Rept. No. 425). By comparison, a firm that had done reverse engineering would have copious records of analysis and experimentation as well as a new chip with improved performance capabilities. As courts grapple with determining the scope of protection in computer programs and screen displays, the approach of the Chip Act may serve as a model for courts to find infringement only in cases of piracy (Raskind, 1985).

Once infringement is established, the mask work owner has the traditional battery of remedies associated with copyright protection, with two exceptions. First, criminal penalties are not available. Second, the amount of permissible statutory damages for mask work infringement is five times greater (\$250,000) than the maximum amount (\$50,000) of statutory damages for copyright infringement.

As the newest addition to the intellectual property regime, the Chip Act is a good candidate for further study by economists. To date, only one case has been decided under this statute. And in the case of *Brooktree Corp. v. Advanced Micro Devices, Inc.* (705 F. Supp. 491 [S.D. Cal. 1988]), the plaintiff was denied a preliminary injunction. A study of research and development in this industry would contribute to resolving the present debate over whether the Chip Act was a necessary or worthy form of intellectual property protection (Risberg, 1990).

Trademarks

Trademark protection differs from the other regimes of intellectual property both in its legal basis and its economic function. Unlike patents and copyrights, there is no constitutional foundation for trademark protection. In fact, there are no federally created rights in trademarks at all; the federal framework provides a system of registration and of enforcement of marks whose genesis is in state law (McCarthy, 1984; Landes and Posner, 1987).

Although trademark protection did not originate as an incentive for innovation or creativity, it now provides an economic incentive. The primary function of trademarks is to provide rules of orderly marketing by identifying products and their sources.

State law attaches protection to trademarks (and other devices to identify producers) when they are adopted and used. Protection is given by the branch of tort law governing unfair competition. By registering a trademark with the Patent and Trademark Office, the registrant gains access to the federal courts and can stake out a national claim to the registered mark, a result that cannot be achieved by state law. Beginning in 1989, a trademark owner who has not yet used a mark in commerce may apply for registration of intended use and support that claim by actually using the mark within six months and filing a statement at that time.

The origin of trademark protection is usually associated with the medieval guild practice of affixing an identifying mark to a goblet or like product. Accordingly, the initial purpose of trademark protection was to make it illegal to pass off the goods of another artisan as those of a guild member. As modern manufacturing and marketing practices made the consumer remote from the source of the product, however, trademarks took on the function of product identification and differentiation, as well as source identification. Protection was extended from the trademark, an arbitrary and distinctive designation, to include a tradename, a surname or descriptive word, a service mark, a collective mark (like "union made"), as well as packaging and product features. Over time, the legal theory of protection was adapted to prevent a second entrant from unfairly appropriating the value of a successful trademark, service mark, or trade dress. Thus, the protection of trademarks has evolved as a form of indirect protection of the consumer by insuring that purchasing decisions are based on marks that properly identify the product and its source.

The value of the trademark is enhanced both by the quality of the product and the public familiarity with it. A trademark may impose costs of advertising and establishing a reputation upon a prospective entrant to a market. Moreover, trademark protection may dampen competition by limiting the ability of competitors to copy a successful mark or packaging design, even though these features are not protected by copyright or patent.

Patents require novelty; copyright requires originality; the counterpart of these terms for trademark is distinctiveness. The Lanham Act provides that no mark by which the goods of the applicant "may be distinguished from the goods of others" shall be refused registration. In this context, "distinctiveness" means that the claimed work must not be a generic description. Thus, "orange" is not eligible for protection as applied to citrus fruit or its extract. Also ineligible are geographic names to designate location, or even an actual surname if the attachment to a product would be likely to confuse or deceive consumers. Similarly, merely descriptive terms are also ineligible, like "pasteurized" as applied to milk.

A further condition for the registration of trademarks is that the proffered trademark use terms that are either arbitrary or fanciful as applied to a good or service. "Kodak," as applied to photographic film, is the classic example of an arbitrary term being associated with a product. A term or phrase that is not distinctive or otherwise eligible for registration—like "Big Red" as applied to apples—may qualify for registration as applied to a hand tool, if it is found to have acquired "secondary meaning." Secondary meaning is a doctrine that allows protection to attach to a word or phrase that is geographically or otherwise descriptive, requiring the claimant to prove that those words identify that product to consumers. Secondary meaning may be proven by survey evidence, for example by showing that some statistically significant segment of the consumers in a given geographic market will state that the phrase—"Big Red"—means to them a screwdriver manufactured in New Haven, Connecticut (Stern and Hoffman, 1962).

Trademark law recognizes that a term that is not distinctive at the outset may become so through usage. If an arbitrary mark becomes successful enough to become part of the language, that mark may lose its protection because generic terms are not protectible. "Aspirin" and "Thermos" are examples of trademarks that have lost protection by becoming generic (Folsom and Teply, 1980). The board game "Monopoly" also lost protection for a time, based on survey evidence that 65 percent of respondents wanted the game without reference to who made it. Congress reversed this decision in 1984 by modifying the grounds for cancellation of a generic mark to require that the test be, in the words of 15 U.S.C. § 1064(3) [1984], "the primary significance of the registered mark to the relevant public rather than purchaser motivation." The new statute effectively withdraws the significance of secondary meaning as a test of becoming generic. The concept will remain only as a basis of granting protection. But how the courts will determine "primary significance" and secondary meaning remains to be seen. They seem to be groping for some analytical statement in terms of the function of these protected symbols in the competitive process (Stern and Hoffman, 1962; Dreyfuss, 1990). Law in this unsettled state invites economic analysis of how trademarks affect product differentiation and consumer protection.

To prove trademark infringement, it is not necessary to prove actual confusion of specific customers. Proof of the likelihood of confusion in the market circumstances satisfies the requirement, so that similarity between two marks in physical design, in sound or in commercial connotation can make the case for infringement. Strictly speaking, the Lanham Act does not grant legal rights in trademarks beyond registration. However, Section 43 provides a federal law regulating unfair trade practices involving trademarks and product designation. Section 43 broadens the tort rule against "passing off," by making actionable any false statement of fact or any statement likely to deceive, when made in a competitive context.

Like the other branches of intellectual property law, the traditional remedies of injunction, damages, and fees and costs are available to the successful litigant. A successful plaintiff in a trademark infringement action is entitled to injunctive relief, to recover the defendant's profits and to receive damages for lost sales. These penalties can be further increased if there is a deliberate use of a counterfeit mark.

Trade Secrets

Trade secret law covers specific business information transmitted by persons, firms, and markets (Grossman and Stiglitz, 1976; Kitch, 1980). A trade secret has alternatively been described (Milgrim, 1989) as "any formula, pattern, device or compilation of information which is used in one's business, and which gives him an opportunity to obtain an advantage over competitors who do not know or use it." Or in the words of the Uniform Trade Secrets Act, §1(4) (1979), as "information including a formula, pattern, compilation, program, device, method technique, or process, that: (i) derives independent economic value, actual or potential, from not being generally known to, and not being readily ascertainable by proper means by, other persons who can obtain value from its disclosure or use, and (ii) is the subject of efforts that are reasonable under the circumstances to maintain its secrecy."

Trade secret law differs from patent law in three respects. First, it is grounded in state law, so that aside from the uniformity prevailing in the 16 states that have enacted the Uniform Trade Secrets Act, the scope of protection varies among the states. A few states rest trade secret protection on a property theory, while the majority of states invoke doctrines of tort, contract, constructive trust, or unjust enrichment as a basis of trade secret protection. In addition, 25 states have made it a crime to steal a trade secret (Kitch, 1980).

Second, trade secret law is also outside the inducement/disclosure framework of patent and copyright law. Protection is granted to a patent and copyright owner in return for the disclosure of the subject matter to the public. Trade secrets are, by definition, not disclosed. They are protected against discovery by "improper means," but not against discovery of the trade secret by independent means or by reverse engineering. The incentive to "create" trade secrets, such as customer lists or chemical formulae, and to incur costs of protecting them, is derived from their value. Of course, trade secret protection may serve as an ancillary incentive for the firm to perfect a process that might be eligible for patent protection. But given the more limited prospects for protection of trade secrets, the patent affords a far more powerful incentive.

A third difference between trade secret law and patent law is the subject matter and duration of protection. While protection is granted only for subject matter that represents some creative efforts under the copyright and patent

regimes, trade secret protection rests solely on the commercial value of the matter to the claimant (Kitch, 1980). Thus, trade secret law includes a wider subject matter. The duration of trade secret protection is limited only by the happenstance of independent discovery or by improper disclosure. This potential for perpetual protection serves as an incentive to avoid the disclosure requirements of the patent regime. There is also an abusive potential in trade secret protection if the subject matter of a valuable but little-known expired patent were to be given further protection as a trade secret.

When a competitor has used "improper means" of discovery, or an employee has breached the confidential condition under which a trade secret was disclosed, the available remedies are injunctive relief and damages. The Uniform Trade Secrets Act makes illegal both the use of "improper means" to discover the trade secret and the "misappropriation" of improperly discovered material. Under the UTSA Sec. 1(1-2) (1979), improper means include "theft, bribery, misrepresentation, breach or inducement of a breach of duty to maintain secrecy, or espionage through electronic or other means" while misappropriation is defined in part as "acquisition of a trade secret of another by a person who knows or has reason to know that the trade secret was acquired by improper means." Thus, the focus of trade secret law is "fair dealing" between competitors and between employer and employee with regard to the uses of specific business information.

Since trade secret law is enmeshed both with the competitive process and the internal decisions of the firm, economic analysis of the properties and consequences of trade secret protection would illuminate important public policy interests. One possibility might be to examine the workings of the commercial espionage industry. A systematic investigation of the litigated trade secret cases would provide useful data (Miller, 1989). In this issue, Friedman, Landes, and Posner provide a starting point by arguing that existing trade secret law appears to be consistent with considerations of economic efficiency.

Economic analysis might also illuminate the judicial task of applying trade secret protection. In our view, judges are presently too concerned with the "dirty trick" aspects of competition. We believe that optimal administration of the trade secret laws requires more emphasis on the private and social costs and benefits of trade secret protection, and on economic efficiency, and correspondingly less concern with norms of fair commercial conduct.

Misappropriation

Misappropriation is a legal doctrine that functions outside of trade secret law as a general common law property right against some takings of information of commercial value. The doctrine is derived from a Supreme Court

opinion, *International News Service v. Associated Press* (248 U.S. 215 [1918]), barring the use of uncopyrighted news reports. During World War I, the Hearst news gathering agency copied Associated Press dispatches on the Eastern seaboard and transmitted them by wire to their midwest and west coast papers ahead of their receipt by Associated Press subscribers there. Although the relief granted by the court was limited to protection during the period of initial dissemination, the reasoning of the opinion launched a broad principle of unfair competition law by stating (at p. 240), "... defendant ... admits that it is taking material that has been acquired by complainant as the result of organization and the expenditure of labor, skill, and money, ... and that ... in appropriating it and selling it as its own is endeavoring to reap where it has not sown." This doctrine has been adopted by state and federal courts as a general rule of unfair competition, sometimes granting protection to material otherwise appropriately outside the reach of intellectual property laws (Baird, 1983). However, this doctrine has been repeatedly criticized for its lack of analytical content (Raskind, 1991).

Concluding Thoughts

Increased interest in the economics of intellectual property is timely. The pace of technological change during the last few decades has forced intellectual property law into unknown areas and hard cases, straining the capabilities of courts and legislatures. How should innovations related to semiconductor chip or computer software be protected? Should genetically engineered life forms be patented? Under what conditions should videotaping a television show for home use infringe the rights of program producers?

These and other issues have forced a searching re-examination of many of the premises of the intellectual property system during the last decade. Some authors have called into question some of the basic underpinnings of the law in this area, while others have concluded that the system is fundamentally sound. The papers in this symposium provide examples of both of these views.

Research along these lines could play a key role in affecting America's future standard of living and economic competitiveness. After all, a nation's regime of intellectual property law sets the stage and establishes the incentives for innovation and technological change.

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